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PROJECT #1

Project Title: Assessing the Economic Potential of EBT and Credit Card Capability

Partner Organization: Washington State University

PROJECT SUMMARY

Farmers markets provide an increasingly important, high-value sales venue for specialty and sustainable crops grown in WA State. The initial purpose of this project was to support the growth of direct-market sales of specialty and sustainable crops for small farms in Washington State by evaluating, improving, and increasing the implementation of EBT/credit/debit technologies at farmers markets. Technology that could dramatically increase the sales volume at markets by allowing shoppers to pay with credit/debit cards or use SNAP benefits is currently unavailable to most farmers markets in Washington. WSU believed that developing the technological capacity of WA farmers markets to accept electronic payments could maximize sales volumes and expand access to fresh market specialty crops for far greater numbers of consumers.

This project collected data and provided education at 7 farmers markets that had previously been enrolled in the state legislature-initiated EBT/credit/debit pilot program and expanded the technology to 8 new markets in the 2011/2012 seasons, making a total of 15 pilot markets in the study group. WSU analyzed the cost to benefit ratio of implementing these new technologies and investigated methods that could maximize the reach and impact of the new machines and technologies.

This project was important and timely due to the fact that wireless technology is changing very rapidly. While wireless point of sale machines and wooden tokens used to be the main method for taking EBT/credit/debit cards at farmers markets, new technologies, like the Square, iPod and iPhones with Apps are now available to use for wireless sales. One market in the research group switched over in the 2013 season to the iPod system for wireless sales. Overall wireless farmers market sales have been tracked in the past, but this project was the first time in Washington State that wireless specialty crop sales were tracked. It was critical to research the importance of technologies to specialty crop sales in this rapidly changing environment.

PROJECT APPROACH

The project began at the end of 2010 by reviewing bids from various processors who would provide wireless machines, processing of transactions, and customer service to the pilot farmers markets. The decision was made to go with First National (later called TSYS) for this project. The advisory team concluded that when working with a card processing company--excellent customer service, quick conflict resolution and experience working in a farmers market setting—were more important than a lower cost wireless machine.

The application process for new markets was then initiated, and application materials were distributed via listserves, posted on the WA State Farmers Market Association (WSFMA) website, and discussed in presentations at the WSFMA conference in January 2011. There were 12 new markets that initially applied for the program. Eight of those markets carried the process through to completion. The application process was then opened up to the 20 original markets who had participated in the first pilot stage in 2009-10. Ten from the original group of pilot markets applied and were chosen to participate in this study project, three later dropped out because they did not want to take time to collect the data or the market had closed. These original pilot markets agreed to provide data on wireless sales from the 2009 and 2010 seasons. All 20 original pilots were asked to estimate specialty crop wireless sales during 2009-2010; ten agreed. Thirteen new wireless machines from First National were purchased for the markets participating in the project; two original pilot markets decided to stay with the machine they had received from ePayment America in 2009.

The advisory group decided sales data would be collected for the 2011 and 2012 seasons only. Decisions were also made by the advisory on how specialty crop data should be collected in a farmers market setting. It was agreed that processed foods utilizing specialty crops would not be counted in the sales data that was being collected for this project. The coordinator worked with a CPA to develop an accounting manual and excel/QuickBooks tracking system for the wooden tokens used by markets in the project. Markets were trained on how to use the accounting system and track specialty crop sales through the wireless machine. Markets were also trained on marketing the wireless technologies and low-income customer outreach best practices. Technical support for markets was provided by coordinator Ordóñez during the 2011 and 2012 seasons. Much of it was focused on interfacing with the processor TSYS when problems with the wireless machines arose.

In June, 2011, Colleen Donovan from WSU presented information about this project in "*Assessing the Potential Impacts of Electronic Benefits Transfer and Credit Card Capability at Washington Farmers Markets*," at the Agriculture, Food, and Human Values Society Annual Meeting at the University of Montana. Throughout the summer of 2011, Dr. Gallardo and coordinator Ordóñez surveyed 12 managers, 48 vendors, and 96 customers at 12 of the 17 participating markets. Surveys covered perceived benefits of wireless technology at the market. Dr. Gallardo analyzed sales data, built and calibrated an economic model in statistics software, generated summary statistics and conducted a willingness to pay analysis. Dr. Gallardo analyzed the cost to benefit ratio and overall economic impact of implementing new technology for specialty crop growers selling at markets with credit/debit/EBT machines. Preliminary results were presented at the WA State Farmers Market Association Conference in Leavenworth, WA in February, 2012.

In August, 2012, Dr. Gallardo and her graduate student presented their model for peer review at the Agricultural and Applied Economics Association Conference in Seattle. The peer review presentation was used to see if the numbers were solid or if the model could be improved. Dr. Gallardo submitted her final report titled, "*Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability*" on November 26, 2012. Conclusions as reported by Dr. Gallardo were that managers, vendors, and customers had varying perceptions about wireless technology and the wireless capacity of farmers markets. Managers valued the quality of the technology over the amount of the credit and debit card fees, while vendors most highly valued the customer service aspects of the technology providers over the quality of the technology. Finally, the farmers market customers valued the credit/debit/EBT capabilities of markets, but not as highly as the quality of the food and the opportunity to support local farmers. Customers did indicate that having access to additional forms of payment beyond cash would likely increase their spending. This report was emailed to all markets participating in the project in January 2013.

The 2nd project year began with a presentation at the WSFMA Annual Conference in February 2012. Karen Kinney, Executive Director of the WSFMA and Dr. Gallardo discussed the WSU specialty crop project, the King County Farmers Market Access Project, and the preliminary results from Dr. Gallardo's market surveys and research. Later that year, coordinator Ordóñez trained the Proctor and Everett Farmers Market managers. Proctor FM had a new manager in the 2012 season. They had not received a new wireless machine in year 1 of the project, but their new manager and board requested one in year 2. The project purchased a new wireless POS machine from TSYS and it was delivered to the Proctor Farmers Market in May 2012. Coordinator Ordóñez reviewed the financial and narrative reporting requirements and forms with the new manger. Everett FM was sold to new owners in 2012. Coordinator Ordóñez worked with them to process USDA paperwork for a new FNS (Food Stamp) Retailer Permit, and trained them on accounting procedures.

In 2012, project partners in the King County Agriculture department's Farmers Market Access Project (FMAP) compiled and presented findings on methods to maximize the positive benefits of utilizing new wireless technologies in farmers market pilot projects across the country. The report had a complete research section on alternative emerging models for using wireless technology at farmers markets. In November 2012, the research from the King County Farmers Market Access Project (FMAP) was published by our project partners at: http://your.kingcounty.gov/dnrp/library/water-and-land/agriculture/farmers-markets/201211-FMAP-Report.pdf
The research and an evaluation of alternative emerging models for wireless technology at farmers markets is included in *Section 4: Appropriate Technology Options for Farmers and Farmers Markets*, and in appendices that cover a *Comparison of Central Market Model and Vendor Operated Model*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, and a *Process for State Adoption of Mobile Market+ App and Use at Markets*.

Coordinator Ordóñez visited the Everett, Anacortes and Okanogan FMs during July and August 2012. She was also invited to be a participant in the US Dept. of Health and Human Services Technology and Human Services Symposium in Washington, D.C. on Sept. 10, 2012. After the completion of the 2012 season, twelve markets planned to continue the wireless program –Kittitas, Port Townsend, Mount Vernon, Deer Park, Chehalis, Camas, Prosser, Okanogan, Everett, Tumwater, Anacortes, and Proctor. Three markets stated that they planned to discontinue the current wireless program – Suquamish, Wenatchee, and Kirkland. These 3 markets had significant problems with the processor TSYS. Suquamish and Kirkland were looking into taking EBT only; Wenatchee moved to an iPod system for wireless sales.

During the final program year, data collection was finalized and information was compiled into reports. Coordinator Ordóñez held an interactive market roundtable at the WSFMA Annual Conference in Vancouver, WA on January 25, 2013. The title of the session was, "*The Nuts and Bolts of Plastic*". Panelists included managers from Jefferson

County/Port Townsend FM, Everett FM, and Proctor FM, and advisory group member Suzanne Briggs from Collaboration. Ordóñez discussed the basics of the WSU project, gave preliminary 2011 financial data, and discussed findings from Dr. Gallardo's study. Farmers market managers on the panel discussed market day tips, getting resolution from processor's customer service, 5% charge to vendors to pay for processing fees, other expenses for programs, importance of checking statements, benefits of using the Square for Credit/Debit, advertising and collaborations, flexibility of different types of technology-Square vs. wireless machines, customer and vendor appreciation, the future of wireless technology in farmers markets, and the importance of doing research when choosing a provider.

This was a research project designed specifically to help understand whether having wireless card readers at markets would enhance the competitiveness of specialty crop producers. The data collection methods were designed to allow us to distinguish specialty crops sales through the wireless machines from other types of sales so that we could determine whether or not this capacity would increase the sales of specialty crop producers at markets. This research had never been done before. Before our project, we did not know whether using wireless technologies would increase the competitiveness of specialty crop growers or not. The point of this project was to gain knowledge about how market shoppers behave. This research design that we used was the ONLY practical way to do this type of research. In this setting where there was one machine that could read EBT/Credit Cards for the whole market, it would have been impossible to exclude everything but specialty crops from being run through the machines. Although farmers markets include non-specialty crop items, the use of tokens allowed the market managers to separate specialty crops from non-specialty crop sales so that WSU could separately analyze the specialty crop data. To the best of our knowledge, this was the only research design that would have been practical to implement and the only way that we could have acquired this data on specialty crops sales. We did not analyze the data from the non-specialty crops portion of the sales.

If this research inadvertently benefited non-specialty crop market vendors who were interested in the findings regarding the results of adding wireless technologies to markets, we could certainly devote the matching funds dedicated to this project to support any data collection our outreach procedures that may have benefited non-specialty crop market vendors.

Financial reports from markets in this project were compiled by coordinator Ordóñez and were reported as follows:

20 Original Pilots - Wireless Sales – 2009/2010

	2010	**2009**	
Total Wireless Sales	$437,868	$302,417	$135,451 increase

10 Original Pilots - Estimated Wireless Specialty Crop Sales – 2009/2010

	2010	**2009**	
Total Specialty Crop Sales	$107,453	$64,542	$42,911 increase

15 Project Markets - Wireless Sales – 2011/2012

	2012	**2011**	
Total Wireless Sales	$401,349	$336,499	$64,810 increase

15 Project Markets - Wireless Specialty Crop Sales – 2011/2012

	2012	**2011**	
Total Wireless Specialty Crop Sales	$185,766	$126,346	$59,420 increase
Specialty Crop Sales as a % of Total Wireless Sales	46%	37.5%	

2012 Wireless Sales Breakdown

SNAP EBT	**Credit**	**Debit**
$39,546-10%	$210,766-53%	$151,037-38%

2011 Wireless Sales Breakdown

SNAP EBT	**Credit**	**Debit**
$37,439-11%	$192,592-57%	$106,467-32%

In 2013, *The Washington State Farmers Market Management Toolkit* was published on the WSU Small Farms Team website at: http://csanr.wsu.edu/pages/FMMToolkit/
Information from this specialty crop project was included in Chapter 7, "Accepting Multiple Currencies at Your Farmers Market": http://csanr.wsu.edu/pages/FMMT7/
The process of setting up a farmers market to accept EBT, credit and/or debit cards is outlined. Discussed are key considerations, current options, and creative ideas developed by Washington farmers markets.

"The Use of Wireless Capability at Farmers Markets: Results from a Choice Experiment Study" manuscript by Gallardo, K.; Olanie, A., Ordonez, R. and M. Ostrom was submitted to the *International Food and Agribusiness Management Review* in September 2013. It is awaiting review.

In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* includes data from this specialty crop grant project. As stated in the introduction, "the purpose of this report is to take stock of current "food access" programs at farmers markets in Washington State. Data is aggregated from a variety of sources including recent surveys of farmers market managers and farm vendors, the Washington State Farmers Market Association, the Washington State Department of Social and Health Services and Department of Health, and a Washington State University Small Farms Program project that has worked to collect data and provide EBT, credit and debit technology to farmers markets." The document reports on the Farmers Market Nutrition Program, SNAP, SNAP EBT Technology and Specialty Crops, Food Banks and other Emergency Food Providers, and provides Key Findings and Recommendations.

Project partners were the WSU Small Farms Team, Washington State Farmers Market Association, the WSDA Small Farm and Direct Marketing Program, King County Agriculture Program, and the Washington State Farmers Market Action Team. All were an integral part of each major decision that was made for this project. Members of each organization took part in quarterly conference calls and provided a critical voice in adjusting benchmarks, discussing sales data, providing information about EBT matching program pilots in the state of WA, MI, and NY, and reporting on alternative emerging models for using wireless technology at farmers markets. Many of the project partners were also carrying out companion research and educational projects on farmers market development and farmers market access that benefited from the findings of this project and also informed the design of this project in a synergistic way as described above. This project was specifically designed to address the research question of whether having wireless technologies available would improve the specialty crop sales of farmers market vendors. The research advisory group felt that it was most practical to collect sales data for the 2011 and 2012 seasons. It was critical for markets to record sales through the wireless machines for two seasons and specifically track specialty crop sales. A definition of what specialty crops to target in a Farmers Market context was developed by the advisory group based on the federal definition of a specialty crop. The decision was made not to include processed foods made from specialty crops. Managers and vendors were trained in how to differentiate specialty crops sales from other sales. This was more complicated for a vendor who sells vegetables and chicken than for a vendor who just sells vegetables (for example). In order to make an electronic purchase with either a credit/debit card or an EBT (food stamp) card, customers made a payment at the manager's desk and in return obtained a certain number of wooden "tokens" based on the value of their electronic charge. Customers could then use these tokens to make purchases from farmers. The project coordinator, Rita Ordóñez, trained market managers on ways for vendors at grantee markets to track each day's "token" sales.

Ordóñez worked with a CPA to develop an accounting manual and excel/QuickBooks tracking system for the wooden tokens used by markets in the project. Market managers were trained on how to use the accounting system and track specialty crop sales through the wireless machine. Markets were also trained on marketing specialty crop sales through the wireless technologies and low-income customer outreach best practices. Technical support to help market managers understand the token and tracking system for specialty crop sales was provided by the coordinator, Ordóñez, during the 2011 and 2012 seasons. These methods broke out and isolated specialty crop sales so that markets could easily collect this data.

GOALS AND OUTCOMES ACHIEVED

Goal 1: Improve sales for specialty crop farmers.

This project documented how EBT/credit/debit machines at farmers markets impact sales for specialty crop products. Markets were asked to record sales through the wireless machines for two seasons and specifically track specialty crop sales. Wireless sales increased $64,810 from 2011 to 2012. Specialty Crop Wireless Sales increased $59,420 in the same period and made up 37.5% of wireless sales in 2011 and 46% of wireless sales in 2012. Between 2011 and 2012, average

SNAP EBT sales decreased from $21 to $20, average debit sales increased from $25 to $27 and average credit sales held steady at $34.

WSU compiled farm sales data from farmers markets provided by the WSFMA for the years 2009-2011. Due to the yearly fluctuation and wide variation in both the reported number of farmers and the reported number of weeks that markets were open, WSU experts felt that the data was not robust enough to evaluate ***the benchmark of increasing farm sales by 10 percent each year at markets with the technology***. Due to the number of untracked variables involved, WSU could not use the WSFMA data set to quantify the increase in sales of farm products at markets that used EBT/credit/debit machines; or use it to evaluate farm sales at markets with EBT/credit/debit machines compared to markets without them.

The most useful indicator tracked was annual amount of wireless specialty crop sales, which went up each year. For example, as outlined in the tables on page 4, between 2011 and 2012, wireless specialty crop sales at the study markets increased by 47%.

Goal 2: Increase consumer access to Washington specialty crops.
Markets participating in this WSU specialty crop project monitored the numbers of electronic transactions during each market day. In order to demonstrate increasing consumer access to Washington specialty crops, WSU set ***a benchmark of 1000 electronic transactions per pilot market per year***. In the last year of the project there were 920 transactions per market. While the benchmark of 1000 transactions per market was not quite met, there were increasing numbers of transactions each year. In 2012 there were 2,102 more transactions than there were in 2011. In 2011, there were a total of 11,692 electronic transactions for the study markets, averaging 779 transactions per market. In 2012, there were 13,794 transactions, averaging 920 transactions per market. Over the two-year timeframe of data collection, SNAP EBT transactions remained a steady 14-15% of total transactions, while Credit decreased from 49% to 45% and Debit increased from 36% to 41% of total transactions.

2012 Wireless Transactions Breakdown

SNAP EBT	Credit	Debit
1,932-14%	6,255-45%	5,607-41%

2011 Wireless Transactions Breakdown

SNAP EBT	Credit	Debit
1,801-15%	5,698-49%	4,193-36%

Markets were unable to track the number of new clientele using Basic Food benefits coming to markets with EBT/credit/debit technologies, and WSU did not require participating markets to monitor customer attendance.

Goal 3: Evaluate the economic benefits of current EBT/credit/debit technologies for farmers markets in relation to costs.
Dr. Gallardo's surveys of managers, vendors and customers sought to elicit the perceived benefits and value of wireless technology at the market. Dr. Gallardo analyzed sales data, built and calibrated an economic model in statistics software, generated summary statistics and conducted a willingness to pay analysis. Dr. Gallardo analyzed the cost to benefit ratio and overall economic impact of implementing the new technology for specialty crop growers selling at markets with credit/debit/EBT machines. Her research for *The Use of Wireless Capability at Farmers Market: Results from a Choice Experiment Study*, found that *"in general, respondents expressed that having the wireless machines at the market benefits all three groups. When dealing with values, managers seem to value more quality of technology, than credit card fees, and debit card fees. For vendors, customer service was more important than quality of technology. This is perhaps due to the model used to implement the technology. It is managers who have to deal with it when the machines break. However, if the wireless provider customer service is poor, it is vendors who will be affected, as they will not have their cash on time. For customers, quality of the food was the most important feature of a market, followed by supporting local farmers. Enabling the use of credit/debit/food stamp cards was third in importance, ahead of market atmosphere. In sum, results from this study are encouraging for those who advocate the use of wireless capacity at farmers markets. Managers and vendors are receptive to the model used. Most importantly, customers have indicated that having access to other forms of payment rather than cash will likely increase their spending."*

The benchmark number of two Extension reports was met through the following publications:

1) *The Washington State Farmers Market Management Toolkit* was published on the WSU Small Farms Team website at: http://csanr.wsu.edu/pages/FMMToolkit/
Information from this WSU specialty crop project was included in Chapter 7, "*Accepting Multiple Currencies at Your Farmers Market*": http://csanr.wsu.edu/pages/FMMT7/
These recommended practices and strategies included in Chapter 7 can be used to optimize the implementation of EBT/credit/debit machines at farmers markets.

2) In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* included data from this WSU specialty crop grant project demonstrating the overall economic impact to specialty crop growers selling at markets with EBT/credit/debit machines.

Goal 4: Help additional Washington farmers markets access wireless EBT/credit/debit readers.
WSU assisted 8 new markets and 6 original pilot markets to access new wireless EBT/credit/debit readers. While ***the benchmark of assisting 20 new Washington farmers markets with the necessary education and training on the use, record-keeping, and promotion of the technologies*** was not met, WSU did work with 15 markets who completed the study. There was initial interest from 22 markets, but not all ended up participating in or completing the project due to various unforeseen circumstances.

Goal 5: Investigate and employ methods to maximize the positive benefits of utilizing new wireless technologies.
In order to maximize the reach and impact of the 14 new machines, WSU trained markets on accounting, marketing and outreach. Markets were trained on how to properly use the wireless machines and how to use the accounting system to track wireless and specialty crop sales. Training on marketing and low-income customer outreach best practices insured that the availability of the machines was advertised widely with key target audiences.

Information and recommendations from WSU's research were shared with market managers at the annual 2012 and 2013 WSFMA conferences and to a broader audience through two extension publications. Dr. Gallardo's academic research is still pending review for publication in the *International Food and Agribusiness Management Review*. Project partners in the King County Agriculture department's Farmers Market Access Project (FMAP) compiled and presented findings on methods to maximize the positive benefits of utilizing new wireless technologies in farmers market pilot projects across the country. The report had a complete research section on alternative emerging models for using wireless technology at farmers markets. In November 2012, the research from the King County Farmers Market Access Project (FMAP) was published at: http://your.kingcounty.gov/dnrp/library/water-and-land/agriculture/farmers-markets/201211-FMAP-Report.pdf
The research and an evaluation of alternative emerging models for wireless technology at farmers markets is included in *Section 4: Appropriate Technology Options for Farmers and Farmers Markets*, and in appendices that cover a *Comparison of Central Market Model and Vendor Operated Model*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, and a *Process for State Adoption of Mobile Market+ App and Use at Markets*.

While the ***benchmark to train 20 new managers in the optimal use of EBT technologies and community outreach*** was not met, WSU did train 8 new managers and 7 original pilot managers. In addition, WSU produced 2 extension publications, and 1 research report which is awaiting review for publication. Presentations about this WSU specialty crop project were made at three WSFMA Annual Conferences, the 2011 Agriculture, Food, and Human Values Society Annual Meeting at the University of Montana, and the 2013 Agricultural and Applied Economics Association Conference in Seattle. Information about this project was also shared at the US Dept. of Health and Human Services Technology and Human Services Symposium in Washington, D.C. in September, 2012. All materials pertaining to this project were distributed through the WSFMA and WSU Small Farms Program website.

Here is a comparison of our Activiteis and Goals and our Actual Accomplishments:

Activities and Goals	**Actual Accomplishment**
Identify data collected by markets needed to quantify specialty crops.	A definition of what specialty crops to target in a Farmers Market context was developed by the advisory group. The decision was made to leave out of this analysis processed

	foods made from specialty crops. It was critical for specialty crop sales through the wireless machine to be differentiated from other sales. This is more complicated for a vendor who sells vegetables and chicken than for a vendor who just sells vegetables (for example). Markets needed a method to get vendors to track specialty crop sales information. Ordóñez trained markets on a variety of formats for vendors at grantee markets to track each day's "token" sales. These methods broke out and isolated specialty crop sales so that markets could easily collect this data. Market managers worked with their vendors to decide which method would work best for them.
Provide technical assistance to 20 markets currently using EBT/credit/debit machines.	Jackie Aitchison, Past Executive Director of the WSFMA, provided technical assistance and support to the 20 farmers markets that were utilizing wireless EBT/Credit/Debit machines in 2010. These markets were part of an earlier pilot project through WA State Dept. of Health and Social Services. Once 8 new markets were identified in February 2011, Ordóñez provided ongoing technical assistance to them and the 7 original pilots who continued to work with the project, for a total of 15 markets. Additional markets expressed initial interest in participating in the project, but did not complete the study.
Work with market managers to ensure that critical data is acquired and proper records kept.	The 20 original pilot markets from 2009/2010 turned in reports to WSU and sales data was compiled from the 2010 season. New reporting forms, methods and surveys were developed for farmers markets participating in the WSU Specialty Crop Grant during the 2011/2012 season. These market managers were trained on accounting procedures/reporting and outreach/marketing. Estimated specialty crop sales data from the 2009 and 2010 seasons was compiled for 10 original pilot markets. Wireless sales data and specialty crop sales data from 2011/2012 were compiled with data from all 15 participating markets.
Administer application process for new EBT/credit/debit machines	The application process for new EBT/Credit/Debit machines was advertised over listserves and the WA State Farmers Market Association (WSFMA) website during January and February 2011. Presentations done at the WSFMA conference in Leavenworth, WA in January 2011 included information on the application procedure for the 2011-2012 WSU wireless grant project. The deadline for grant applications was February 18, 2011. The Farmers Market Wireless Technology Advisory Group reviewed the 12 applications that came in and had a conference call to discuss the markets that had applied. There were three markets (Clarkston, Pullman and Sunnyside) that the advisory group asked for follow-up information from. After follow-up, the Advisory Group decided to fund all the markets that had applied. The three markets that the advisory group asked for follow-up with (Clarkston, Pullman and Sunnyside) gave the grant further consideration and decided to drop out of the project. Port Angeles Farmers Market also dropped out due to the requirements of a USDA Farmers Market Promotion Program grant that they had also received. Since the WSDA Specialty Crop grant funding was for 20

	markets, the Advisory Group decided to open the application process up to the original pilot markets that had participated in 2009 and 2010. Seven of the initial 20 pilots decided to participate in our study and to collect specialty crop sales data in the 2011 and 2012 seasons and test a new machine and marketing materials.
Train new market managers on use and advertising around EBT/credit/debit machines.	Three trainings were held in April 2011. Markets were provided with excel spreadsheets for tracking specialty crop sales and all other sales through the wireless machines. They were also provided with an accounting manual specifically aimed at the procedures that are necessary when running a wooden token/wireless machine system at the farmers market. Markets were trained on how to use the paper forms and the excel spreadsheets. All new markets were also trained on outreach and marketing best practices. They were asked to network with other markets present to develop an outreach plan prior to the end of the training session.
Analyze and report on use and impact of machines at markets for 2010, 2011	During the 2010 season, the 20 original pilot markets reported a total of $437,868 of sales through the wireless machines. This is an increase of $135,451 over total sales of $302,417 in 2009. In addition, a presentation entitled, "*Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability at Washington Farmers Markets*" was given at the Agriculture, Food, and Human Values Society Annual Meeting at the University of Montana in June 2011. During the 2011 season, 15 farmers markets reported sales of $336,499 through the wireless machines. *Specialty crop* sales made up $126,346 or 37.5% of the total sales through the machine. Dr. Gallardo analyzed the cost to benefit ratio and overall economic impact of implementing new technology for specialty crop growers selling at markets with credit/debit/EBT machines. Dr. Gallardo presented preliminary results at the WA State Farmers Market Association Conference in Leavenworth, WA in February, 2012. In August, 2012, Dr. Gallardo and her graduate student presented their model for peer review at the Agricultural and Applied Economics Association Conference in Seattle. Dr. Gallardo submitted her final report titled, "*Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability*" on November 26, 2012. This report was emailed to all markets in the project in January 2013. "*The Use of Wireless Capability at Farmers Market: Results from a Choice Experiment Study*" manuscript was submitted to International Food and Agribusiness Management Review in September 2013. It is awaiting review. *The Washington State Farmers Market Management Toolkit* was published on the WSU Small Farms Team website at: http://csanr.wsu.edu/pages/FMMToolkit/ Information from this WSU specialty crop project was included in Chapter 7, "*Accepting Multiple Currencies at*

	Your Farmers Market": http://csanr.wsu.edu/pages/FMMT7/ These recommended practices and strategies included in Chapter 7 can be used to optimize the implementation of EBT/credit/debit machines at farmers markets. In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* included data from this WSU specialty crop grant project demonstrating the overall economic impact to specialty crop growers selling at markets with EBT/credit/debit machines.
Partner with the Washington State Farmers Market Association to collect and enter sales data from all Washington State Farmers Markets for 2006 through 2012.	Colleen Donovan, WSU Small Farms Program, compiled the sales data from the WSFMA markets. Coordinator Ordóñez provided her with a list of markets participating in the 2009-2010 pilot and markets participating in the current 2011-2012 project. Markets were coded and the sales data set was analyzed through SPSS. Due to the yearly variables in both the reported number of farmers and reported number of weeks that markets were open, WSU staff felt that the data was not robust enough to evaluate *the benchmark of increasing farm sales by 10 percent each year at markets with the technology*. WSU could not use the WSFMA data set to quantify the increase in sales of farm products at markets as a result of using EBT/credit/debit machines; or use it to evaluate farm sales at markets with EBT/credit/debit machines compared to markets without them.
Analyze sales data, build and calibrate economic model, program model in statistics software, calibrate program.	Data was collected at 12 markets via customer, vendor and manager questionnaires. Dr. Gallardo, WSU, analyzed the cost to benefit ratio and overall economic impact of implementing new technology for specialty crop growers selling at markets with credit/debit/EBT machines. Dr. Gallardo submitted her final report titled, "*Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability*" on November 26, 2012.
Report on economic impacts of EBT/credit/debit machines to markets that used them.	Dr. Gallardo presented preliminary results at the WA State Farmers Market Association Conference in Leavenworth, WA in February, 2012. Dr. Gallardo submitted her final report titled, "*Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability*" on November 26, 2012. This report was emailed to all markets in the project in January 2013. Coordinator Ordóñez held an interactive market roundtable at the WSFMA Annual Conference in Vancouver, WA on January 25, 2013. The title of the session was, "*The Nuts and Bolts of Plastic*". Panelists included managers from Jefferson County/Port Townsend FM, Everett FM, and Proctor FM, and advisory group member Suzanne Briggs from Collaboration. Ordóñez discussed the basics of the WSU project, gave preliminary 2011 financial data, and discussed findings from Dr. Gallardo's study. Farmers

	market managers on the panel discussed market day tips, getting resolution from processor's customer service, 5% charge to vendors to pay for processing fees, other expenses for programs, importance of checking statements, benefits of using the Square for Credit/Debit, advertising and collaborations, flexibility of different types of technology-Square vs. wireless machines, customer and vendor appreciation, the future of wireless technology in farmers markets, and the importance of doing research when choosing a provider. *The Washington State Farmers Market Management Toolkit* was published on the WSU Small Farms Team website at: http://csanr.wsu.edu/pages/FMMToolkit/ Information from this WSU specialty crop project was included in Chapter 7, "*Accepting Multiple Currencies at Your Farmers Market*": http://csanr.wsu.edu/pages/FMMT7/ These recommended practices and strategies included in Chapter 7 can be used to optimize the implementation of EBT/credit/debit machines at farmers markets. In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* included data from this WSU specialty crop grant project demonstrating the overall economic impact to specialty crop growers selling at markets with EBT/credit/debit machines.
Prepare academic and extension publications on economic impacts of EBT/credit/debit machines to specialty crop producers and farmers markets.	"The Use of Wireless Capability at Farmers Market: Results from a Choice Experiment Study" manuscript was submitted to *International Food and Agribusiness Management Review* in September 2013. It is awaiting review. In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* included data from this WSU specialty crop grant project demonstrating the overall economic impact to specialty crop growers selling at markets with EBT/credit/debit machines.
Research and evaluate alternative emerging models for wireless technology at farmers markets.	In 2012, project partners in the King County Agriculture department's Farmers Market Access Project (FMAP) compiled and presented findings on methods to maximize the positive benefits of utilizing new wireless technologies in farmers market pilot projects across the country. The report had a complete research section on alternative emerging models for using wireless technology at farmers markets. In November 2012, the research from the King County Farmers Market Access Project (FMAP) was published at: http://your.kingcounty.gov/dnrp/library/water-and-land/agriculture/farmers-markets/201211-FMAP-Report.pdf The research and an evaluation of alternative emerging models for wireless technology at farmers markets is included in *Section 4: Appropriate Technology Options for Farmers and Farmers Markets*, and in appendices that cover a *Comparison of Central Market Model and Vendor*

	Operated Model, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, and a *Process for State Adoption of Mobile Market+ App and Use at Markets*.
Project performance monitoring through quarterly teleconference meetings with project staff and stakeholder input committee.	Quarterly conference calls were held with coordinator Ordóñez and members of the advisory committee every quarter of the project. Updates were given and items of importance were discussed. Meeting notes were emailed to the advisory committee after conference calls were held.

Here is a comparison of the Expected Measurable Outcomes, the Baseline Data, and Achievement of set targets:

Expected Measurable Outcome	**Baseline Data**	**Achievement of set targets**
Improve sales for specialty crop farmers.	There were $336,499 in sales through wireless machines in 2011, 37.5% of these, or $126,346 were specialty crop sales. There were $401,349 in sales through wireless machines in 2012, 46% of these, or $185,766 were specialty crop sales. Wireless sales increased $64,810 from 2011 to 2012. Specialty Crop Wireless Sales increased $59,420 in the same period, an increase of 47%.	The wireless sales for specialty crop farmers selling at participating markets increased by $59,420 from 2011 to 2012, an increase of 47%. WSU compiled farm sales data from farmers markets provided by the WSFMA for the years 2009-2011. Due to the yearly variables in both the reported number of farmers and reported number of weeks that markets were open, WSU staff felt that the data was not robust enough to evaluate ***the benchmark of increasing farm sales by 10 percent each year at markets with the technology***.
Increase consumer access to Washington specialty crops.	Eight new farmers markets were able to test sales of specialty crops through the use of credit/debit/EBT cards in 2011 and 2012. Six additional markets obtained new wireless machines to try out in search of more consistent and trouble free sales of specialty crops and other items.	Markets participating in this WSU specialty crop project monitored the numbers of electronic transactions during each market day. In order to demonstrate increasing consumer access to Washington specialty crops, WSU set ***a benchmark of 1000 electronic transactions per pilot market per year***. In 2012, there were 13,794 transactions, averaging 920 transactions per market. While the benchmark of 1000 transactions was not quite met, there were increasing numbers of transactions each year. In 2012 there were 2,102 more transactions than there were in 2011. In 2011, there were a total of 11,692 electronic transactions, averaging 779 transactions per market. In 2012, there were 13,794 transactions, averaging 920 transactions per market. Over the two year timeframe of data collection, SNAP EBT transactions remained a steady 14-15% of total transactions, while Credit decreased from 49% to 45% and Debit increased from 36% to 41% of total transactions.
Evaluate the economic benefits of current	Dr. Gallardo, WSU, analyzed the cost to benefit ratio and	Dr. Gallardo analyzed sales data, built and calibrated an economic model in statistics software, generated summary statistics and conducted a willingness to pay analysis. Her

EBT/credit/debit technologies for farmers markets in relation to costs.	overall economic impact of implementing new technology for specialty crop growers selling at markets with credit/debit/EBT machines. She designed a study which surveyed 96 customers, 48 vendors and 12 managers at 12 farmers markets with wireless technology. Surveys covered perceived benefits of wireless technology at the market.	research for *The Use of Wireless Capability at Farmers Market: Results from a Choice Experiment Study*. Of the wireless machines features, managers assigned a higher value to ease of use ($6.1) and quality of the technology ($4.1) over customer service ($3.7). Vendors assigned a higher value to customer service ($0.01) over quality of the technology ($0.007). Customers place the highest values to quality of the food sold ($0.04) and vendors being local farmers ($0.03). Having access to wireless capability was positively valued at ($0.02) over entertaining atmosphere ($0.001). Customers indicated that having access to other forms of payment rather than cash would likely increase their spending. "*The Use of Wireless Capability at Farmers Market: Results from a Choice Experiment Study*" manuscript was submitted to International Food and Agribusiness Management Review in September 2013. It is awaiting review. ***The benchmark number of two Extension reports was met through the following publications***: *1) The Washington State Farmers Market Management Toolkit* was published on the WSU Small Farms Team website at: http://csanr.wsu.edu/pages/FMMToolkit/ Information from this WSU specialty crop project was included in Chapter 7, "*Accepting Multiple Currencies at Your Farmers Market*": http://csanr.wsu.edu/pages/FMMT7/ These recommended practices and strategies included in Chapter 7 can be used to optimize the implementation of EBT/credit/debit machines at farmers markets. 2) In 2013, *Accepted Here! Food Access Programs at Washington State Farmers Markets* was also published on the WSU Small Farms Team Website under Marketing. *Accepted Here!* included data from this WSU specialty crop grant project demonstrating the overall economic impact to specialty crop growers selling at markets with EBT/credit/debit machines.
Help additional Washington farmers markets access wireless EBT/credit/debit readers	WSU assisted 8 new markets and 6 original pilot markets to access new wireless EBT/credit/debit readers.	While ***the benchmark of assisting 20 new Washington farmers markets with the necessary education and training on the use, record-keeping, and promotion of the technologies*** was not met, WSU did work with 15 markets and began initial inquiry with 22 markets interested in participating in the project.
Investigate and employ methods to maximize the positive benefits of utilizing new wireless technologies.	Three trainings on accounting and outreach/marketing best practices were held in April 2011. Information and recommendations from WSU's research were shared with market managers at the annual 2012 and 2013 WSFMA	While the ***benchmark to train 20 new managers in the optimal use of EBT technologies and community outreach*** was not met, WSU did work with 15 managers intensively. In addition, WSU held three trainings for managers on best marketing/outreach practices, made three conference presentations for market managers at the annual WSFMA conference, and produced 2 extension publications, and 1 research report which is awaiting review for publication. Project partners in the King County Agriculture department's Farmers Market Access Project (FMAP) compiled and presented findings on methods to maximize

	conferences and to a broader audience through two extension publications. Dr. Gallardo's academic research is still pending review for publication in the *International Food and Agribusiness Management Review*.	the positive benefits of utilizing new wireless technologies in farmers market pilot projects across the country. The report had a complete research section on alternative emerging models for using wireless technology at farmers markets. In November 2012, the research from the King County Farmers Market Access Project (FMAP) was published at: http://your.kingcounty.gov/dnrp/library/water-and-land/agriculture/farmers-markets/201211-FMAP-Report.pdf The research and an evaluation of alternative emerging models for wireless technology at farmers markets is included in *Section 4: Appropriate Technology Options for Farmers and Farmers Markets*, and in appendices that cover a *Comparison of Central Market Model and Vendor Operated Model*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, a *Cost Analysis for Point of Sale Devices to Accept EBT and Credit/Debit Cards*, and a *Process for State Adoption of Mobile Market+ App and Use at Markets.* All materials pertaining to this project were distributed through the WSFMA and WSU Small Farms Program website.

BENEFICIARIES

Specialty crop farmers, farmers market managers, shoppers, and those working on food access have benefitted and will continue to benefit from the research completed for this project. The research can also be applicable to those working in the arena of Agricultural Economics. The project has shown that having wireless technology in farmers markets increases sales for specialty crop farmers, it provides access to shoppers wanting to use their credit or debit cards, and it gives low income shoppers the opportunity to shop with their SNAP EBT cards. The research has also demonstrated a method of how to carry out a customer, manager and vendor "willingness to pay analysis" for various attributes found at a farmers market.

The data collected for this project demonstrates that having wireless sales technology in a farmers market setting can provide increased sales for specialty crop farmers and farmers market managers. It also demonstrates that wireless machines provide increased access to sales for all shoppers, and it provides those working on food access with data about SNAP sales at farmers markets. In this project, specialty crop sales made up a significant and growing portion of all sales through the wireless machines, 37.5 % in 2011 and 46% in 2012.

20 Original Pilots - Wireless Sales – 2009/2010

	2010	**2009**	
Total Wireless Sales	$437,868	$302,417	$135,451 increase

10 Original Pilots - Estimated Wireless Specialty Crop Sales – 2009/2010

	2010	**2009**	
Total Specialty Crop Sales	$107,453	$64,542	$42,911 increase

15 Project Markets - Wireless Sales – 2011/2012

	2012	**2011**	
Total Wireless Sales	$401,349	$336,499	$64,810 increase

15 Project Markets - Wireless Specialty Crop Sales – 2011/2012

	2012	**2011**	
Total Specialty Crop Sales	$185,766	$126,346	$59,420 increase
Specialty Crop Sales as a % of Total Wireless Sales	46%	37.5%	

2012 Wireless Sales Breakdown

SNAP EBT	Credit	Debit
$39,546-10%	$210,766-53%	$151,037-38%

2011 Wireless Sales Breakdown

SNAP EBT	Credit	Debit
$37,439-11%	$192,592-57%	$106,467-32%

2012 Wireless Transactions Breakdown

SNAP EBT	Credit	Debit
1,932-14%	6,255-45%	5,607-41%

2011 Wireless Transactions Breakdown

SNAP EBT	Credit	Debit
1,801-15%	5,698-49%	4,193-36%

A summary of Dr. Gallardo's research, "*Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability*" included this quantitative data, "The use of wireless capability is an alternative to increase farmers markets' sales and customer base. In this study, we elicited the value managers and vendors assign to different wireless machines' features. Also we estimate customers' values on different markets' features, including access to wireless capability. Of the wireless machines features, managers assigned a higher value to ease of use ($6.1) and quality of the technology ($4.1) over customer service ($3.7). Vendors assigned a higher value to customer service ($0.01) over quality of the technology ($0.007). Customers place the highest values to quality of the food sold ($0.04) and vendors being local farmers ($0.03). Having access to wireless capability was positively valued ($0.02) over entertaining atmosphere ($0.001). Findings from this study should be useful to those designing ways to implement wireless capability at farmers markets in order to increase adoption rates."

LESSONS LEARNED

Technology offers opportunities for improved sales in a farmers market setting. When the technology is available, specialty crop farmers receive a significant portion of wireless sales. Having technology in the farmers market's hands evens the playing field for small farmers. Farmers who might not be able to afford the technology and fees, can still have access to increased sales through the market's machine.

Technology offers opportunities for all customers to have access to purchasing fresh, local specialty crop farm products. Lower income shoppers who want to use their SNAP benefits can only do so in markets that have the technology.

Through Dr. Gallardo's research, WSU now has documentation of the value customers, vendors and managers place on various attributes of farmers markets. Her research has shown that managers and vendors are receptive to the model where the market is responsible for providing the technology which enables wireless sales. It also has shown that customers have indicated that having access to other forms of payment rather than cash will likely increase their spending.

Projects like this WSU specialty crop grant can demonstrate the value of having technology to farmers that can afford it. One market manager stated that "many of the farmers who participated in the program for the full 3 years decided to get credit/debit access for themselves. Had it not been for this program, I do not believe that many of these farmers would have believed just what an advantage it is to take these payment forms".

Finding a single processor that meets the needs of all the farmers markets is very difficult. Several markets had no problems with TSYS, or if they did run into a problem, it was resolved very quickly. Three markets had significant problems with TSYS. These problems often resulted in lost sales or money never being deposited for sales that were made. It may be best in these types of programs to train markets on what to look for in a processor, give them several options (including going to their local bank), and then allow them to choose a processor on their own. While it would be difficult for a program coordinator to advocate for markets with so many different processors, it may provide a unique research opportunity to identify characteristics of markets and processors that work well together.

Market leadership changes regularly. Development of webinar training, training on what to do when things go wrong with a processor and a mentoring program could help ease transition of technology projects for market management.

In 2013, Wenatchee Farmers Market transitioned vendors to an all iPod system with market doing the bookkeeping (not all vendors participated). While it seemed that this new technology might be a better/cheaper system, there were these unexpected consequences:

A. Cost of program increased over the wireless terminals due to approximately 3 times more transactions at farmer's level than at the market level when using tokens.
B. Printer battery lasts only 4 hours and printer paper is expensive.
C. When printer is not working, vendors key in transactions, which costs more per transaction.
D. Market can only charge 9 iPods at one time. Process very cumbersome with many cords.
E. SNAP transactions are half of 2012. Factors that might have affected this are – the market changed location, transportation barriers and lack of promotion.

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ADDITIONAL INFORMATION

In kind matching was provided through WSU salaries and benefits for project personnel Karina Gallardo, Marcia Ostrom, Douglas Collins and Chad Kruger (Director of CSANR) who dedicated their time to the project and in unrecovered indirect costs.

Salaries of project personnel: $41,779.61
Benefits for project personnel: $12,584.17
Uncharged Indirect Costs: $59,745.63
Total Match Provided: $114,109.41
Total Promised: $108,627.00

PROJECT #2

Project Title: Production Efficiency and Sustainability of New Potato Varieties

Partner Organization: Washington State Potato Commission

PROJECT SUMMARY

The Pacific Northwest Potato Variety Development Program (NWVDP) is a highly collaborative multi-state (WA, ID, OR) and multi-institutional effort focused on breeding new varieties. It is the most successful breeding effort in the U.S. for long russet cultivars and exemplifies the cooperative research approach visualized by writers of the original Farm Bill. Selections from the program are evaluated using agronomic management tailored to the standard, input-intensive cultivar, Russet Burbank (RB). However, many of the newly released cultivars outperform RB and could be grown profitably with fewer inputs, resulting in greater returns with less impact on the environment. The potential increased efficiency of these cultivars is currently not evaluated in the trials. Hence, the full extent of their increased efficiency and sustainability is unknown. With funding from the WSDA Specialty Crop program, advanced agronomic trials were conducted to compare the production efficiencies and sustainability of newly released cultivars from this program under a range of management inputs. Results from the 3-year project define best management practices and sustainability parameters for selected production inputs (e.g., N, P, water, land) for each cultivar. Much of the data provide a direct measure of the resource utilization efficiency and potential environmental impact of producing each cultivar in the highly productive Columbia Basin. This information is essential to enable stakeholders to choose cultivars that maximize profit margins and environmental stewardship and will lead to increased adoption of more sustainable cultivars and competitiveness of the WA potato industry.

Major goals of the research were to identify clones that are more efficient in producing yield and higher economic returns than the mainstay cultivar, Russet Burbank, and to develop best management practices and 'sustainability indices' for the most productive and newest releases from the NWVDP. Much of the core data needed to accomplish these goals was acquired through the trials described under 'Project Approach' below. Communication of the results of these trials to stakeholders through extension and outreach activities will lead to increased adoption of several of the more efficient cultivars along with implementation of best management practices for their production.

Fourteen new cultivars have been released from the NWVDP in the last five years. By design, these cultivars are mostly evaluated using agronomic management tailored to the standard, input-intensive cultivar Russet Burbank (RB) until their release from the program. Although many of the new cultivars outperform RB under this level of management, many could likely be grown profitably with reduced inputs, benefitting growers, consumers, and the environment. Therefore, this research was needed to provide growers with more detailed information on the performance of these cultivars under a broader range of management inputs to define the full potential of the new (and superior) genotypes for production in WA. Results from this project can be used to optimize production systems for maximum profitability and sustainability.

PROJECT APPROACH

Three seasons of field and postharvest research were conducted to evaluate the utilization efficiency of agronomic inputs (e.g. nitrogen, phosphorus, water, land) by new potato cultivars from the NWVDP. Postharvest research from the final (2013) field season is currently in progress and results will be available in June 2014. Seasonal activities were accomplished as described in the seasonal work plan (Table 1) of the original proposal. These activities involved maintaining all the field trials listed below, including application of in-season N, P and irrigation treatments, processing tuber samples from in-season harvests, analysis of petioles, harvesting, sorting and grading of selected trials (harvested in October of each year), and data analysis (still ongoing).
Major goals of the research were to identify clones that are more efficient in producing yield and higher economic returns than the mainstay cultivar, Russet Burbank (RB), and developing best management practices and sustainability information for the most productive and newest releases from the NWVDP under WA growing conditions. The trials listed below were completed during the 2011, 2012 and 2013 growing seasons at the Othello Research Unit. All trials were showcased at the Othello Potato Field day in June of each year and results from selected studies were presented at the WA/OR annual Potato Conferences in Kennewick every January. A short synopsis of the significant results of each trial is provided below. Additional information can be found as reported to the Washington State Potato Commission in: Washington State Potato Commission Progress Reports for the years 2011 (pp 138-165 and 225-246) and 2012 (pp. 141-164 and 213-235).

- **Late Regional yield potential and quality evaluation screening trial (avg 14 clones per year vs. Russet Burbank, Ranger and Norkotah Russet standard varieties)**
  The objective of this trial was to identify advanced clones from the breeding program that have the potential to be produced more efficiently and sustainably than standard varieties. Forty three clones/cultivars were evaluated in this trial over the 3-year period. Of these, A01010-1 and A03158-2TE survived the screening process and were clearly superior to the check cultivars when agronomic performance, efficiency of resource utilization, and postharvest attributes were collectively considered. For example, A01010-1 produced a 3-year average total yield of 40.7 T/A compared with 39.7 T/A for A03158-2TE and 35.7 T/A for RB with the same agronomic inputs. U.S. #1 yields (>4 oz) averaged 35.3 (A01010-1), 34.6 (A03158-2TE) and 26.8 T/A (RB). N use efficiencies for total yield averaged 8.6 lb N/T (A01010-1), 8.8 lb N/T (A03158-2TE) and 9.8 lb N/T (RB). For U.S. #1 yields (>4 oz), A01010-1, A03158-2TE and RB required 9.9, 10.1 and 13.1 lb N/A, respectively, to produce a ton of U.S. #1 potatoes. Therefore, to produce a yield target of 27 T/A U.S. #1 tubers (= avg yield of RB), RB required 350 lb/A seasonal N, A01010-1 required 267 lb/A N and A03158-2TE required 273 lb/A N. On average, these clones were thus 30% more efficient in their utilization of N for production of U.S. #1 tuber yield than RB. These clones also produced higher yields with less P and water than RB. For a 27-ton yield of U.S. #1 tubers, A01010-1 and A03158-2TE required 193 lb/A P_2O_5 compared with 251 lb/A P_2O_5 for RB. Seasonal water use averaged 0.59 inches/T of total yield for A01010-1 and A03158-2TE versus 0.67 inches/T for RB. The superior efficiency of these clones in producing high yield with reduced inputs, excellent tuber quality and storability attributes supports their release as cultivars to enhance production and profitability for PNW growers. The results from this trial will help facilitate adoption of these clones by industry when released as cultivars.

- **Land use efficiency plant population trials - Premier Russet (in-row spacing); Alturas, Umatilla Russet, Russet Burbank, Russet Norkotah, Chieftain, Ranger Russet (row width)**
  Three years of results demonstrate that when grown with a constant level of nutrition (N, P, K and other nutrients) and water, total and marketable yields (U.S. No. 1 + <4 oz) significantly increase when Premier was grown at 8- and 6-inch in-row spacings (34 inches between rows) compared to the standard 10-inch spacing. Decreasing in-row spacing from 10 inches reduced tuber set per plant, increased the number of tubers produced per acre, increased or maintained the percentage of tubers from 4-14 oz and decreased the proportion of oversize tubers (>14 oz). Relative to the conventional 10-inch spacing, the shift in size distribution for 8-inch spacing returned an extra $248/A on a frozen processing contract (+5.7% return, after subtracting the added seed cost). For production of seed, the shift in tuber size distribution toward smaller tubers with 6- and 8-inch spacings increased returns per acre by 16% and 8%, respectively, over 10-inch spacing (seed costs subtracted). In-row spacing also interacted with seed-tuber physiological age to affect tuber size distribution. Across three years, closer in-row spacing increased the efficiency of yield production per unit nutrient and water input on an acre basis for this cultivar.
  The industry standard row width for potatoes is 34 inches. In an effort to maximize land use efficiency, we conducted three years (2011-13) of research with 6 varieties (Ranger, R. Burbank, Umatilla, R. Norkotah, Alturas, and Chieftain) and planted them at 30-, 32-, 34-, and 36-inch row widths, holding input (N, P, K, etc) levels constant. The data indicate that these varieties can be grown more efficiently simply by reducing row width. Total yield and economic revenue of all varieties increased as row width was reduced from 36- to 30-inches. Across all varieties 30- and 32-inch wide rows produced higher economic returns than the industry standard of 34 inches, while the 36 inch row width produced the lowest returns for all varieties. All varieties except Ranger performed best when planted to 30 inch rows. Ranger performed best when planted into 32 inch rows. WA growers can boost their potato production and economic return by at least 5.25%, just by reducing row width 2 inches. Moreover, they can maintain the input levels they used for 34 inch rows including water, fertilizer, land, irrigation equipment, diesel, and pesticides. Growers with 100 acres of potatoes should produce an extra $20,500 of gain by switching to 32 inch rows; with 1,000 acres they should expect to see and additional $200,500. However, in order for growers to reduce row width, they will need newly designed, expensive equipment.

- **Nitrogen use efficiency studies - Sage Russet and Alpine Russet (harvest index, physiological maturity modeling, and effects on postharvest quality)**
  Sage and Alpine Russet, two recent releases from the NWVDP, were grown under four levels of in-season N over 3 years to model N use efficiency and define the N requirements for each cultivar for WA growers.

The N rates averaged 190, 278, 365 and 453 lb/A. Multiple harvests began ~59 days after planting and continued at approximately 12-day intervals through 177 days during each growing season. Foliar and tuber growth were modeled as affected by N rate. Sage produces significantly less foliage than Alpine at similar levels of N nutrition. Foliar growth and tuber yield increased with N for both varieties. Total biomass (foliage + tubers) increased substantially with N rate. While growth data over the 3-year period are still being compiled and postharvest trials for the final season have just begun, a summary of growth and storage characteristics, along with key findings and recommendations for these cultivars, is presented below.

(1) Tuber yield increased with N-induced increases in total foliar growth and foliar duration for both Alpine and Sage Russet.

(2) Both cultivars should be managed to promote early foliar growth during the first 100 days to maximize the available source (i.e. foliage) to support bulking and achieve the highest yield potential. The harvest index (HI) of Alpine Russet should be 45-50%, slightly favoring foliar growth over tuber growth at maximum foliar development (94-106 DAP) to achieve the greatest yield at season end. In contrast, Sage Russet is unique in often producing much less foliar growth than Alpine and many other late season russet cultivars. Consequently, the HI of Sage will favor tuber growth (HI 58-63%) at maximum foliar development (94-106 DAP).

(3) As N rate increases, the duration of crop development is extended and the attainment of tuber physiological maturity (PM) delayed. A crop should be harvested within days of achieving PM to maximize retention of postharvest quality. When harvested late (e.g., 175-180 DAP), a crop produced under high N often maintains quality longer during storage than a crop produced under lower N. Tubers from high N plots are physiologically younger and maintain process quality longer than tubers from low N plots. Therefore, N rate can affect postharvest retention of process quality.

(4) Reducing sugars in the stem ends of tubers were higher at harvest when grown with lower levels of in-season N, indicating physiologically older tubers – this resulted in earlier loss of process quality during storage, particularly for Alpine.

(5) Based on three years of trials, maximum yield of Alpine was achieved with approximately 365 lb/A N. Maximum yield of Sage was obtained with approximately 400 lb/A N. These rates do not consider the economics of N use, which is currently being analyzed. The N use efficiency of Alpine (~9.6 lb N/T for a 38 T/A yield) is higher than Sage (~10.5 lb N/T for 38 T/A Yield).

(6) Sage Russet tubers are resistant to low temperature sweetening. Sage retains processing quality longer in storage than Alpine. Delaying harvest beyond PM will compromise the process quality of Alpine tubers more than Sage tubers during storage.

(7) For maximum retention of process quality during storage, planting dates, vine kill dates, and harvest dates should be coordinated to limit over-maturation of tubers under dead vines at season end. Tubers should be harvested within a week to ten days of achieving PM, which normally occurs approximately 148 to 165 DAP (approximately 2400-2900 cumulative degree days (45°F base) from planting). PM can be gauged by days after planting, cumulative degree days, and the degree of vine senescence.

Growth & Storage Characteristics of Alpine & Sage Russet

Petiole NO_3 (6/15-7/30)	2.7-3.0 to 1.5-1.8ppm	2.9-3.2 to 2.2-2.5ppm
Harvest index (max foliar growth)	~44-48%	~55-66%
Max foliar growth	Higher (17-21 T/A)	Lower (13-17 T/A)
Total biomass	Higher (62 T/A)	Lower (53 T/A)
Source/sink efficiency (38-T/A yld)	2.0 T tubers/T vines	2.4 T tubers/T vines
H_2O use efficiency	>RB (ID), TBD in WA	TBD
N use efficiency (38-T/A yield)	2.1 cwt per lb N/A (~365 lb/A)	1.9 cwt per lb N/A (~400 lb/A)
Vine senescence	Delayed with >N; later than Sage	Delayed with >N; earlier than Alpine
Physiological maturity (delayed with >N)	150-160 DAP; 2500-2900 DD (45°F base); 70-80% vines dead	148-155 DAP; 2400-2800 DD (45°F base); 60-70% vines dead
Postharvest retention of process quality	Good	Better
Low Temp Sweetening	More susceptible	More resistant
Delayed harvest (post PM)	More sensitive for earlier loss process quality	Less sensitive –retains process quality longer
Higher N	Increases tuber N, protein, amino acids & asparagine	
Acrylamide forming potential	Higher	Lower

- **Cultivar yield responses to N rate screening studies (4 N rates x 6 cultivars - Russet Burbank, Ranger, Umatilla, Classic Russet, Owyhee Russet, Teton Russet)**
  During 2011-13, six cultivars were grown under four levels of in-season N to assess N use efficiency, determine optimum N rates, maximize grower income, and minimize potential N leaching. Petiole and soil data collected throughout the growing season indicated that the N status of each treatment was significantly different from the other treatments. The yields of Owyhee R., Ranger R., Sage R., and Umatilla R. kept climbing as N rate increased to 450 lbs/A, while yields of Alpine R., Classic R., and R. Burbank peaked below 450 lbs/A. Despite the linear increase in some of the yields, the economic return from ALL varieties peaked prior to 450 lbs/A. The "Law of Diminishing Returns" typically counters gains in yield that come from relatively high rates of N. At some point, the economic value reaches a peak. Beyond this peak, the marginal increase in yield is offset by a disproportional increase in N expense, resulting in a decline of adjusted gross return. The Law of Diminishing Returns occurred for all varieties when the economic value peaked at some point prior to reaching the highest N rate (450 lbs/A). With the exception of Umatilla R., economic value for all varieties reached a maximum somewhere between 325- and 375-lbs/A. Umatilla found its peak closer to 400 lbs/A. A lower rate appeared to provide the best economic return for Teton Russet. Teton Russet provided the best economic return around 260 lbs N/A. Teton R. likely uses less N than the other varieties because it matures and senesces earlier in the season. The N removed in tubers at harvest decreased from near 100% of the application rate to 50% of the application rate when comparing the 150 lbs N/A treatment to the 450 lbs N/A treatment, respectively. This linear decrease in N use efficiency (yield/unit N) was seen in all cultivars. Nitrogen use efficiency values for Ranger, R. Burbank, Sage, Teton, Umatilla, Alpine, Classic, and Owyhee were 2.4-, 2.3-, 2.4-, 2.1-, 2.6-, 2.7-, 2.3-, and 2.4-CWT/lb N, respectively. Ranger, Umatilla, Alpine, and Owyhee were 2.6%, 10%, 14%, and 2% more efficient that R. Burbank, respectively. Overall, Alpine Russet was the most N efficient variety using only 250 lbs N/A to produce yields higher than the industry standard, R. Burbank, grown with 450 lbs N/A.

- **Phosphorus use efficiency trial (2 P rates x 9 cultivars - Russet Burbank, Ranger, Umatilla, Classic Russet, Owyhee Russet, Teton Russet, Alpine, Alturas, Sage)**
  This research was conducted to estimate and compare P use efficiencies among new and traditional varieties when grown in the Columbia Basin. Petiole and soil samples were collected every two weeks for analysis of P and quantification of P use efficiency. Across 2011-13, all nine varieties responded positively to the addition of phosphorus (P) when applied to P deficient soils. Profits and yields were maximized for all varieties when 100 lbs of P (227 lbs P_2O_5) was pre-plant incorporated vs. the treatments with no pre-plant P. Although all varieties performed better when P was added to the deficient soil, several new cultivars produced outstanding yields when P was not added. Russet Burbank, the industry standard, produced 6.7 CWT/A tuber yield per lb of soil P, however, Alturas, Alpine Russet, Chieftain, Ranger R., Sage R., and Umatilla R., all produced 7.2-8.8 CWT/A per lb of soil P. Alturas was 30% more P efficient than the industry standard. Alpine, Chieftain, Ranger, Sage, and Umatilla were 19%, 14%, 12%, 8% and 6% more efficient that R. Burbank, respectively. During 2012-13 an additional treatment of P at 200 lbs/A (454 lbs P_2O_5/A) was added to determine if plants from some varieties (R. Burbank, Ranger, Umatilla) were actually healthier and more efficient (lbs of potatoes/lb of P) with higher P rates. All varieties grew better with the extra P in 2012, but in 2013, the extra P delayed maturity and reduced yields. Across all varieties and years, the most efficient treatment was that with 0 lbs added P, but it was also the lowest yielding with the lowest economic value. In order for growers to adopt new management strategies, the new strategies must be economically viable. Although some varieties were more P efficient than the industry standard, the yields and gross returns from all cultivars, across both years, were higher on average with 100 lbs/A added P. P efficiency across WA could be improved 6-19% simply by replacing R. Burbank with Alpine, Chieftain, Ranger, Sage, or Umatilla.

- **Water use efficiency trials – (3 evapotranspiration (ET) levels x 9 cultivars - Russet Burbank, Ranger, Umatilla, Classic Russet, Teton Russet, Alpine, Alturas, Sage Russet, Premier Russet)**
  Water application across nine cultivars was adjusted to replace 100%, 75%, and 50% of daily evapotranspiration in an effort to identify a water efficient cultivar. Due to the catastrophic failure of the irrigation system during mid-June 2012, the 2012-13 trials were abandoned. The 2011 data indicated that most varieties grew best with 100% ET replacement. Although, Classic R. and Umatilla R. did just as well, if not better at 75% ET. This may indicate that these cultivars are more water efficient, but it may just be that they have a genetic predisposition for low yields and their foliage can only use a limited amount of

water. Specific gravity appeared to be unaltered by irrigation treatment. Tuber number per plant tended to increase for some varieties as the water became more abundant. Varieties grown under the two wettest treatments saw the most economic gain compared to those that were highly deficient in water. Stakeholders should use discretion when viewing this data as it came from only one year of research.

- **Length of growing season efficiency studies (100/150 DAP season x 13 cultivars)**
  Thirteen cultivars (Norkotah, CO-3, CO-8, TX278, and TX296, R. Burbank, Teton R., Classic R., PA00N14-2, A03158-2TE, AO96305-3, AO00057-2, and A01010-1 were studied to determine which may be suited for early harvest, late harvest, or both, from an economical perspective. All but three varieties, PA00N14-2, RN CO-3, and AO00057-2 produced more economic revenue per acre than the industry standard R. Norkotah (RN) when harvested early (~100 days after planting (DAP)). Classic R. produced 40% more revenue than RN, followed by, A03158-2TE and Teton R. However, both new varieties had green vines at harvest. The green vines indicate these varieties are not truly "early", however, vines could be killed early to enable their harvest; both benefited by extending the harvest another 50 days. Varieties that finish early allow for reduced inputs due to the short growing season and can be more lucrative due to early price premiums for fresh or process markets. They also allow for a second crop or cover crop to be planted following the early harvest, resulting in increased land use efficiency and sustainability. A cover crop to build the soil for the next growing season is more likely than a second crop as the earlier harvest may not be early enough. At the late harvest (~150 DAP), all varieties produced a higher income than the industry standard, RN. The top revenue earners included A03158-2TE, Classic R., AO00057-2, and A01010-1, all producing 60% more revenue than RN. Varieties more efficient than the industry standard were identified for both early and late harvest dates. Efficient early varieties include Classic Russet, Teton Russet, and A03158-2TE. Efficient late varieties include A03158-2TE, Classic Russet, AO00057-2, and A01010-1. All returned higher yields and economic values than the industry standard.

This project did not involve research partners from other states. Cooperators included personnel from Lamb Weston, Simplot, and PVMI (Potato Variety management Institute) who helped in procuring seed of newly released varieties. In the first year of trials, cooperators from AMVAC Chem Co. provided technical assistance in modifying the linear move irrigation system to facilitate application of treatments in the water use efficiency studies. Portions of the project also constitute part of the thesis of Rhett Spear and Chandler Dolezal, PhD students under the direction of Dr. Pavek in the Horticulture program at WSU.

GOALS AND OUTCOMES ACHIEVED

The activities undertaken to achieve the project goals are described above under Project Approach. Research-based sustainability indices (e.g. N and P use efficiencies) and BMP recommendations for the selected newly released cultivars are an improvement for WA growers over the existing recommendations, which are based solely on management of the mainstay cultivar, Russet Burbank. Management recommendations and resource utilization efficiencies based on this work were and are being formulated for cultivars Premier Russet, Alpine Russet, Sage Russet, Alturas, Umatilla Russet, Classic Russet, Owyhee Russet, and Teton Russet. Much of the data collected from the third year of trials continues to be analyzed and assimilated with previous year's results and will be presented to the potato industry at the WA/OR Potato Conference and elsewhere in 2013/14. The major progress achieved to date is completion of the third year agronomic trials. The results described above for each trial summarize many of the specific measurable outcomes in accordance with those outlined in the proposal. The postharvest phase of assessing the impact of in-season management on retention of process quality has been completed for years one and two but year three is still in progress. Measurable outcomes and impacts are the identification and ultimately the adoption by industry of cultivars that are more efficient in their use of agronomic inputs than standard cultivars, along with the best management practice recommendations needed to maximize production efficiency and retention of postharvest quality of each cultivar in WA. Potential reductions in use of fertilizer, water, and fossil fuel as a result of growing these cultivars will be calculated and reported to industry when all data is fully analyzed.

The measurable outcome of greater adoption of more sustainable cultivars will occur over time facilitated by some of the best management practices developed in this project. Extension of the results to stakeholders is now needed to encourage adoption of these cultivars and implementation of agronomic practices. A major challenge remains in convincing the QSR industry end users to incorporate and adopt more efficient potato cultivars into their businesses. The long-term economic impact of this project will thus depend on the extent to which these newer cultivars and BMPs are adopted by stakeholders.

All of the activities in this project contributed directly to the goals of developing best management practices and quantifying the efficiency of utilization of selected management inputs for newly released cultivars from the NWVDP. Details of selected accomplishments from the various studies are summarized above, under Project Approach.

Except for the original variety performance data from the NWVDP, baseline data for performance of many of the newly released cultivars under varying levels of management inputs in WA was non-existent prior to this project. The research-based sustainability indices and BMP recommendations from this project represent an improvement over the dispersed, often intuition-based management 'trial-and-error' approaches currently used by stakeholders as they adopt new cultivars for production. Results from the N, P, water and land use efficiency trials provide growers and industry quantitative measures that will inform adoption and management decisions for these cultivars into the future.

BENEFICIARIES

Because the project was only just completed, potato growers and industry have not yet had an opportunity to assimilate and implement the findings. However, it is expected that extension of the results will lead to further adoption of selected cultivars and best management practices. The beneficiaries of this project will be potato growers, including seed and commercial growers of fresh pack and frozen processing potatoes, as well as processors, consultants, fertilizer, chemical and equipment manufacturers and applicators. Extension of the results has already begun. Results were reported to stakeholders at the WA/OR annual Potato Conference and Trade Show and the Western WA Potato Growers meetings in 2012. Articles containing results from the project have been published in the Proceedings of the WA Potato Conference and Trade Show (e.g., Knowles et al., 2013. In-season management and postharvest quality – lessons learned from Alpine Russet, Sage Russet and other cultivars. Proceedings of the Washington-Oregon Potato Conference, Kennewick, WA, pp 34-47; Pavek et al., 2013. Definition and application of potato harvest index and source-sink relationships. Proceedings of the Washington-Oregon Potato Conference, Kennewick, WA, pp 52-57.). Results have also been summarized in presentations at the annual potato industry field days (Othello, WA) and annually during the WA Potato Commission research reviews.

Results from the 3-year project define best management practices and sustainability parameters for selected production inputs (e.g., N, P, water, land) for each cultivar. Much of the data provide a direct measure of the resource utilization efficiency and potential economic and environmental impact of producing each cultivar in the highly productive Columbia Basin. This information is essential to enable stakeholders to choose cultivars that maximize profit margins and environmental stewardship and will lead to increased adoption of more sustainable cultivars and competitiveness of the WA potato industry.

Forty three clones/cultivars were evaluated over the 3-year period. Three survived the screening process and were clearly superior to the check cultivars; A01010-1 produced a 3-year average total yield of 40.7 T/A compared with 39.7 T/A for A03158-2TE and 35.7 T/A for Russet Burbank with the same agronomic inputs. N use efficiencies for total yield averaged 8.6 lb N/T (A01010-1), 8.8 lb N/T (A03158-2TE) and 9.8 lb N/T (RB). On average, these clones were thus 30% more efficient in their utilization of N for production of U.S. #1 tuber yield than RB.

Across three years, closer in-row spacing increased the efficiency of yield production per unit nutrient and water input on an acre basis for Premier Russet. Relative to the conventional 10-inch spacing, the shift in size distribution for 8-inch spacing returned an extra $248/A on a frozen processing contract (+5.7% return, after subtracting the added seed cost). For production of seed, the shift in tuber size distribution toward smaller tubers with 6- and 8-inch spacings increased returns per acre by 16% and 8%, respectively, over 10-inch spacing (seed costs subtracted). In-row spacing also interacted with seed-tuber physiological age to affect tuber size distribution.

WA growers can boost their potato production and economic return by at least 5.25%, just by reducing row width 2 inches. Moreover, they can maintain the input levels they used for 34 inch rows including water, fertilizer, land, irrigation equipment, diesel, and pesticides. Growers with 100 acres of potatoes should produce an extra $20,500 of gain by switching to 32 inch rows; with 1,000 acres they should expect to see and additional $200,500. However, in order for growers to reduce row width, they will need newly designed, expensive equipment.

Nitrogen use efficiency values for Ranger, R. Burbank, Sage, Teton, Umatilla, Alpine, Classic, and Owyhee were 2.4-, 2.3-, 2.4-, 2.1-, 2.6-, 2.7-, 2.3-, and 2.4-CWT/lb N, respectively. Ranger, Umatilla, Alpine, and Owyhee were 2.6%, 10%, 14%, and 2% more efficient that R. Burbank, respectively. Overall, Alpine Russet was the most N efficient variety using only 250 lbs N/A to produce yields higher than the industry standard, R. Burbank, grown with 450 lbs N/A.

Russet Burbank, the industry standard, produced 6.7 CWT/A tuber yield per lb of soil P, however, Alturas, Alpine Russet, Chieftain, Ranger R., Sage R., and Umatilla R., all produced 7.2-8.8 CWT/A per lb of soil P. Alturas was 30% more P

efficient than the industry standard. Alpine, Chieftain, Ranger, Sage, and Umatilla were 19%, 14%, 12%, 8% and 6% more efficient that R. Burbank, respectively. P efficiency across WA could be improved 6-19% simply by replacing R. Burbank with Alpine, Chieftain, Ranger, Sage, or Umatilla.
A03158-2TE, Classic R., AO00057-2, and A01010-1, produced 60% more revenue than Russet Norkotah following a late harvest. Varieties more efficient than the industry standard were identified for both early and late harvest dates. Efficient early varieties include Classic Russet, Teton Russet, and A03158-2TE. Efficient late varieties include A03158-2TE, Classic Russet, AO00057-2, and A01010-1. All returned higher yields and economic values than the industry standard.

LESSONS LEARNED

One of the most significant lessons learned from these trials is that many of the newly released cultivars from the NWVDP outperform the mainstay cultivars, Russet Burbank and Russet Norkotah when grown under nutrient, space and water limiting conditions. Moreover, their yield and quality responses to increasing inputs are more robust than the mainstay cultivars. While they produce higher yields and quality than the traditional varieties when grown under conditions optimized for the traditional varieties, they have the capacity to produce even higher yields with higher agronomic inputs. In many cases, the growth responses of the newer varieties to increasing inputs are greater than the traditional varieties. However, because of the costs associated with many of the inputs, economic returns are optimized at levels specific to each variety.

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ADDITIONAL INFORMATION

The following publications contain results pertinent to or directly from some of the trials conducted during the course of this project:

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2. Whitworth J., R.Novy, J.C.Stark, J.J.Pavek, D.L.Corsini, S.L.Love, N.Olsen, S.Gupta, T.L.Brandt, M.I.Vales, A.R.Mosley, S.Yilma, S.R.James, D.C.Hane, B.A.Charlton, C.C.Shock, N.R.Knowles, M.J.Pavek*, J.S.Miller, C.R.Brown. 2011. Alpine Russet: A potato cultivar having long term tuber dormancy making it suitable for processing from long-term storage. Am J Potato Res 88:256-268.
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6. Knowles, N.R., M.J. Pavek*, C. Hiles, L.O. Knowles and Z.J. Holden. 2011. Nitrogen Management Affects Tuber Physiological Maturity and Retention of Processing Quality. Abstract – The 94th Annual Meeting of the Potato Association of America. Am J Potato Res 88:49.
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9. Pavek, M.J., N.R. Knowles, Z.J. Holden, and C.D. Hiles. 2012. Nitrogen fertigation in potatoes: application timing, rate, and varietal response. Proceedings of the 2012 Washington - Oregon Potato Conference. pp. 29-36.
10. Pavek, M.J., Knowles, N.R., Holden, Z.J., and C.D. Hiles. 2011. Making sense of new PVMI varieties and their management. Proceedings of the 2011 Washington - Oregon Potato Conference. pp. 113-115.
11. Spear R.R, M.J. Pavek, Z.J. Holden. 2012. Superior Fresh Market Russet-Type Potato Varieties Revealed Through Production Economics and Consumer Preference. 2012 WSU Academic Showcase Poster Session, March 30, 2012, Pullman, WA.
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19. Pavek M.J., Knowles, N. R., Spear, R., Knowles, L.O., Holden, Z., and C. Hiles. 2011. New variety sustainability: water use, nutrient, and production efficiencies. WSU Annual Potato Field Day, IAERC, Othello, WA, June 23 (presentation & poster by MJP).
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PROJECT #3

Project Title: Developing Disease Resistant Sources of Nordman/Turkish fir trees

Partner Organization: Washington State University

PROJECT SUMMARY

Christmas tree industry leaders in the Pacific Northwest (PNW) named the identification of disease and pest resistant sources of trees with superior growth and postharvest characteristics as a top research priority. We took advantage of existing industry-supported research and field plantings of Nordmann and Turkish fir to identify superior sources and individual trees that are resistant to Phytophthora root rot and current season needle necrosis (CSNN), are adapted to the PNW climate and production conditions, and that exhibit superior postharvest needle retention. The results are now leading to the development of seed orchards of these species, a benefit to the conifer seed and nursery industries which provide plant material to growers.

To address sustainability issues that are of concern to consumers and to remain competitive with the artificial tree market, growers must meet consumer demand for high quality trees, reduce their use of pesticides, and potentially provide an opportunity to produce organically-grown Christmas trees. Noble fir is considered to be one of the highest quality Christmas trees on the market today. While this species can be grown in many areas in the PNW, it is highly susceptible to Phytophthora root rot and current season needle necrosis, which limits many growers' ability to grow it. In addition, needle loss is one of the biggest concerns for families purchasing real Christmas trees.

Previous research has shown that Nordmann and Turkish fir, which are native to Eurasia, are potentially resistant to diseases like Phytophthora root rot and current season needle necrosis and there has been a significant increase in the planting of these species in the PNW. Unfortunately, very little information is available regarding their adaptability here. In addition, some sources of these species have a tendency to shed green needles if allowed to dry after harvest, thus potentially reducing consumer acceptability.

A series of replicated Nordmann and Turkish fir genetic trials that were established with industry support in 2004 were used in this project. These trials provided a unique opportunity to collect growth, quality, disease and bud break data on known sources of trees. In addition, by using a detached branch needle loss assay that was developed at WSU Puyallup, they also provided an opportunity to examine variation in postharvest needle retention among the sources.

Below is a summary of the trial materials used during this project:

2004 Regional Nordmann and Turkish fir genetic trials - In 1997, Drs. Gary Chastagner at WSU and Christmas tree geneticist Ulrik Nielsen at the University of Copenhagen in Denmark initiated a collaborative research project to examine variation in the postharvest needle retention among different sources of Nordmann fir. As a result of that project, seed was obtained from a number of sources of Nordmann and Turkish fir in Denmark and Turkey to establish a series of genetic trials in the PNW. Seedlings were grown from the seed and in collaboration with Christmas Tree Specialist Chal Landgren at Oregon State University, a series of nine replicated, regional genetic trials were established in 2004. Each planting generally contained 25 seedlings from a maximum of 20 sources; 4 of Turkish fir and 16 of Nordmann fir (Table 1). Trial locations ranged from two sites at WSU Puyallup ("hill" and "valley") in the north to Kings Valley, OR in the south (Table 2 and Figure 1). Due to establishment issues at three of the sites, trees in plantings at six to eight of the sites were used during this SCBGP project to evaluate various parameters; genetic variability in growth, bud break, current season needle necrosis (CSNN), postharvest needle loss, and economic value of the different sources of trees in these plots.

Figure 1. 2004 Nordmann and Turkish fir plot locations

Table 1. Sources of Nordmann (NF) and Turkish (TF) fir from Denmark and Turkey included in the 2004 regional genetic trials.

Species	Source # and identifier
TF	1. Bursa: Komursu
TF	2. Bolu: Bolu-Kokez
TF	3. Adapazan: Hendek
TF	4. Adapazan: Akyazi
NF	5. Artvin: Yayla
NF	6. Trabzon: Torul
NF	7. DSP Aabenraa, Saltbjerg 012/99
NF	8. DSP Nordjylland, Tversted
NF	9. DSP Aabenraa, Saltbjerg 053/98
NF	10. DSP Berritzgaard, Hildesvig
NF	11. DSP Randbol Ussinggard 221a + 222
NF	12. DSP Randbol 053/00
NF	13. Vallo #1
NF	14. Vallo #7
NF	15. Vallo #12
NF	16. Vallo #13
NF	17. Vallo #15
NF	18. Vallo #18
NF	20. Vallo #9
NF	22. DSP Koberhavn

Table 2. Site locations for 2004 Nordmann/Turkish fir genetic trial

Site #	Location	Owner
1	Puyallup, WA 'Hill'	WSU
2	Puyallup, WA 'Valley'	WSU
3	La Center, WA	Evelyn Casella
4	Scholls, OR	Bob Werfelman
5	Sublimity, OR	Jim Heater
6	McMinnville, OR	Doug Sager
7	Estacada, OR	Dan Rickel
8	Monroe, OR	Sievers
9	Kings Valley, OR	Pat & Betty Malone

- Trial PH104 was used to provide data on susceptibility of the Nordmann and Turkish fir sources to Phytophthora root rot. It was established in 2004 at WSU Puyallup and consisted of over 8,000 trees that were planted in 100 10'X10' cells that were laid out in a checkerboard design. Each cell contained a single tree from 47 of the families included in a 2004 Oregon State University noble fir genetics test, 16 sources of Nordmann and 4 sources of Turkish fir included in the 2004 Nordmann and Turkish fir progeny and provenance genetic trial (see Table 1), as well as balsam, Canaan, European silver, Fraser, grand, Korean, Momi, Nikko, Shasta, Veitch, and white fir. A single seedling from each source was planted on one-foot centers in each cell.

  Soil at this site is a very well-drained, Puyallup fine sandy loam that is not conducive to the development of Phytophthora root rot. To encourage disease development after the seedlings were established, the cells were

periodically flooded in 2007, 2008 and 2009. A berm was constructed around each cell and then each one was flooded for a period of 2 to 3 days.

- Trial PH306 provided data on CSNN and Phytophthora root rot on another set of Nordmann fir sources It was established at WSU Puyallup in 2006 and includes Fraser, King Boris, noble, and Nordmann fir from three different elevations of two regions of the Republic of Georgia; Tlugi (low – 1,230 m, mid – 1,450 m, high – 1,600 m) and three different elevations of Borshomi (low – 920 m, mid – 1,030 m, and high – 1,240 m). Seedlings were planted on six-foot centers and there are 6 replications of 6 trees of each species per source. The soil is a somewhat poorly-drained Briscot loam, which is conducive to the development of Phytophthora root rot.

- Trial N306, another root rot plot, was also established in 2006 and includes noble, Fraser, and the mid-elevation sources of Tlugi and Borshomi Nordmann fir used in trial PH306. Seedlings were planted on two-foot centers and there are 3 replications of 5 trees of each species per source. During the first growing season, the trees were overhead, sprinkle irrigated once every 14 days from June 23 through September 6. The soil is a somewhat poorly-drained Briscot loam, which is conducive to the development of Phytophthora root rot. Block A of this planting was used in our root rot evaluations for this project.

- Trial N206 was established at a hill site at WSU Puyallup in 2006 and is a duplicate of PH306 (a valley site), but does not include noble and Fraser. N206 is located adjacent to the 2004 Nordmann and Turkish fir regional genetic 'PuyHill' plot. The site is well drained. Along with PH306, the trees in this plot were evaluated for resistance to CSNN.

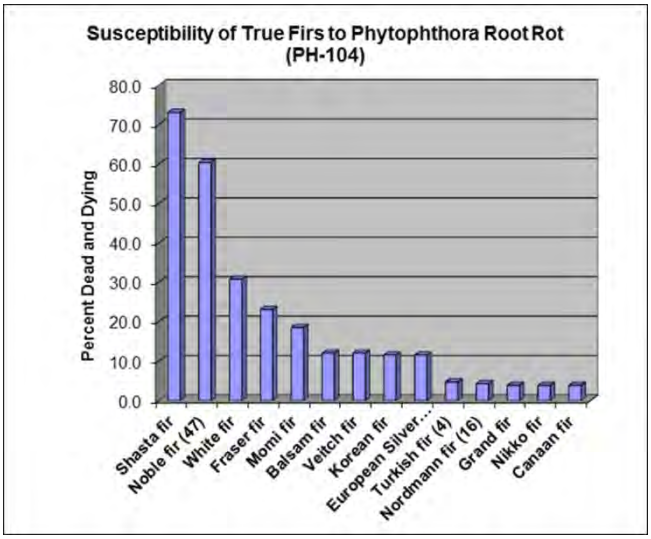
This project did not build on a previously funded SCBGP project; however it did build on projects previously funded by industry groups (See No. 2 above).

PROJECT APPROACH

Activity 1. Collect Phytophthora susceptibility data from trees in replicated root rot trials at WSU Puyallup in 2011 and 2012.

PH104: Following initiation of the flooding in March 2007, initial symptoms of root rot (wilting and branch flagging) were evident on some trees by early summer 2007. Data on the incidence of trees killed by root rot was collected through 2010. Isolations were done from a subset of symptomatic roots and stems to determine the *Phytophthora* species associated with root rot. Over 70% of the Shasta fir and 60% of all the noble fir in the 26 cells were killed by root rot. White fir (30%) and Fraser fir (23%) were the next most susceptible species. Less than 5% of

the Turkish, Nordmann, grand, Nikko, and Canaan fir in these cells had evidence of root rot. Isolations indicated that the root rot in this trial was caused by *P. cambivora*, *P. cryptogea*, *P. citricola*, and *P. gonapodyides*.



PH306: There is a soil moisture gradient across this plot. The west side, blocks 1 and 4, tend to have wetter soil than the east side. Mortality associated with root rot was evident on trees in this planting by spring 2007, particularly in the wetter blocks. There has been no mortality in the Nordmann fir, but 36.1 and 55.6% of the Fraser and noble fir, respectively, have been killed. Isolations from symptomatic trees done in fall 2011 indicate that the mortality in these plots is due to *P. megasperma*.

N306, Block A: Disease pressure was very high in this plot because of a spring near the planting and the poorly drained soil. Mortality associated with root rot was evident by spring 2007. Slightly more than 70% of the noble fir and about 26% of the Fraser fir were killed by fall 2010. At that time, no mortality had been observed on the two sources of Nordmann fir. During the past three years, 100% of the noble and Fraser fir have been killed, but only 13% of the Tlugi and 20% of the Borshomi Nordmann fir have died. Isolations indicated that the root rot is caused by *P. megasperma*.

N306 - Row of dead noble fir between two rows of Nordmann fir

The data collected during this project clearly demonstrate that there are significant differences in the susceptibility of true firs to Phytophthora root rot under field conditions. Noble, white and Fraser firs, which are commonly grown Christmas trees, were very susceptible to root rot in these tests. All of the sources of Nordmann and Turkish firs included in these trials were among the most resistant species tested. Although additional trials are needed to confirm the resistance of these species to other aggressive *Phytophthora* species such as *P. cinnamomi* and *P. cactorum* that commonly occur in some areas, the data from these trials indicates that irrespective of source, Nordmann and Turkish fir should provide growers with a viable alternative to planting highly susceptible species in sites that are conducive to root rot development. Additional work to understand the mechanism of resistance of Nordmann and Turkish firs to Phytophthora root rot is being done with support from a 2012 SCBGP project.

Activity 2. Rate trees in regional genetic trials for current season needle necrosis (CSNN) damage during summer/fall of 2011 and 2012.

CSNN is a poorly understood disease on true firs grown for Christmas trees and boughs in Europe and North America. Early research suggested that CSNN was likely a physiological disorder that was associated with

calcium deficiency and environmental stress. (However, recent research in Norway has found that a fungus, *Sydowia polyspora*, may play a role in the development of this disease).

In the PNW, CSNN is most commonly seen on noble and grand fir grown at low elevation sites, such as WSU Puyallup. In Europe, CSNN has also been observed on grand and noble firs, but the greatest economic impact has been on Nordmann fir, the dominant Christmas tree species.

Initial CSNN symptoms appear on needles during shoot elongation. Symptoms consist of tan to yellow-colored bands and/or spots, which turn reddish-brown during summer (Figure 2). Entire needles may become necrotic and on some species, such as grand and Nordmann fir, are shed during early summer. Highly susceptible trees are often not marketable.

Figure 2. Current season needle necrosis symptoms on Nordmann fir needles.

Currently, there are no effective ways for growers to control this disease. The WSU Research Center at Puyallup is a low elevation (10 to 30m) site which makes it very conducive to the development of CSNN, and thus it has provided an opportunity to examine yearly variation in development of CSNN and determine the variation in resistance to this disease among different sources of trees.

CSNN ratings were completed on the 2004 Nordmann/Turkish fir trial at six sites in 2011 (~3600 trees) and at eight sites in 2012 (~4300 trees). Trees in the two Nordmann fir elevation trials (PH306 and N206) at Puyallup were also rated. Once CSNN appeared, its severity on each tree was rated during the summer/fall on a scale of 0 to 10, where 0 = no CSNN, 1 = 1-10% and 10 = 91-100% of the current season needles had symptoms.

Very few trees had any symptoms of CSNN at any of the 2004 Nordmann and Turkish fir trial sites, especially in 2012 (Table 3). In 2011, the WSU Puyallup "valley" and "hill" sites were significantly different from each other and the rest of the sites tested. In 2012, there were fewer symptomatic trees at all of the six sites tested in 2011 and none of the sites were significantly different from each other.

Table 3. Overall average CSNN ratings for the 2004 Nordmann and Turkish firs at sites in WA and OR for 2011 and 2012 test years.

		~# of available trees		# Symptomatic		Avg. Rating			
Site #	Site	2011	2012	2011	2012	2011		2012	
2	PuyVal	733	650	105	15	0.480	a[1]	0.02	a
1	PuyHill	948	851	393	15	0.170	b	0.02	a
4	Scholls	473	472	3	2	0.009	c	0.00	a
5	Sublimity	491	490	4	4	0.008	c	0.01	a
3	La Center	497	487	3	5	0.040	c	0.04	a
6	McMinn	na	460	na	3	na	na	0.02	a
7	Estacada	na	482	na	2	na	na	0.01	a
9	KingsVal	444	422	0	1	0.000	c	0.00	a

[1]Means followed by the same letter are not significantly different (p=0.05) Tukey's Studentized Range (HSD) test.

There were also differences in the development of CSNN on individual sources of Nordmann and Turkish fir (Table 4). The greatest differences were seen at the two Puyallup sites in 2011. The ratings ranged from 0 to 0.68 for sources at the hill site and 0.06 to 1.28 at the more conducive valley site. In general, the Turkish fir sources (#1, 2, 3, and 4) tended to have very little CSNN. No CSNN developed on >80% of the trees from seven of the sources of Nordmann/Turkish fir at the hill and valley sites.

Table 4. Average CSNN ratings for 2011 and 2012 at the 2004 Nordmann/Turkish fir sites.

	1.PUY-HILL		2.PUY-VAL		3.LA CENTER		4.SCHOLLS		5.SUBLIMITY		6.McMINN	7.ESTACADA	9.KINGS VAL	
Source	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2012	2012	2011	2012
1	0	0	0.08	0	0	0	0	0	0	0	0.16	0	0	0
2	.	.	0.22	0	0	0	0	0	0	0	0	0	0	0
3	0.02	0.02	0.14	0	0	0	0	0	0	0	0	0	0	0
4	0.04	0.03	0.06	0	0	0	0.04	0	0	0	0	0	0	0
5	0.68	0.09	1.28	0.02	0	0	0.08	0	0	0	0	0	0	0
6	.	.	0.46	0	0	0	0	0	0.04	0	0.09	0	0	0
7	0	0.02	0.42	0.02	0	0.04	0	0.04	0	0	0	0.17	0	0
8	0.18	0.05	0.54	0.08	0	0	0	0	0	0	0	0	0	0
9	.	.	.	.	0	0	.	.	0	0	.	0	.	.
10	0.2	0	0.52	0.05	0	0	0	0	0	0.08	0	0	.	.
11	.	.	0.42	0	0	0	0	0	0	0	0	0	0	0
12	0.3	0.04	0.58	0	0	0.25	0	0	0	0	0.08	0	0	0.04
13	0.28	0.05	0.86	0	0.04	0.4	0	0.04	0	0	0	0	0	0
14	0.26	0.02	0.4	0	0.04	0	0	0	0	0	0	0	0	0
15	0.14	0	0.38	0.06	0	0	0	0	0	0	0	0	0	0
16	0.16	0	0.46	0.02	0	0	0	0	0	0	0	0	0	0
17	0.26	0	0.54	0	0	0	0	0	0	0.04	0	0	0	0
18	0.04	0.03	0.3	0	0	0	0	0	0	0	0	0	0	0
20	.	.	0.96	0.15	0.04	0.08	0.04	0	0.1	0.1	0	0.12	0	0
22	0	0	0.42	0.03	0	0	0	0	0	0	0	0	0	0

In 2011, there was a highly significant Spearman's rank-order correlation between the ranking of the sources at the hill and valley sites (Table 5).

Table 5. Spearman's rank-order correlation for CSNN ratings for sources in the 2004 Nordmann/Turkish fir Puyallup sites

Site and Year	PuyHill '12	PuyValley '11	PuyValley '12
PuyHill '11	0.5710*	0.8110**	0.1220
PuyHill '12		0.4900*	0.0545

*P=0.05, **P<0.001

Data was also taken on trees in two 2006 Nordmann fir elevation provenance trial plantings at Puyallup in August 2011 and July 2012 (PH306 (a valley site) and N206 (a hill site)). The trees in these plots were grown from seed collected from the three elevations in two regions of Tlugi and Borshomi. In both 2011 and 2012, very little CSNN developed on any of the trees in these plots (Table 6). In 2011, the trees in the valley site, PH306, had a small, but significantly higher CSNN rating (Table 7).

Table 6. The number of trees out of 30 with current season needle necrosis in 2011 & 2012 for Nordmann fir originating from 3 elevations in the Tlugi and Borshomi regions of the Republic of Georgia.

		Tlugi Region Elevation			Borshomi Region Elevation		
Year	Site	low	medium	high	low	medium	high
2011	N206	0	0	0	1	0	0
	PH306	0	5	4	5	3	7
2012	N206	3	1	2	3	2	0
	PH306	1	4	3	1	4	4

Table 7. Overall average CSNN ratings for Nordmann fir originating from 3 elevations in the Tlugi and Borshomi regions of the Republic of Georgia for 2011 and 2012

Site	2011		2012	
N206	0.006	a[1]	0.061	a
PH306	0.181	b	0.083	a

[1]Means followed by the same letter are not significantly different (p=0.05) Tukey's Studentized Range (HSD) test.

Compared to the severity of CSNN on noble and grand fir at Puyallup, all of the sources of Nordmann and Turkish fir that were evaluated are much more resistant than the sources of noble and grand fir that are commonly grown in the PNW.

Activity 3. Collect growth, quality and bud break data on 6,000 trees in replicated genetic trials in 2011, 2012 and 2013.

Bud break

Two types of assessments were done. The first consisted of a one-time rating on a 0 to 5 scale, where 0 = tight bud, no bud swell (winter condition), 1 = buds swelling/elongating, no needle emergence, 2 = bud burst(needles emerging out of scales), 3 = emerging shoot less than 1", needles still "brush-like", 4 = elongating shoot < 3" long, shoots and needles still soft, and 5 = elongating shoot > 3" long, shoots and needles still soft. These assessments were done on ~3700 trees at six of the nine 2004 Nordmann/Turkish fir trial sites in 2011 and 2012 (sites # 1, 2, 3, 4, 5 and 9). Because of the distances and time necessary to do these assessments, they were done over a period of several days from mid to late May. As expected, there were significant differences in the average ratings for the different sites (Table 8).

Table 8. Variation in bud break ratings (0-5) for 6 sites in 2011 and 2012.

		Average Rating[1]			
Site No.	Name	May 16-27, 2011		May 25-30, 2012	
2	PuyVal	1.19	c[2]	3.80	a
4	Scholls	2.10	a	3.77	ab
1	PuyHill	0.97	d	3.61	b
3	La Center	1.67	b	3.36	c

9	KingsVal	1.15	cd	2.80	d
5	Sublimity	1.18	cd	2.49	e

[1] Rating scale = 0 to 5; 0 = tight bud, no bud swell (winter condition), 1 = buds swelling/elongating, no needle emergence, 2 = bud burst(needles emerging out of scales), 3 = emerging shoot less than 1", needles still "brush-like", 4 = elongating shoot < 3" long, shoots and needles still soft, 5 = elongating shoot > 3" long, shoots and needles still soft.

[2] Means followed by the same letter are not significantly different, (p=0.05) Tukey's Studentized Range (HSD) test.

Overall, there were significant differences in the bud break ratings for the different sources at these sites in 2011 and 2012 (Tables 9 and 10). These data indicate that the four sources of Turkish fir and the Trabson (#6) source of Nordmann fir broke bud earlier and had more extensive growth at the time of this rating than the other sources in these plots.

Table 9. Variation in overall bud break ratings (0-5) for sources of Nordmann and Turkish fir at 6 sites in Washington and Oregon on May 24, 2011.

Rating		Species	and source # & identifier
2.74	a[1]	TF	3. Adapazan: Hendek
2.63	a	NF	6. Trabson: Torul
2.48	a	TF	4. Adapazan: Akyazi
2.43	a	TF	1. Bursa: Komursu
2.43	a	TF	2. Bolu: Bolu-Kokez
1.80	b	NF	5. Artvin: Yayla
1.74	b	NF	14. Vallo #7
1.34	bc	NF	20. Vallo #9
1.23	cd	NF	8. DSP Nordjylland, Tversted
1.20	cd	NF	13. Vallo #1
1.08	cd	NF	9. DSP Aabenraa, Saltbjerg 053/98
1.06	cd	NF	17. Vallo #15
0.90	cde	NF	7. DSP Aabenraa, Saltbjerg 012/99
0.86	cde	NF	16. Vallo #13
0.77	de	NF	12. DSP Randbol 053/00
0.76	de	NF	22. DSP Koberhavn
0.74	de	NF	10. DSP Berritzgaard, Hildesvig
0.56	e	NF	11. DSP Randbol, Ussinggard Sonderskov
0.55	e	NF	15. Vallo #12
0.48	e	NF	18. Vallo #18

[1]Means followed by the same letter are not significantly different (p=0.05) Tukey's Studentized Range (HSD) test.

Table 10. Variation in overall bud break ratings (0-5 scale) for sources of Nordmann and Turkish fir at 6 sites in Washington and Oregon taken between May 25-30, 2012.

Rating		Species	Source # and identifier
4.00	a[1]	TF	3. Adapazan: Hendek
3.89	ab	NF	6. Trabzon: Torul
3.87	ab	TF	1. Bursa: Komursu
3.82	ab	TF	4. Adapazan: Akyazi
3.73	ab	TF	2. Bolu: Bolu-Kokez
3.56	bc	NF	5. Artvin-Yayla
3.57	bc	NF	14. Vallo #7
3.33	cd	NF	13. Vallo #1
3.25	cde	NF	8. DSP Nordjylland, Tversted
3.13	def	NF	20. Vallo #9
3.08	def	NF	17. Vallo #15
3.07	def	NF	12. DSP Randbol 053/00
3.09	def	NF	10. DSP Berritzgaard, Hildesvig
3.03	def	NF	15. Vallo #12
3.03	def	NF	16. Vallo #13
3.02	def	NF	7. DSP Aabenraa, Saltbjerg 012/99
2.94	ef	NF	9. DSP Aabenraa, Saltbjerg 053/98
2.86	fg	NF	18. Vallo #18
2.78	fg	NF	22. DSP Koberhavn
2.55	g	NF	11. DSP Randbol Ussinggard

[1]Means followed by the same letter are not significantly different (p=0.05) Tukey's Studentized Range (HSD) test.

Spearman's rank-order correlation analysis also indicated that ranking of the sources was very highly correlated between the sites (Tables 11 and 12). This means that sources that had higher bud break ratings at one site also had higher ratings at all of the other sites.

Table 11. Spearman's rank-order correlations for the 0 to 5 bud break ratings in 2011.

Site/date	PuyVal	La Center	Scholls	Sublimity	KingsVal
PuyHill	0.868	0.951	0.950	0.832	0.854
PuyVal	-	0.842	0.876	0.854	0.783
La Center	-	-	0.940	0.907	0.888
Scholls	-	-	-	0.909	0.896
Sublimity	-	-	-	-	0.792

All *P* values are <0.001

Table 12. Spearman's rank-order correlations for the 0 to 5 bud break ratings in 2012.

Site	PuyVal	La Center	Scholls	Sublimity	KingsVal
PuyHill	0.733	0.946	0.881	0.923	0.849
PuyVal	.	0.743	0.779	0.805	0.712
La Center	.	.	0.904	0.885	0.823
Scholls	.	.	.	0.871	0.877
Sublimity	.	.	.	.	0.811

All P values are <0.001 except PuyHill vs. PuyVal which is 0.00145.

While the 0 to 5 rating clearly shows that there are significant differences in the early growth of trees, it does not provide information on just how early bud break occurs. Trees that break bud early are prone to potential damage from late season frosts, which can adversely affect their suitability for use as Christmas trees. To obtain information relating to the timing of bud break, we also rated each tree multiple times during late April through early June in 2012 and 2013 at the three Washington sites (#1. PuyHill, #2. PuyVal, and #3. La Center). Trees were rated on a 0 to 2 scale, where 0 = tight bud, no bud swell (winter condition), 1 = buds swelling/elongating, no needle emergence, and 2 = bud burst (needles emerging out of scales) to obtain a better understanding of when bud break was actually happening. Temperature data were also collected and the bud break and temperature data were used to calculate growing degree days (GDD) associated with bud break for each of the sources. GDD was calculated using the following formula: GDD=Daily (High+Daily Low)/2-41 starting on March 1. As expected there was a progression of trees that broke bud during late April through May. In 2013, about 5% of the trees in the plots at Puyallup had broken bud by April 22 (Table 13). Trees continued to break bud over the next four weeks.

Table 13. Percent of trees with a rating of 2 (bud burst) at the Puyallup sites.

Site	4/22/13	4/29/13	05/07/13	05/17/13
#1 Hill	2.6	15.9	65.5	98.9
#2 Valley	4.8	26.6	72.3	98.0

The calculated bud break GDD averages ranged from a low of 440.2 to 567.3 (Table 14). The four sources of Turkish fir (#1, 2, 3, and 4) and the Trabson source (#6) of Nordmann fir had the lowest GDD values, confirming the results from the one-time 0-5 ratings. Based on Spearman's rank-order correlations, there was a highly significant correlation between the GDD ranks for the sources in 2012 and 2013 (Table 15), again confirming the data from the one-time 0-5 rating. These data suggest that the Turkish fir sources and the Trabson source of Nordmann fir may be at a higher risk of injury than some of the other sources of Nordmann fir if they are planted in frost-prone sites. We will also be using this information as we try to relate bud break with susceptibility to adelgids in a new SCBGP project that was initiated in 2013.

Table 14. Average growing degree days at bud break in 2012 and 2013.

	#1 PuyHill		#2 PuyValley		#3 La Center	Avg.
Sources	2012	2013	2012	2013	2012	'12 & '13
6	.	.	466.1	427.6	427.0	440.2
3	492.2	435.4	479.5	447.5	420.9	455.1

2	.	.	484.2	483.7	423.8	463.9
4	509.1	473.6	456.1	452.3	447.8	467.8
1	525.8	509.1	450.5	428.3	433.9	469.5
14	511.6	457.5	506.3	472.7	482.5	486.1
5	520.4	468.9	504.1	460.2	532.6	497.2
20	.	.	517.9	503.9	514.6	512.1
9	.	.	.	.	524.4	524.4
13	538.2	500.0	541.4	521.0	524.6	525.0
8	543.2	513.7	547.0	509.1	519.3	526.5
11	.	.	555.0	531.5	542.8	543.1
17	555.3	560.8	545.0	546.1	518.1	545.1
7	559.4	542.5	535.6	542.0	557.7	547.4
16	574.9	556.6	552.7	554.5	533.8	554.5
12	565.3	569.4	551.1	538.9	548.8	554.7
10	578.4	569.0	549.2	553.3	545.7	559.1
15	573.3	566.0	548.8	544.0	570.9	560.6
22	570.3	588.0	551.2	575.5	527.9	562.6
18	578.0	579.6	558.4	558.7	561.3	567.2

Table 15. Spearman's rank-order correlations for GDD values at sites in 2012 and 2013.

Site	PulHill '13	PuyValley '12	PuyValley '13	La Center '12
PuyHill '12	0.906	0.900	0.903	0.838
PuyHill '13		0.865	0.874	0.735
PuyValley '12			0.902	0.811
PuyValley '13				0.786

All P values are <0.001

Growth and Tree Value Assessments

The trees in three of the nine 2004 Nordmann/Turkish fir plots were measured and graded to obtain an estimate on their quality and wholesale value in 2012. Only three plots were measured because a number of trees at the other grower sites had been harvested. The plots we evaluated contained 19 of the 20 original sources – 4 Turkish fir provenance collections and 15 Nordmann fir sources (both provenance and progeny).

It is always an arbitrary task to assign a final "value" to a provenance or family of trees. Within any test like this there is a mix of superior and poor trees, with most trees somewhere in a wide middle. Our goal was to identify the best individual trees and the best families/provenances in each of the plots. To do so, each tree was measured for height and graded for quality. We also assigned values to a wide range of grades (Table 16). The values were selected to give a wide separation from the best to the poor grades.

The final value of any tree is a function of tree height and grade. Height is a straightforward measure from the base to the tip of the tree. In practice, even this measurement needs some clarification. In these measurements we determined height from the tree base to top of a "properly cut tip". Trees that had uncut, long tops were "assigned" tip heights where we assumed they should be cut. Grade is much more subjective and variable between growers. For purposes of our evaluation, each tree was divided into 4 faces or quadrants and then assigned one of the following five grades:

- Premium- no holes "larger than a grapefruit" on any tree face, uniform density top to bottom and side to side, healthy, a single straight top. Generally only a few trees per field make this class.
- #1- Can have up to one hole in one face. Healthy. A single, straight leader. Typically the Premium and #1 grades are sold at one price.
- #2- Can have up to 2 holes in 2 tree faces. Healthy. Density may be somewhat variable. Top is straight.

- Utility- The short description would be: this is a tree that could be displayed in a home, if the price were low. Up to 3 holes in various faces. Healthy. Density is often lower than the better grades.
- Cull- Unhealthy looking (either CSNN> 30%, and/or poor color, deformity, dead branches), top missing or off-center, clumpy density, frequent holes.

The value of the trees was determined based on the grades and the height of the tree. This method of evaluation places a high premium on the sources/families that grow rapidly and have good bud density.

Table 16. Criteria used to assign tree values at three grower test sites.

Grade	Assumed price	Value ($)/in
p=premium	6 ft p = $20	0.28
1 = #1	6 ft. #1 = $15	0.21
2 = #2	6 ft.#2 = $10	0.14
u = Utility	6 ft. u = $7	0.10
c = cull	-1$/tree	

Based on the overall estimated average, the market values for the different families at these three sites ranged from $8.43 to $15.96 per tree (Table 17). At a typical 5.5' X 5.5' planting spacing, this equates to a difference of $10,843 per acre.

The top 5 sources for value included three Turkish fir provenances and two Nordmann fir families (Table 17). Given that these data are from only three sites, it was reassuring to note that there was a highly significant correlation between the ranking of the sources at each of the sites (Table 18). This means that the sources that had the highest value at one grower site tended to be the sources with the highest value at other locations.

Table 17. Estimated value of the Nordmann (NF) and Turkish fir (TF) trees at three sites and a family (source) average for 2012.

	Sites			
Family source # and identifier (Species)	La Center	Estacada	Scholls	Family Avg.
18. Vallo #18 (NF)	$16.57	$15.14	$16.17	$15.96
3. Adapazan: Hendek (TF)	$16.18	$14.13	$15.19	$15.17
22. DSP Koberhavn (NF)	$16.16	$13.34	$13.50	$14.33
4. Adapazan: Akyazi (TF)	$13.09	$14.34	$13.74	$13.72
1. Bursa: Komursu (TF)	$14.52	$12.09	$14.47	$13.69
15. Vallo #12 (NF)	$14.01	$13.66	$13.14	$13.60
13. Vallo #1 (NF)	$14.58	$13.10	$13.07	$13.58
10. DSP Berritzgaard, Hildesvig (NF)	$14.40	$12.83	$12.85	$13.36
11. DSP Randbol Ussinggard (NF)	$13.57	$12.55	$13.49	$13.20
2. Bolu: Bolu-Kokez (TF)	$12.42	$13.46	$13.37	$13.08
8. DSP Nordjylland, Tversted (NF)	$12.93	$12.17	$13.60	$12.90
7. DSP Aabenraa, Saltbjerg 012/99 (NF)	$13.71	$11.75	$12.58	$12.68
12. DSP Randbol 053/00 (NF)	$11.85	$13.02	$12.25	$12.37
17. Vallo #15 (NF)	$11.55	$12.51	$12.33	$12.13
14. Vallo #7 (NF)	$12.16	$11.06	$12.13	$11.78
9. DSP Aabenraa, Saltbjerg 053/98 (NF)	$10.95	$11.86	-	$11.41
20. Vallo #9 (NF)	$12.09	$9.32	$12.48	$11.30
6. Trabzon: Torul (NF)	$11.59	$9.95	$10.31	$10.62
16. Vallo #13 (NF)	$8.46	$9.86	$12.14	$10.15
5. Artvin: Yayla (NF)	$9.38	$6.48	$9.42	$8.43
Site Average	$12.99	$12.13	$12.96	

Table 18. Spearman's rank-order correlations of the values at three grower sites in 2012

Site	Scholls	Estacada
La Center	0.802	0.685

Scholls	-	0.732

All P values <0.001

The following is a brief biography of the five best (and the worst) sources:

Five Best Sources

Family 18

- From an open-pollinated Nordmann fir in a Danish Seed Orchard. The original collection shipped from a town named Pjatigorsk in Russia. The source is assumed to be from the N. Caucasus Mountains and substantially north of the typical collection areas of Georgia.
- Bud break is in the midpoint of tested sources.

Family 3

- Turkish fir provenance source from the Hendek locality (Turkish National registration # 218) at an altitude of 4838 ft.
- Early bud break source.

Family 22

- Small provenance collection of second generation Danish Nordmann fir. The original collection area is not known.
- Late bud break source.

Family 4

- A Turkish fir provenance collection from the Akyazi locality (Turkish National registration # 219) at an altitude of 4000 ft.
- Early bud break source.

Family 1

- Turkish fir provenance collection from the Komursu locality (Turkish National registration # 221) at an altitude of 5400 ft.
- Early bud break source.

Worst performing source

Family 5

- Nordmann fir provenance collection from the Artvin District, Savsat locality at tree line (Yayla) at an altitude of 5900 ft. (Turkish National registration # 216)
- Bud break is in the midpoint of tested sources.
- Generally the Artvin sources have performed poorly in tests. It is best to avoid these sources, especially high elevation collections.

Activity 4. Collect and test branch samples from 6,000 trees in genetic trials for needle loss in 2010, 2011, and 2012.

We collected and tested branch samples for needle loss from ~1200 Nordmann/Turkish fir trees in genetic trials at two sites in 2010 and ~2800 in genetic trials at six grower sites in Washington and Oregon in 2011 and 2012 (Table 19). In order to determine which of these trees had the best needle retention, two-year-old branches were harvested between mid-October and mid- November. Branches were transported to WSU-Puyallup for postharvest needle loss testing. Two branches were cut from each tree, one each from the north and south side. The branches were displayed in a postharvest room at ~64F, with continuous light, and evaluated for needle loss after 10 days of display on a subjective, 0-7 rating scale

where 0 = no needle loss, 1 = <1%, 2 = 1-5%, 3 = 6-15%, 4 = 16-33%, 5 = 34-66%, 6 = 67-90%, 7 = 91-100% needle loss. Individual trees with needle loss ratings of less than or equal to 1 are considered to have superior needle retention characteristics.

Table 19. Dates that branches were harvested for needle loss testing.

Site	2012	2011	2010
1. PuyHill	Nov. 14	Oct. 31	
2. PuyVal	Nov. 14	Oct. 31	Nov. 18
3. La Center	Nov. 6	Nov. 7	Nov. 16
4. Scholls	Nov. 4	Nov. 3	
5. Sublimity	Nov. 8	Nov. 2	
9. KingsVal	Nov. 9	Nov. 2	

Overall, needle loss varied by site and year (Table 20). There was also significant variation in the needle loss ratings for the sources at each site (Table 21).

Table 20. Overall average needle loss ratings by site and test year for sources common to all sites.

	Site number and location					
Year	1. Puy-Hill	2. Puy-Val	3. La Center	4. Scholls	5. Sublimity	9. KingsVal
2012	2.83	1.68	1.21	2.52	5.01	2.32
2011	4.10	3.39	2.13	4.55	3.89	0.74
2010		1.12	4.06			

Rated on a 0-7 scale where 0 = no needle loss, 1 = <1%, 2 = 1-5%, 3=6-15%, 4=16-33%, 5=34-66%, 6=57-90% and 7=91-100% needle loss.

Table 21. Average needle loss rating[1] for all sources in 2010, 2011 and 2012 branch tests for 6 sites in Washington and Oregon

		Site number and location													
		1. Puy-Hill		2. Puy-Val			3. La Center			4. Scholls		5. Sublimity		9. KingsVal	
Source	Spec	2012	2011	2012	2011	2010	2012	2011	2010	2012	2011	2012	2011	2012	2011
1	TF	3.08	5.31	1.79	1.99	0.5	2.31	3.58	5.9	2.85	4.85	5.24	4.80	2.56	0.67
2	TF	.	.	1.11	1.96	0.4	2.05	3.91	4.9	3.92	4.72	5.53	5.31	2.80	0.58
3	TF	2.50	4.04	1.06	2.96	0.4	1.24	3.10	4.1	4.75	4.74	4.87	3.80	3.33	0.76
4	TF	2.86	3.85	0.43	1.89	0.6	1.15	2.19	3.5	2.91	3.65	4.08	3.45	2.23	0.65
5	NF	2.88	4.84	1.05	1.13	0.8	0.93	2.33	3.6	2.73	3.47	4.65	3.97	2.17	0.72
6	NF	.	.	1.74	3.48	0.8	1.97	2.75	4.9	2.97	4.86	4.43	4.48	3.57	1.20
7	NF	3.26	4.72	1.50	2.43	0.4	1.37	2.16	3.8	2.92	4.57	4.86	4.08	2.73	1.15
8	NF	2.11	2.86	1.76	3.27	1.0	1.59	2.46	4.1	3.04	5.02	5.28	3.73	2.67	0.82
9	NF	.	.	.	.	.	1.68	2.44	.	.	.	5.32	4.45	.	.
10	NF	2.66	3.96	1.54	2.49	0.7	2.66	2.82	3.9	3.97	4.90	5.04	4.62	.	.
11	NF	.	.	1.56	3.04	1.3	0.75	1.56	3.7	2.27	4.78	5.06	3.88	2.23	0.93
12	NF	3.53	4.44	2.16	4.84	1.3	1.42	3.24	5.0	2.73	5.47	5.43	3.43	1.97	0.65
13	NF	3.13	4.48	1.69	3.28	1.1	0.91	1.27	3.7	2.24	4.65	5.52	4.47	1.83	0.46
14	NF	1.95	3.04	3.00	5.76	2.5	0.52	1.29	3.4	0.82	3.43	4.55	3.10	2.05	0.25
15	NF	4.17	4.93	2.39	4.87	1.8	1.48	2.26	4.8	2.04	5.69	5.37	4.35	2.06	0.89
16	NF	2.57	3.41	1.13	2.47	0.8	1.21	1.34	3.7	1.53	3.18	5.21	3.66	1.71	0.33
17	NF	2.82	4.23	1.88	4.27	1.7	0.57	1.76	3.9	1.80	5.23	5.88	3.70	1.94	0.93
18	NF	3.54	4.69	2.16	3.81	1.2	1.17	1.29	3.6	2.75	4.89	4.74	4.03	3.13	1.30
20	NF	.	.	3.06	5.28	1.9	0.62	1.25	3.4	1.78	4.51	4.86	2.80	1.48	0.45
22	NF	1.28	2.51	1.55	4.45	1.6	1.14	1.56	3.7	2.19	4.89	4.50	3.92	2.09	0.80

[1]0-7 rating scale where 0 = no needle loss, 1 = <1%, 2 = 1-5%, 3 = 6-15%, 4 = 16-33%, 5 = 34-66%, 6 = 67-90%, 7= 91-100% needle loss.

Spearman's rank-order correlation analysis was done on the needle loss data for the sources present at each site to determine if there was a significant correlation between the needle loss ranking of the sources from one year to the next at these sites. This analysis showed that at all of the sites, except Scholls and Sublimity, the ranking of the sources was the same from year to year (Table 22). Spearman's rank-order correlation analysis was also done using the needle loss data for the sources that were common to all of the sites in 2011 and 2012. This analysis indicated that there was no correlation between how the sources ranked at one site vs. another (Tables 23 and 24).

Table 22. Spearman's rank-order correlation of yearly needle loss rankings for sources within sites.

Site	Years	R^2 Value
1. PuyHill	2011 vs. 2012	0.868**
2. PuyVal	2011 vs. 2012	0.869**
2. PuyVal	2010 vs. 2011	0.882**
2. PuyVal	2010 vs. 2012	0.797**
3. La Center	2011 vs. 2012	0.825**
3. La Center	2010 vs. 2011	0.840**
3. La Center	2010 vs. 2012	0.802**
4. Scholls	2011 vs. 2012	0.325
5. Sublimity	2011 vs. 2012	0.327
9. KingsVal	2011 vs. 2012	0.653*

*P=0.002, **P=<0.001

Table 23. Spearman's rank-order correlations of the 2011 needle loss rankings for sources common to all sites

Site	PuyValley	La Center	Scholls	Sublimity	Kings V.
PuyHill	-0.2620	0.3010	0.1670	0.6920**	0.2750
PuyValley		-0.3140	0.5080	-0.2480	0.0060
La Center			0.3670	0.0637	0.1160
Scholls				0.1870	0.5410*
Sublimity					0.4110

R^2 values. *P=0.05, **P=0.01

Table 24. Spearman's rank-order correlations of the 2012 needle loss rankings for sources common to all sites

Site	PuyValley	La Center	Scholls	Sublimity	Kings V.
PuyHill	0.2700	0.3410	0.0989	0.3580	0.0505
PuyValley		0.0505	-0.455	0.3760	-0.1960
La Center			0.525	0.2480	0.4150
Scholls				-0.1430	0.8370*
Sublimity					-0.4070

R^2 values. *P=0.001

Cold Accumulation

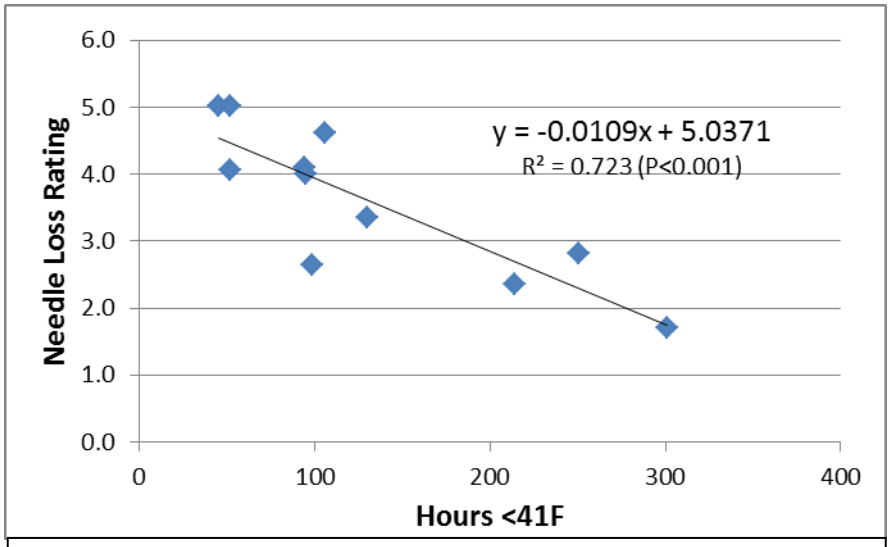


Figure 4. Relationship between the number of hours <41F to which Nordmann and Turkish fir trees were exposed and needle loss.

Growers often talk about the importance of waiting to harvest trees until they have been exposed to some cold temperatures in the fall. Delaying harvest has been shown to improve needle retention, but there is very little information relating to the specific relationship between the hours of accumulated cold temperatures and needle retention. During 2011 and 2012, temperatures were measured at several of the plots and the number of hours that temperatures were <41F from September 1 until the branches were harvested for needle loss testing was used to determine if decreased levels of needle loss were associated with exposure to more hours of cold temperature. Data analysis showed that there was a high correlation between the number of hours trees were exposed to <41F (Figure 4). If confirmed, growers may be able

to reduce the risk of potential needle loss problems by monitoring temperatures and delaying harvest until Nordmann/Turkish fir trees have been exposed to a minimum of 300 hours <41F.

Activity 5. Identify 60 to 100 trees with superior growth characteristics from 30,000 trees in grower fields in 2010 and 2011.

Looking for the best tree per acre, Oregon State University cooperators visited grower partners' fields and seed orchards and identified ~140 Nordmann and Turkish fir trees that exhibited superior growth characteristics.

Activity 6. Collect and test branch samples from 60 to 100 superior trees in grower fields for needle loss (fall) 2010 and 2011.

In mid-November of 2010 and 2011, two branches per tree (north and south sides) were collected from the ~140 trees that were identified in Activity 5 and shipped to WSU Puyallup for needle loss testing. Data from this collection showed that 82 and 55 of the trees had average needle loss ratings of 1 or less in 2010 and 2011, respectively. When the data were combined for trees that were tested in both years, 48 of the trees had average needle loss ratings of 1 or less. A Spearman's rank-order correlation of the needle loss from trees tested for two years showed a high correlation ($p<0.001$) between the two years.

Activity 7. Collection of scion wood from trees with superior growth and postharvest needle retention in genetic trials and grower fields and grafting scions onto rootstock for future seed orchard development in 2012 and 2013.

Based on the results of Activities 3, 4, 5, and 6, scion wood was collected in 2012 and 2013 from the 30 of the best individual Nordmann and Turkish fir trees from the top performing sources at two of the regional genetic sites (Table 25). In addition, scion wood was collected from 20 of the superior Nordmann and Turkish fir trees from grower fields that had excellent needle retention (Table 25). The scion wood was grafted onto rootstocks and used to establish new seed orchards and/or holding blocks to preserve this genetic material at WSU Puyallup, the OSU North Willamette Research and Extension Center, and three grower sites.

Table 25. Number and identification of Nordmann and Turkish fir trees from which scion wood was collected and grafted into one or more seed orchards/holding blocks

Nordmann fir			Turkish fir		
		Trees From Regional Genetic Trials			
Site	Family ID#	No. of Trees	Site	Family ID#	No. of trees
La Center	7	1	La Center	1	1
	10	1		2	1
	13	3		3	3
	15	2		4	2
	18	3	Sublimity	1	2
	22	2		3	4
Sublimity	8	1		4	2
	14	1		**Total**	**15**
	22	1			
	Total	**15**			
		Superior Trees From Grower Fields			
Stone Mt.	.	1	Stone Mt.	.	7

Schmidlin	.	4	Schmidlin	.	2
Werfelman	.	4	Werfelman	.	2
	Total	**9**		**Total**	**11**

Activity 8. Evaluate Nordmann and Turkish fir trees in two genetic plantings at WSU Puyallup for adelgid damage. 2012, 2013

In 2011, we noticed that an adelgid was damaging some of the trees in one of the 2004 genetic plots at Puyallup (Figure 5). This adelgid spread to additional trees the following year and in our September 2012 Annual Report, we noted our intention to continue to follow the spread of the adelgid, which we believe is *Dreyfusia nordmannianae* (syn. *Adelges nordmannianae*), and evaluate the trees in the 2004 genetic plots to determine if there are any differences in their susceptibility to this pest. During the summer in 2012 and 2013, we rated the adelgid damage on all of the trees in the WSU Puyallup hill site. Damage includes discoloration and distortion of needles. The severity of damage was rated on a scale of 0 to 3, where 0 = none, 1 = slight, 2= moderate, and 3 = severe damage. Based on the overall average rating for each source, the difference in damage on the Nordmann and Turkish fir was striking (Table 25). Compared to the Nordmann fir, there was very little evidence of damage on any of the three sources of Turkish fir in the trial. These data also appear to confirm data from Denmark, which suggest that some sources of Nordmann fir are much less susceptible to adelgids than others.

Figure 5. Severe needle damage on Nordmann fir caused by adelgid feeding. Aug 2011.

Table 25. Adelgid damage ratings on Nordmann (NF) and Turkish (TF) fir at WSU Puyallup hill site in 2012 and 2013.

Species	Source # & indentifier	'12 Rating (0-3)	'13 Rating (0-3)
TF	1. Bursa/Komurso, TK	0.06	0.12
TF	4. Adapazan/Akyazi, TK	0.05	0.14
TF	3. Adapazan/Hendek, TK	0.07	0.14
NF	7. Aabenraa/Saltbjerg, DK 012/99	1.62	1.00
NF	12. Randbol 053/00, DK	0.65	1.04
NF	16. Vallo #13, DK	1.00	1.04
NF	5. Artvin/Yayla, TK	0.91	1.18
NF	15. Vallo #12, DK	1.10	1.63
NF	22. DSP Koberhavn, DK	1.30	1.80
NF	17. Vallo #15, DK	1.49	1.94
NF	10. DSP Berritzgaard/Hildesvig, DK	1.88	1.95
NF	18. Vallo #18, DK	1.61	2.11
NF	14. Vallo #7, DK	1.75	2.12
NF	13. Vallo #1, DK	1.95	2.13
NF	8. DSP Nordjylland/Tversted, DK	1.43	2.19

Data collected July 24, 2012 and July 25-29, 2013. Rating scale: 0=none, 1=slight, 2=moderate, and 3=severe damage.

Figure 6. Adult adelgids and egg masses on Nordmann fir shoots (left) and crawlers on newly emerging needles.

In late February 2013, we also began inspecting branches from a subset of 5 trees in the 2004 Nordmann/Turkish fir hill planting at WSU-Puyallup to determine when the crawler stage of this adelgid would be active and how many generations of this pest occur during the growing season. On March 21, the first eggs were observed (Figure 6) and on April 3, a few crawlers had hatched from eggs on one of our test trees. Crawlers were present on all of the test trees by April 15, which was about two weeks prior to bud break on any of the trees. Once the trees broke bud, the crawlers moved to the new growth (Figure 5) and by June 5, fliers and summer needle mothers were molting. Within a few days the new mother adelgids were laying eggs, and by June 13, a second generation of crawlers began to appear. By July 10, the last of the active 2nd generation crawlers was observed.

Activity 9. Plot maintenance at WSU. Yearly.

WSU Puyallup project staff maintained ~9 acres of Christmas trees that were used in this project. Bob Moore, owner of Double Four Tree Farm, assisted in the maintenance of some of these plots.

Activity 10. Prepare project reports and make presentations at industry meetings and field days. Yearly.

During this project, all quarterly and yearly annual reports were submitted on time.
Dr. Gary Chastagner disseminated our findings by means of the following presentations, workshops, field days, and tours; local, nationwide and international Christmas tree meetings; industry publications; professional articles and technical reports; web site postings; print, television and radio media; and university classes.

WORKSHOPS/FIELD DAYS/TOURS ORGANIZED OR CO-ORGANIZED

- Integrated Pest Management for Christmas Trees. OSU North Willamette Research and Experiment Station. Aurora, OR
- Field Plant Pathology (PLP 525) class tour. Puyallup, WA. June 13-14, 2012.
- Puget Sound Christmas Tree Association (PSCTA) Summer Meeting. Puyallup, WA. August 4, 2012.
- National Christmas Tree Association (NCTA) Annual Convention Field Tour. Placerville, CA. August 11, 2012.
- Pacific Northwest Christmas Tree Association (PNWCTA) Summer Meeting. Kelso, WA. June 24, 2011.
- PNWCTA Summer Meeting Field Tour. Rochester, WA. June 25, 2011.

PRESENTATIONS

- Emerging adelgid problem on Nordmann fir, Swiss needle cast, and Phytophthora root rot. Wilbur-Ellis University. Auburn, WA. January 22, 2013.
- Tree keepability: Improving the postharvest quality & safety of cut trees.

- Inland Empire Christmas Tree Assn. Spring Meeting. Spokane, WA. April 6, 2013.
- Overview of new research projects: Nordmann, Turkish and Trojan firs; adelgid, needle necrosis, needle retention, Phytophthora root rot, and more. Inland Empire Christmas Tree Assn. Spring Meeting. Spokane, WA. April 6, 2013.
- Identification of needle cast and canker diseases of Christmas trees. Integrated Pest Management for Christmas Trees. OSU North Willamette Research and Experiment Station. Aurora. OR. June 3, 2013
- An emerging adelgid problem on Nordmann and Turkish firs and new needle retention and Phytophthora root rot research. PNWCTA Summer Meeting. Portland, OR. June 21, 2013.
- Diagnosis and management of needle diseases of Christmas trees. PNWCTA Summer Meeting. Portland, OR. June 21-22, 2013.
- Update on postharvest needle retention research. SCRI Christmas Tree Genomics Project meeting. St. Louis, MO. July 30, 2013.
- An emerging adelgid pest on Nordmann fir Christmas trees in western Washington. IUFRO International Christmas Tree Research Conference. Truro, Nova Scotia. August 10-15, 2013.
- Nordmann and Turkish fir: Phytophthora root rot, CSNN, bud break, and postharvest needle retention evaluations. IUFRO International Christmas Tree Research Conference. Truro, Nova Scotia. August 10-15, 2013.
- The U. S. Christmas Tree industry. WSU CB Marketing 368 ~Marketing Research~ class. Pullman, WA. September 16, 2013.
- Strategies to minimize losses caused by Phytophthora root rot. Wisconsin Christmas Tree Association Annual Conference. Wausau, WI. January 21, 2012.
- Reducing needle loss – A key to improving the quality of cut Christmas trees. Wisconsin Christmas Tree Association Annual Conference. Wausau, WI. January 21, 2012.
- Summary of Christmas Tree Research - Local and Abroad. PNWCTA Short Course. Portland, OR. February 24, 2012.
- Overview of Christmas tree research at WSU Puyallup. PSCTA Meeting and Christmas Tree Tour. WSU Puyallup. Puyallup, WA. August 4, 2012.
- Tree Keepability 101: Ways to Improve the Postharvest Quality & Safety of Cut Trees. 2012 NCTA Annual convention. Sacramento, CA. August 10, 2012.
- Diagnosing root rots in Christmas trees. Field Tour, 2012 NCTA Annual Convention Field Tour. Placerville, CA. August 11, 2012.
- Identifying sources of firs from Turkey with superior postharvest needle retention for the U.S. Christmas tree market. IUFRO 14th International Fir Symposium, Kastamonu, Turkey. September 13, 2012.
- Prevention and control of Phytophthora root rot. PNWCTA Summer Meeting. Kelso, WA. June 23, 2011.
- Nordmann and Turkish Fir WSDA Specialty Block Grant Project. PNWCTA Summer Meeting. Kelso, WA. June 23, 2011.
- Diagnosis of root rot diseases on Christmas trees. PNWCTA Summer Meeting field tour. Rochester, WA. June 25, 2011.
- Variation in the development of current season needle necrosis on noble, Nordmann and Turkish fir Christmas trees in the U.S. Pacific Northwest. Fourth International Workshop on the Genetics of Host-Parasite Interactions in Forestry. Eugene, OR. July 31 - August 5, 2011.
- Yearly variation in the development of current season needle necrosis on noble, Nordmann and Turkish fir Christmas trees in the U.S. Pacific Northwest. American Phytopathological Society Annual Meeting. Honolulu, HI. August 6-11, 2011.

- Nordmann and Turkish fir production in the U.S. Pacific Northwest: Preliminary bud break and postharvest needle retention evaluations. 10th IUFRO Christmas Tree Research and Extension Conference. Vienna, Austria. August 21-27, 2011.
- Variation in the development of current season needle necrosis on noble, Nordmann and Turkish fir Christmas trees in the U.S. Pacific Northwest. 10th IUFRO Christmas Tree Research and Extension Conference. Vienna, Austria. August 21-27, 2011.
- Overview of disease and pest issues associated with Christmas tree production in the PNW. NAPPO Import and Export of Christmas Trees Workshop. Salem, OR. September 12 - 14, 2011.
- Chalker-Scott, L. and G. Chastagner. 2011. Last minute advice about Christmas trees and other fun stuff. December 15, 2011. The Garden Professors Blog. https://sharepoint.cahnrs.wsu.edu/blogs/urbanhort/default.aspx
- Use of Turkish *Abies* species for Christmas tree production in the United States. Dept. of Forest Engineering, Karadeniz Technical University. Trabzon, Turkey. October 11, 2010.
- Use of Turkish *Abies* species for Christmas tree production in the United States. Dept. of Forest Engineering, Çoruh University. Artvin, Turkey. October 14, 2010

Annually, a variety of news releases and interviews stories were done to provide information in relation to the WSU Christmas tree research program. These stories are often picked up by major news sources, resulting in worldwide distribution. Examples of media that have carried stories since 2010 include:

Print media

Newsday. Fungus among the firs- researchers battle threat to Christmas tree industry (Dec. 26, 2000), Good Housekeeping, Popular Science, Seattle Times (Front page), Oregonian, Sacramento Bee, Los Angeles Times (front page), The Register-Guard, Capital Press, New York Times, Chicago Times, The Wall Street Journal, Spokesman Review, Skagit Valley Herald, Washington State Magazine, Campus Reform

Television and Radio

- NewProNet and the American Institute of Physics taped a 90-second segment for distribution to about 60 U.S. TV stations as part of their Discoveries and Breakthroughs Inside Science syndicated news service
- KOMO Seattle
- Discovery Channel
- Modern Times – A weekly science show on Austrian TV
- NPR
- CBC Radio in Calgary, Edmonton, Kelowna, and Victoria
- Radio New Zealand.

Chal Landgren, our project collaborator at Oregon State University (OSU), visited grower partners' fields and seed orchards and identified ~140 out of 30,000 trees that exhibited superior growth characteristics for postharvest needle loss testing. He harvested branches for needle loss studies on these trees in fall 2010 and 2011 in order to identify seed sources and individual trees with the best needle retention (see #5 & 6 for activity description). Chal also provided assistance throughout the grant period in the collection of bud break, tree quality and CSNN data at grower sites, and the collection of scion wood from superior grower trees. He also grafted scion wood from superior trees into a new seed orchard at the OSU North Willamette Research and Extension Center and provided scion wood to Ken Brown, who grafted scions into a grower's seed orchard.

In addition, Dr. Art Antonelli, an emeritus WSU Extension Entomology Specialist at WSU Puyallup; Dr. Richard Cowles, an entomologist at the Connecticut Agricultural Experiment Station; and Dr. Ulrik

Bräuner Nielsen, a Christmas tree geneticist at the University of Copenhagen provided advice relating to the adelgid work.

The following grower partners provided access to their farms and plant material for evaluation:

- Evelyn Casella and Jim Ehlbeck, Christmas Creek Ranch, La Center, WA
- Bob and Dee Werfelman, Norlain Acres, L.L.C., Scholls, OR
- Jim Heater, Silver Mountain Christmas Trees, Sublimity, OR
- Doug Sager, McMinnville, OR
- Dan Rickel, Rickel's Tree Farm, Estacada, OR
- Pat and Betty Malone, Sunrise Tree Farm, Kings Valley, OR
- Schmidlin Farms
- Bays Farms
- Kintigh's Mountain Home Ranch
- Noble Mountain Tree Farm
- Holiday Tree Farm
- Stone Mountain Tree Farm

GOALS AND OUTCOMES ACHIEVED

Scion wood was collected from 24 Nordmann fir and 26 Turkish fir trees with superior growth and postharvest needle retention. The scion wood was grafted onto rootstocks and used to establish new seed orchards and/or holding blocks to preserve this genetic material at WSU Puyallup, the OSU North Willamette Research and Extension Center, and three grower sites. This will preserve this genetic material and provide the industry with sources of genetically-superior seed in the future.

Project Activity	Timeline - Goals	Timeline - Actual
Collect Phytophthora susceptibility data from trees in replicated root rot trials at WSU Puyallup (summer/fall)	June 2011 – September 2011 June 2012 – September 2012	Completed as scheduled
Rate trees in regional genetic trials for CSNN damage during summer/fall.	August 2011 – September 2011 August 2012 – September 2012	Completed as scheduled
Collect growth, quality and bud break data on 6,000 trees in replicated genetic trials (spring-fall)	May 2011 – September 2011 May 2012 – September 2012	Completed bud break as scheduled Growth & Quality completed 2012
Collect and test branch samples from 6,000 trees in genetic trials for needle loss	November 2010 October 2011 October 2012	Completed as scheduled
Identify 60 to 100 trees with superior growth characteristics from 30,000 trees in grower fields	November 2010 – February 2011	Completed as scheduled
Collect and test branch samples from 60 to 100 superior trees in grower fields for needle loss (fall)	October 2010 October 2011	Completed as scheduled
Collection of scion wood from trees with superior growth and postharvest needle retention in genetic trials and grower fields and grafting scions onto rootstock for future seed orchard development	January 2012 – October 2013	Completed as scheduled

Evaluate Nordmann and Turkish fir trees in two genetic planting at WSU Puyallup for adelgid damage	March-August 2013	Completed as scheduled
Plot maintenance at WSU	November 2010 - September 2013	Completed as scheduled
Prepare project reports and make presentations at industry meetings and field days	November 2010 - September 2013	Completed as scheduled

We have confirmed that Nordmann and Turkish fir have limited susceptibility to Phytophthora root rot and CSNN and have identified three sources of superior Turkish fir and two sources of superior Nordmann fir that produced high value trees when grown at a range of sites in WA and OR. Recommendations relating to these sources of trees were provided to over 300 growers who attended the 2012 Puget Sound Christmas Tree Association Summer Meeting and the 2013 Pacific Northwest Christmas Tree Association Summer meeting and farm tour. Presentations made to grower groups and on farm tours of one of the regional genetic test plots were used to provide growers with this information. In addition, information relating to these sources was provided to growers via an article in the 2013 summer issue of the PNWCTA Lookout magazine (Lookout 46(2): 21-23).

BENEFICIARIES

Anecdotal evidence from growers has indicated that Nordmann and Turkish fir have been well received by retailers and consumers. However, limited information is available on sources of Nordmann and Turkish fir that are adapted for the production of high quality Christmas tree in the PNW. Traditionally growers have use Ambrolauri, which is widely planted in Europe. However, it's slow growth rate and tendency to shed needles after harvest are a concern for growers. Therefore, the identification of superior sources of disease and pest resistant Nordmann/Turkish fir with superior needle retention during this project will enable the PNW Christmas tree growers to increase profitability, meet consumer demand for high quality trees, and reduce the use of pesticides to manage diseases and insect pests. Companies that collect seed will be able to use the information obtained during this project to focus their collection of Nordmann and Turkish fir from sources that produce superior Christmas trees. This will benefit the conifer and nursery industries in the PNW as well as growers in other regions that are increasing the production of these two species of Christmas tree growers.

This project has identified three sources of Turkish fir and two sources of Nordmann fir that produced high value trees. The identification of these superior sources provides growers and the nursery industry with specific information on sources of seed and seedlings for future plantings. In the long term, scion wood collected from 30 of the best individual Nordmann and Turkish fir trees from the top performing sources at two of the regional grower sites and 20 of the superior Nordmann and Turkish fir trees from grower fields that had excellent needle retention that was used to establish grafted seed orchards/holding block will provide the industry with sources of genetically-superior seed in the future. Based on the economic data collected on the different sources of trees, the difference in the estimated value between the top source and the worst source is about $10,000 per acre.

LESSONS LEARNED

There are a number of positives lessons relating to this project. These include the interactions with growers who were very supportive of the project. Other positives include our ability to identify sources of high value Turkish and Nordmann fir that are adapted to the growing conditions in the PNW, the confirmation that these species have limited susceptibility to Phytophthora root rot and CSNN, and the long-term preservation of superior genetic material in seed orchards and holding blocks. The emerging adelgid issue serves as a reminder that it is seldom possible to identify a perfect tree species for the

growers in a region and that growers need to constantly monitor newly-introduced species to detect emerging disease and pest issues that will need to be managed.

The identification of an emerging adelgid problem on Nordmann fir was not expected. The collection of information on potential differences in host resistance was incorporated into the project and funding was obtained for a new SCBGP project relating to the management of this pest on Nordmann fir Christmas trees. The lack of a correlation for needle loss rankings for the sources at different sites was unexpected. This differs from results of previous studies and it suggests that additional research is needed to determine if specific sources of trees respond to site conditions in variable ways.

All of the goals and Expected Measurable Outcomes were achieved.

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ADDITIONAL INFORMATION

This project was supported by a number of industry stakeholders including the Pacific Northwest (PNWCTA), Puget Sound, and Inland Empire Christmas Tree Associations. The PNWCTA provided $10,000 per year cash match. Washington State University provided financial support including cost sharing and unrecovered indirect costs. In addition, growers in Washington and Oregon supported this project by maintaining over 6,000 trees in replicated regional genetic trials and providing access to over 30,000 trees that were used to identify 60 to 100 trees that exhibit superior growth characteristics for postharvest needle loss testing (See grower list under No. 5). Bob Moore, owner of Double Four Tree Farm assisted in the maintenance of some of the plots at Puyallup.

Information relating to this project has been disseminated via the following publications:

- **Chastagner, G., A. DeBauw, G. Dermott**, K. Coats, and **K. Riley**. 2010. Susceptibility of 14 *Abies* spp. to Phytophthora root rot. Page 8, 5th IUFRO Phytophthoras in Forest and Natural Ecosystems, Auckland and Rotorua, NZ, 7-12 March 2010. http://www.phyto2010.com/Abstracts%2012%20Feb%2010.pdf
- **Chastagner, G. A**. 2010. Susceptibility of true firs to Phytophthora root rot: A research update. Christmas Tree Lookout 43(1): 23-28.
- Talgø, V., **G. A Chastagner**, I. M. Thomsen, T. Cech, **K. Riley**, K. Lange, S. S. Klemsdal, A. Stensvand. 2010. *Sydowia polyspora* associated with current season needle necrosis (CSNN) on true fir (*Abies* spp.). Fungal Biology 114: 545-554 (doi:10.1016/j.funbio.2010.04.005).
- Hart, J., **Landgren, C.**, and **Chastagner, G**. (eds.). 2010. Proceedings of the 9th International Christmas Tree Research and Extension Conference. Corvallis, OR and Puyallup, WA. http://www.iufro.org/science/divisions/division-2/20000/20200/20209/publications/
- **Chastagner, G. 2011**. Research bucks battle diseases, build better trees. Lookout 44(2): 10-12.
- **Chastagner, G. 2011**. Research bucks battle diseases, build better trees – Part Two. Lookout (3): 9-12.
- **Chastagner, G., G. Dermott, K. Riley, and C. Landgren**. 2012. Nordmann and Turkish fir production in the U.S. Pacific Northwest: Preliminary bud break and postharvest needle retention evaluations. Pages 4-11. In: Landgren, C. (ed.). Proceedings of the 10th International Christmas Tree Research and Extension Conference. Eichgraben, Austria, August 21–27, 2011.
- **Chastagner, G., K. Riley, and C. Landgren**. 2012. Variation in the development of currentseason needle necrosis on noble, Nordmann, and Turkish fir Christmas trees in the U.S. Pacific Northwest.

Pages 85-87. In: Landgren, C. (ed.). Proceedings of the 10th International Christmas Tree Research and Extension Conference. Eichgraben, Austria, August 21–27, 2011.

- **Chastagner, G., G. Dermott**, C. Benedict, and A. Bary. 2012. Early-rotation nonchemical weed management in *Abies nordmanniana* Christmas trees. Page 123-127. In: Landgren, C. (ed.). Proceedings of the 10th International Christmas Tree Research and Extension Conference. Eichgraben, Austria, August 21–27, 2011.
- **Chastagner, G. A., K. Riley, and C. Landgren**. 2012. Variation in the development of current season needle necrosis on noble, Nordmann, and Turkish Fir Christmas Trees in the United States Pacific Northwest. Pp. 278-280. In Sniezko, Richard A.; Yanchuk, Alvin D.; Kliejunas, John T.; Palmieri, Katharine M.; Alexander, Janice M.; Frankel, Susan J., tech. coords. Proceedings of the Fourth International Workshop on the Genetics of Host-parasite Interactions in Forest Trees. USDA Forest Service, PSWRS, Gen. Tech. Rpt. PSW-GTR-240, November 2012
- Hart, J., **G. Chastagner, G. Dermott, and C. Landgren**. 2012. Rotational biomass and nutrient accumulation of four Christmas tree species. Pages 28-32. In: Landgren, C. (ed.). Proceedings of the 10th International Christmas Tree Research and Extension Conference. Eichgraben, Austria. August 21–27, 2011.
- **Chastagner, G., and K. Riley**. 2012. An emerging pest threat to Nordmann and Turkish fir in the Pacific Northwest. Lookout 45(3) 17-18.
- Talgø, V., **G. Chastagner**, A. Dobson, A. Stensvand, and I. M. Thomsen. 2013. Use of shade netting strongly reduces current season needle necrosis (CSNN). IUFRO International Christmas Tree Research Conference. Truro, Nova Scotia. August 10-15, 2013.
- **Chastagner, G**. 2013. Recent Christmas Tree Research Grants Aim to Solve Major Problems for Industry. Lookout 46(1): 25-26.
- **Landgren, C**. 2013. Results from the 2004 Turkish-Nordmann fir trial. Lookout 46(2): 21-23.

Chastagner, G. 2013. WSU Puyallup research news. Lookout 46(2): 24-26

PROJECT #4

Project Title: Management of virus and soilborne fungal diseases on cut flower bulb crops

Partner Organization: Washington State University

PROJECT SUMMARY

The production of ornamental bulbs and flowers represents an important high-value specialty crop in western WA and OR. Over 90% of the field-grown daffodils, tulips, iris and Asiatic/Oriental lilies produced in the U.S. are grown along the coastal areas of WA, OR, and northwestern CA. Maintaining the health of vegetatively-propagated bulbous flower crops is a major challenge for growers. There are a number of viral and fungal diseases that build-up in planting stocks resulting in reduced productivity and increased use of pesticides. Ultimately, infested stocks have to be destroyed. The overall goal of this project was to provide growers with improved diagnostic and management tools to reduce losses associated with the buildup of viral and soilborne fungal diseases.

Fungal diseases

Of the fungal diseases, those caused by the soilborne fungi *Fusarium* and *Rhizoctonia* are among the most difficult for growers to control. This is because of the inability to identify planting stocks and sites that are infested with these pathogens. Currently there are no reliable, rapid assay methods that can be used to assess inoculum levels of specific *Fusarium* and *Rhizoctonia* pathogens in soil or on planting stocks. The recent development of real time PCR technologies has provided an opportunity to develop highly specific assays that are capable of detecting and quantifying the specific taxons of *F. oxysporum* that cause basal rot on bulb crops, and *R.solani and R.tuliparum*. Access to this type of information will assist growers in making management decisions relating to the application of chemical or other control measures.

Alternative fungicides

Currently growers typically use fungicides and/or soil fumigation to reduce the losses caused by these soilborne pathogens. Fungicide resistance is a problem with the standard benzimidazole fungicides that are used as bulb dips in *Fusarium* basal rot disease management programs. To address this problem, WSU researchers worked to identify alternative fungicides that are effective in controlling basal rot.

Viruses

Management of viral diseases in lilies and dahlias is problematic for growers. Best-management recommendations vary due to the type of vector responsible for virus spread, persistence of viruses in vectors, the severity of damage caused by specific viruses, the rate of virus build up, and potential inoculum sources. Unfortunately, management of viral diseases by lily and dahlia growers in Washington is limited due to the lack of information on what viruses are commonly present in their stocks. During this project WSU researchers conducted surveys of grower fields and utilized rapid and sensitive serological and molecular techniques such as ELISA and PCR to identify and determine what common viruses affect these crops, which allows for the development of best management recommendations targeting these viruses.

PROJECT APPROACH

Activity 1. Collect isolates of Fusarium and Rhizoctonia from bulb crops

Diseased plants and bulbs were gathered from a number of growers in Washington and Oregon and isolations were performed to obtain a diverse collection of *Rhizoctonia* and *Fusarium* isolates. Several isolates of *Rhizoctonia* were analyzed by DNA sequencing of the ITS region to verify species. One isolate, previously maintained in WSU disease control trials and believed to be *Rhizoctonia tuliparum*, was also sequenced. The results of the sequencing showed that the maintained isolate (I-399) produced a sequence identical to the *Sclerotium tuliparum* (*Rhizoctonia tuliparum*) sequence submitted to the GenBank database by a Dutch group (Pham, Vink, and Hollinger). Two of the isolates (DGF2 and DGF3) collected were also of the same sequence with 100% identity. Four other isolates had poor sequences that indicated the presence of more than one fungal species in these cultures. A phylogenetic tree was produced (Figure 1) comparing isolates I-399, DGF2 and DGF3 to those of the various *Rhizoctonia solani* anastamosis groups and *Rhizoctonia oryzae* as published by Okubara et al. (2008). The tree demonstrates that the current project's isolates are 100% similar to each other and significantly different than any of the *Rhizoctonia* anastomosis groups defined by Okubara. This includes members of the AG-2 anastamosis group of *R. solani* that causes foliar infections on tulips. *Rhizoctonia tuliparum* isolates DGF2 and DGF3 were used in this project to design the *Rhizoctonia tuliparum* quantitative PCR assay.

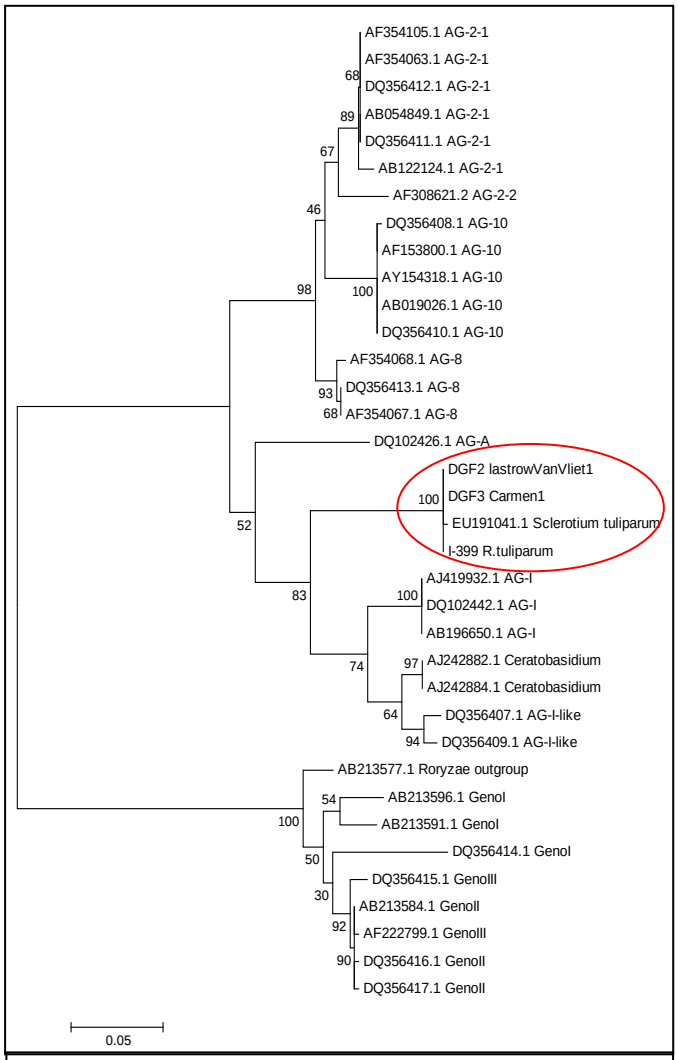

Figure 1. Molecular phylogenetic analysis by Maximum Likelihood method (MEGA5 software) showing the relationship of *Rhizoctonia tuliparum* (circled in red) with various *R. solani* anastamosis groups and *R. orvzae*.

Activity 2. Conduct pathogenicity trials to identify specific taxons of F. oxysporum

Development of the *Fusarium oxysporum* qPCR (See Activity 3) to identify specific taxons of *F. oxysporum* on bulbs requires that pathogenicity tests be conducted with isolates of *F. oxysporum* from bulbs to confirm their specific taxons. To conduct these tests, we used F. *oxysporum* isolates obtained from grower bulbs. Daffodil, iris, and tulip bulbs were inoculated with single spore isolates. Pathogenicity trials were conducted with 24 isolates on 'Blue Diamond' Dutch iris and 'Elite' tulips. Fourteen (14) isolates were evaluated on 'Standard Value' and 'Dutch Master' daffodils. A single non-bulb isolate of *F. oxysporum* (isolate # T16a B isolated from soil from IFA Toledo conifer nursery in SW Washington) was included in each test as a reference. Bulbs were incubated for 10-12 days, at which time the lesions that developed were measured. The outside lesion on all bulbs was measured using calipers. In addition, the daffodil bulbs were sliced open and the length of the inside lesion on each individual scale was measured. The colonization of the iris and tulips was determined by slicing the bulb through the center of the lesion and taking a picture of each bulb to

determine the extent of decay using the APS Assess program to measure the lesion area. These tests have identified 5 isolates *F. oxysporum* f.sp. *gladiolii* from iris, 2 isolates of *F. oxysporum* f.sp. *tulipae* from tulips, and 2-3 isolates of *F. oxysporum* f.sp. *narcissi* from daffodils.

Activity 3. Develop primers for use in real-time PCR to identify specific taxons of F. oxysporum and Rhizoctonia spp. on bulbs

The development of the *Rhizoctonia tuliparum* quantitative PCR (qPCR) detection and quantification assay was successful. Initially, a primer and TaqMan probe set was designed for the test, however it did not amplify well when using the researchers' known *R. tuliparum* isolates. Therefore, two new primer and TaqMan probe sets were designed and tested. Both sets are within the Internal Transcribed Spacer (ITS) region of DNA and showed good amplification of known samples. The finalized primers and TaqMan probe are listed below and referred to as "Rtul".

Type	Sequence	Start bp	Stop bp	Tm
Rtul Forward Primer	CGAGGTCGACTTTTTGTTTTGG	387	408	60
Rtul Reverse Primer	CCGAGTGGAACCGAGTTCAC	486	467	59
Rtul Probe	TTTGCGGATTCACGTCC	420	436	69

To determine the sensitivity of the Rtul primer/probe set, the concentration of a DNA sample extracted from a pure culture of *R. tuliparum* was estimated with a fluorometer. It was then used to make a dilution series from 1.2 ng/µL to 0.12 fg/µL of DNA, which were analyzed in triplicate with the Rtul qPCR assay (Figure 1). Analysis of the standard curve showed a linear association ($R^2 = 0.994$) between the log of the DNA concentration and the cycle threshold (C_t) value over the seven most concentrated DNAs. The least concentrated DNA, at 0.12 fg/µL, was not detected and most likely indicates the threshold of detection for this assay is around 1 femtogram of pathogen DNA. The amplification efficiency, as calculated using the formula: $E = 10^{(-1/slope)} - 1$, was 102%. Amplification efficiency above 100% is good; it usually means that at the higher concentrations of DNA, the sheer amount of DNA present is restricting the reaction from reaching its full amplification potential.

Specificity testing of the Rtul qPCR assay was also performed. It involved running the assay on sixty-three non-*tuliparum* and six *tuliparum* isolates of *Rhizoctonia* (supplemental table of isolates available by request) to assure that amplification does occur for all *R. tuliparum* isolates and does not occur for any isolate that is not *R. tuliparum*. The isolates included *R. solani* from anastomosis groups (AGs) 2-1, 3, 4, 5, 8, and 9, and Ceratobasidiums from AGs A, E, and I, as well as *Waitea circinata* and several unidentified *Rhizoctonia* species. No amplification was observed in the non-*tuliparum* DNA samples and C_t values between 13.93 and 33.51 were observed for various *R. tuliparum* DNA samples.

The development of primers for use in real-time qPCR to identify *F. oxysporum* f. sp. *tulipae* on bulbs was not successful. Based on DNA sequence alignments performed during the project, seven regions of the *Fusarium* genome that are typically used for detection assays (elongation factor 1a, endopolygalacturonase pg1 and pg2, exopolygalacturonase pgx1, internal transcribe spacer, intergenic spacer, and mitochondrial small subunit) were not usable because *F. oxysporum* f. sp. *tulipae* is too similar to (or the same as) other *F. oxysporums* in those regions. With support from FNRI, additional work is underway to identify a region that will be specific to *F. oxysporum* f. sp. *tulipae*.

Activity 4. Develop protocols to quantify pathogen inocula in artificially-infested soil and bulbs

The development of the Rtul protocol to quantify *Rhizoctonia* inocula in soil is described in Activity 3. Using sclerotia on colonized rice grains, WSU researchers "Beta" tested the Rtul protocol and showed that there was a significant correlation (R^2 = 0.8805) between the level of *R. tuliparum* sclerotial rice grain inoculum added to the soil and the quantity of *R. tuliparum* DNA detected (Figure 2).

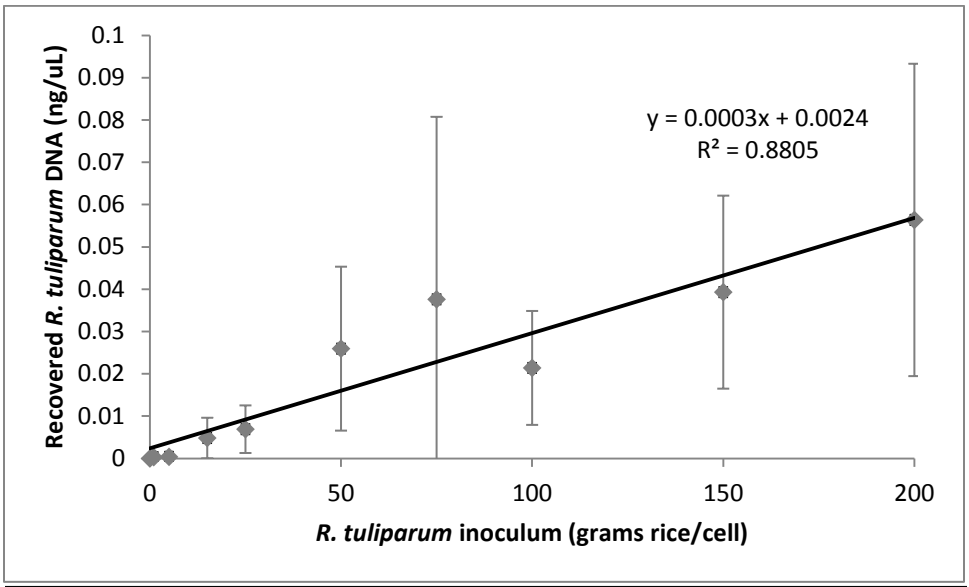

Figure 2. Relationship between the amount of sclerotial rice inoculum added to soil in a three foot long section of row (cell) and the amount of *Rhizoctonia* DNA detected.

Figure 3. View of iris planting. Soil cores and disease assessments were made at each flag site.

While Beta testing indicated that there was a significant correlation between the amount of artificially-produced sclerotial rice grain inoculum added to soil and the amount of pathogen DNA detected with the Rtul assay, WSU researchers conducted two trials to assess the ability of the Rtul assay to detect naturally-produced inoculum in two previously used diseased field plots. The infested plots were originally inoculated with rice-grain inoculum at the time they were planted with iris and tulips in the fall of 2011 in order to study the effect of known inoculum levels on disease development by infesting the soil with different levels of sclerotia that were grown on sterilized rice grains. Gray bulb rot developed on the plants in these plots and the severity of disease was correlated to the amount of rice-grain inoculum added to the soil at the time of planting (see Activity 5 below). Following dieback of the crop, these fields were harvested, and the naturally-produced sclerotia that developed on the diseased plant residues were rototilled back into the soil with a rear-tine tiller. The plots were then replanted in the fall of 2012 with iris and tulip bulbs at the same planting density as in 2011; however, no additional inoculum was added at the time of planting. The day before the plot was re-planted, soil was collected at

two-foot intervals within each row and DNA was extracted for Rtul qPCR detection of *R. tuliparum*. Within each tulip and iris plot, 155 soil cores were collected. During the growing season, gray bulb rot disease ratings were taken within 6 inches on each side of each of the soil sample sites to determine what the relationship was between naturally produced inoculum levels in the soil and disease development (Figure 3).

Analysis of the qPCR data showed that *R. tuliparum* was detected in only nine of the 155 samples taken from the tulip trial and only three of the 155 samples taken from the iris trial. Furthermore, there was no correlation of these positives with the disease development as measured by plant growth density, disease severity or amount of marketable flowers in 2013 (Data not shown).

The inability to detect any *R. tuliparum* DNA in soil samples associated with sites that developed gray bulb rot was unexpected and delayed the testing grower sites. Additional work that is being supported with a new $58,423 USDA Floriculture and Nursery Research Initiative (FNRI) grant is underway to determine if the inability to detect naturally-produced sclerotia is associated with inhibitors associated with the extraction of DNA from the sclerotia.

Activity 5. Determine threshold levels of inoculum necessary for disease development

Four field trials were conducted over a two-year period to determine the relationship between inoculum levels in the soil and the development of Rhizoctonia gray bulb rot on tulips and iris. Prior to hilling, the soil that was used to cover the bulbs was infested with different levels of sclerotia that were grown on sterilized rice grains. The following spring, disease development as measured by the number of emerged plants, plant growth density, and the number of marketable flowers was assessed. The plots were harvested each summer and the yield of bulbs was also determined. No disease developed on any of the non-inoculated iris or tulips. Higher levels of inoculum resulted in very high disease pressure (Figure 4). There was also a highly significant correlation between inoculum levels and disease development and yield (Figure 5). The highest inoculum levels resulted in a 50 to 60% reduction in the number of tulips that emerged and reduced the number of healthy iris plants by one half. A similar trend was observed with respect to the yield of bulbs.

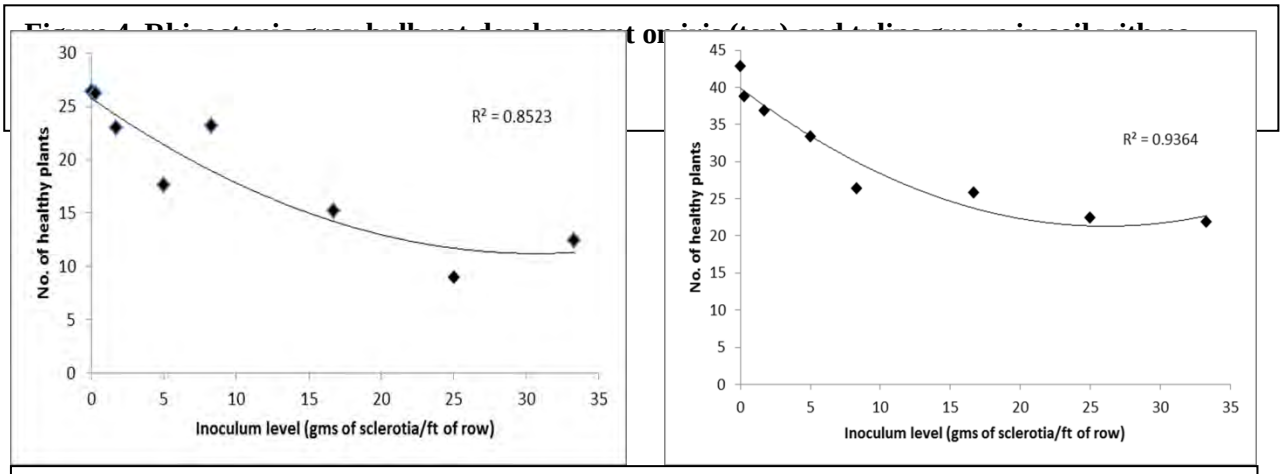

Figure 5. Relationship between the level of *Rhizoctonia tuliparum* inoculum in the soil and the number of healthy tulip (left) and iris plants in 2012.

Activity 6. Survey a minimum of 25 growers during early spring and summer and collect samples for ELISA and PCR testing to identify specific viruses on lily and dahlia crops

Virus surveys were conducted at 27 grower sites in 2011-2012 (Figure 6) to identify viruses present at farms that mainly supply cut flowers to local markets. At each site, information collected included general farming practices, virus and pest management practices, treatments used, farm history, location (GPS), origin and history of the planting stock (if known), cultivar name (if known), flower color, description of symptom(s), and incidence of symptom(s).

Samples were taken from plants exhibiting viral symptoms and, when possible, matching samples with no visible symptoms were also taken. Each lily sample (Table 1) was tested individually by ELISA for the following three viruses: Cucumber mosaic virus (CMV), Lily symptomless virus (LSV), and the Potyvirus group (which includes Tulip break virus (TBV)).

Each dahlia sample (Table 2) was tested individually by ELISA for the following two viruses: Tobacco streak virus (TSV), and Tomato spotted wilt virus (TSWV). Each sample was additionally tested by PCR for the presence or absence of 3 dahlia viruses (caulimoviruses): Dahlia Mosaic Virus (DMV), Dahlia Common Mosaic Virus (DCMV), and the endogenous plant para-retroviral sequence (DvEPRS) formerly known as DMV-D10. A subset of the 2012 dahlia samples (n=52) were also tested for Cucumber

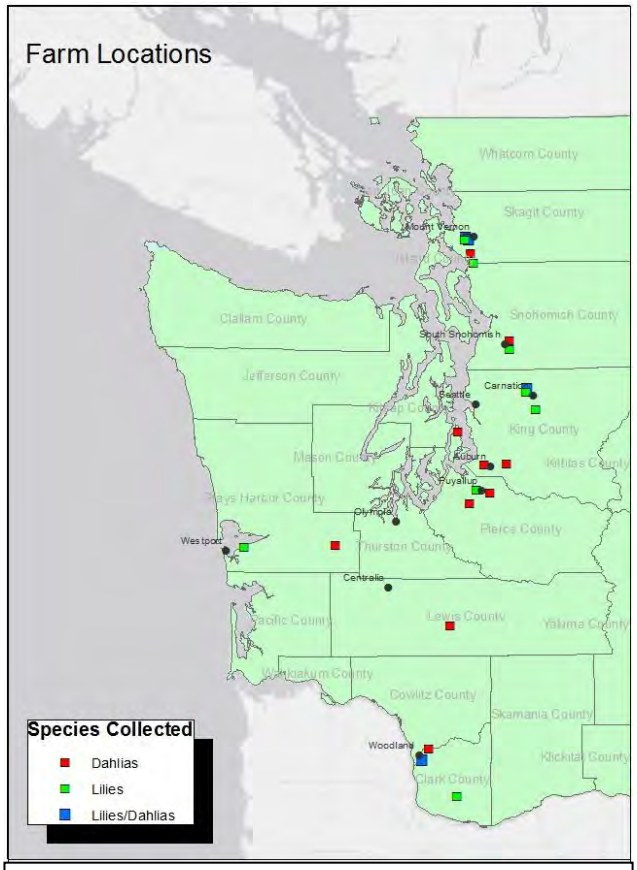

Figure 6. Locations of farms at which lily and dahlia plant samples were collected in 2011 and 2012.

Mosaic Virus (CMV) by ELISA and Potato Spindle Tuber Viroid (PSTVd) by hybridization.

The results, shown in Tables 3 and 4, indicate that the prevalence of viruses in lilies is moderate and the prevalence of viruses in dahlias is high. In 2011, 34.1% of lily plants sampled were positive for CMV, LSV, and/or a potyvirus, while in 2012 51.5% were positive for a virus. LSV was the most common virus found in lilies, occurring in 30.5% (2011) and 45.5% (2012) of the samples. The incidence of potyvirus and CMV were much lower. Two or more viruses were detected in 5.3% (2011) and 15.2% (2012) of the lily samples. No INSV, TRSV, TAV, or TSWV was detected in any of the lily samples.

Most (73% in 2011 and 92% in 2012) of the dahlia plants sampled were positive for one or more viruses. The most common virus, by far, was DvEPRS (49.5% in 2011 and 87% in 2012); however this virus seems to be prevalent in both symptomatic and seemingly healthy samples. Two or more viruses were detected in about one half of the positive dahlia samples. All of the dahlia samples were negative for CMV, INSV, PSTVd and potyviruses.

Table 1. Number of lily samples collected from Washington farms in 2011and 2012 and the diagnostic tests applied.

	2011	2012
Number of farms	10	2
Number of samples	226	33
ELISA: Cucumber mosaic virus (CMV)	•	•
ELISA: Impatiens necrotic spot virus (INSV)	•	
ELISA: Lily symptomless virus (LSV)	•	•
ELISA: Potyvirus group test (Poty)	•	•
ELISA: Tobacco ringspot virus (TRSV)	•	
ELISA: Tomato aspermy virus (TAV)	•	
ELISA: Tomato spotted wilt virus (TSWV)	•	

Table 2. Number of dahlia samples collected from Washington farms in 2011 and 2012 and the diagnostic tests applied.

	2011	2012
Number of farms	10	5
Number of samples	111	83
ELISA: Cucumber mosaic virus (CMV)	•	•[a]
ELISA: Impatiens necrotic spot virus (INSV)	•	
ELISA: Potyvirus group test (Poty)	•	
ELISA: Tomato spotted wilt virus (TSWV)	•	•
ELISA: Tobacco streak virus (TSV)	•	•
PCR: endogenous plant para-retroviral sequence (DvEPRS or DMV-D10)	•	•
PCR: Dahlia mosaic virus (DMV)	•	•
PCR: Dahlia common mosaic virus (DCMV)	•	•
Hybridization: Potato spindle tuber viroid (PSTVd)		•[a]

[a] A portion of samples were tested: 52/83

Table 3. Frequency of viruses in symptomatic and asymptomatic lily plants

	% samples positive					
	2011			2012		
Virus	+Sym[1]	-Sym[2]	Total	+Sym	-Sym	Total
LSV	35.1	25.9	30.5	50.0	36.4	45.5
Potyvirus group test	14.9	0.9	8.0	4.5	0.0	3.0
CMV	1.8	0.9	1.3	13.6	27.3	18.2
INSV	0.0	0.0	0.0	nt[3]	nt	nt
TAV	0.0	0.0	0.0	nt	nt	nt
TRSV	0.0	0.0	0.0	nt	nt	nt
TSWV	0.0	0.0	0.0	nt	nt	nt
Samples with 1 or more viruses	42.1	13.4	34.1	54.5	45.5	51.5

[1]+Sym = samples from plants with symptoms, [2]-Sym = samples from plants with no symptoms, [3]nt = not tested.

Table 4. Frequency of viruses in symptomatic and asymptomatic dahlia plants

	% samples positive					
	2011			2012		
Virus	+Sym[1]	-Sym[2]	Total	+Sym	-Sym	Total
DvEPRS	40.7	73.3	49.5	86.4	88.2	86.7
DCMV	19.8	20.0	19.8	48.5	64.7	51.8
DMV	7.4	6.7	7.2	13.6	35.3	18.1
TSV	23.7	33.3	26.1	10.6	11.8	10.8
TSWV	32.1	10.0	26.1	19.7	11.8	18.1
CMV	0.0	0.0	0.0	0.0	0.0	0.0
PSTVd	nt[3]	nt	nt	0.0	0.0	0.0
INSV	0.0	0.0	0.0	nt	nt	nt
Potyvirus group test	0.0	0.0	0.0	nt	nt	nt
Samples with 1 or more viruses	69.1	83.3	73.0	92.4	88.2	91.6

[1]+Sym = samples from plants with symptoms, [2]-Sym = samples from plants with no symptoms, [3]nt = not tested.

The incidence of virus infected plants on lily farms ranged from zero infected plants at farm 7 to 100% infected plants at farm 12 (Figure 7). On the dahlia farms, infected plants were detected at every farm. The lowest incidence was about 40% of the plants infected and 100% of the plants were infected at five farms (Figure 8).

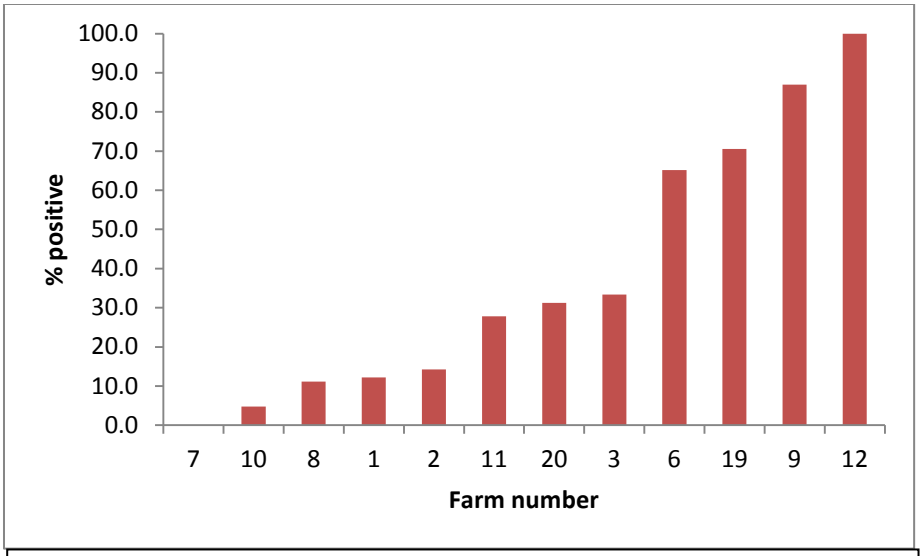

Figure 7. Percent of lily samples from each farm that were positive for a virus (2001-2012)

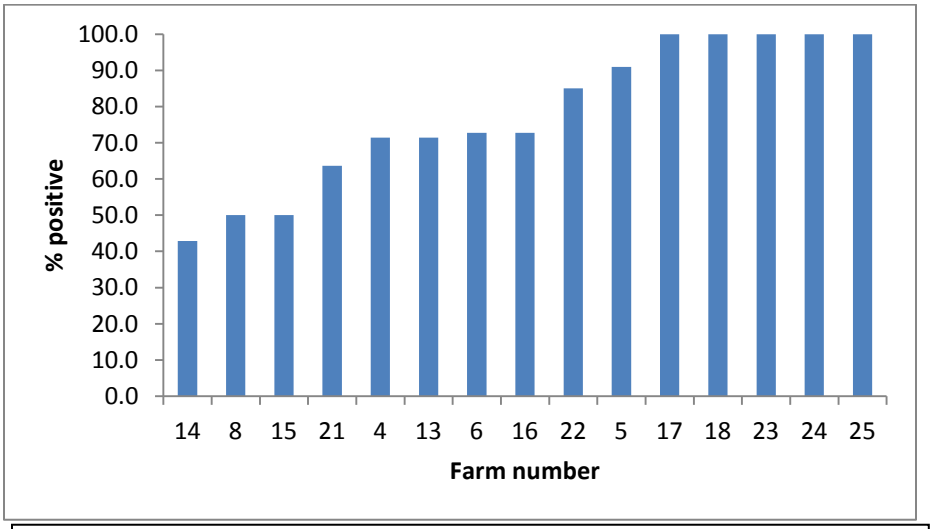

Figure 8. Percent of dahlia samples from each farm that were positive for a virus (2011-2012).

The variety of symptoms observed on lily and dahlia plants during the virus survey are depicted in Figures 9 and 10.

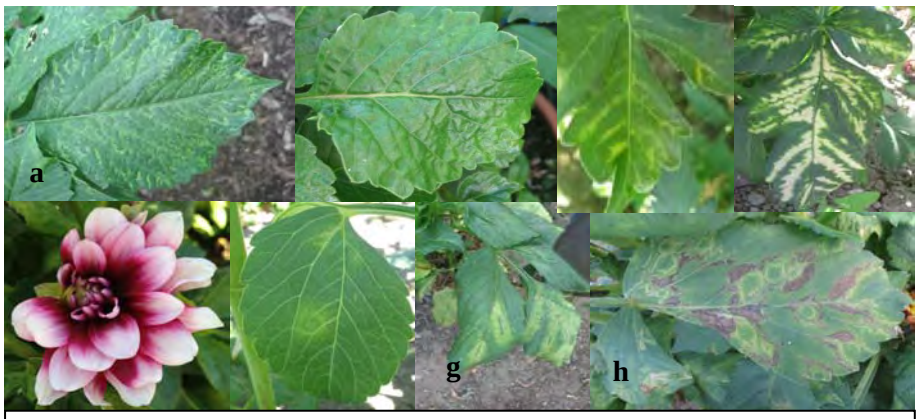

Figure 10. Viral-like symptoms observed on dahlia included a) mottled yellow-green leaf discolor, b) distorted/crinkly leaves, c) and d) discolor along the mid-vein of the leaf, e) flower deformation, and f), g), h) various severities of ringspot.

Figure 9. Viral-like symptoms observed on lily included a) distorted leaves, b) yellow streaking or leaf discolor, c) mottled yellow-green leaf discolor, d)

One aspect of the survey work was to determine whether growers' disease management practices played a role in viral disease levels. Growers were asked a series of questions relating to management practices that are commonly used to reduce the risk of viruses (Figure 11). One recommendation to control virus spread is to disinfest flower harvesting tools regularly, which none of the farmers did. The lily farmer with no virus only plants new stock each year, which was rare among the majority of growers. Spraying insecticides to control vectors and rogueing suspicious plants to remove the potential sources of virus are two Best Management Practices that were also not commonly used by growers or the timing of the activity was such that it would probably provide minimal benefit.

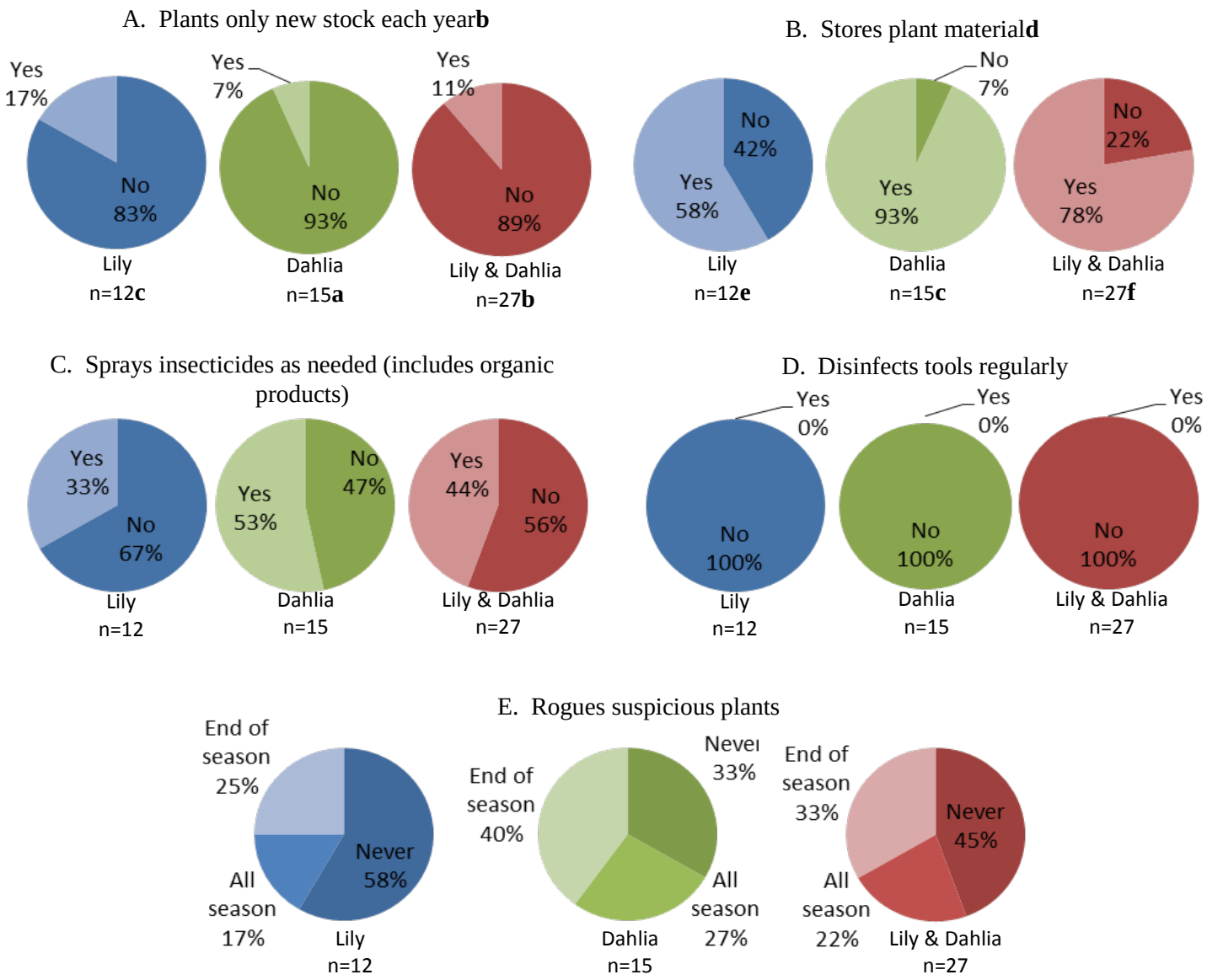

Figure 11. Results of a survey of lily and dahlia growers' virus management practices.

Activity 7. Conduct greenhouse and field trials to determine the effectiveness of reduced-risk and new biocontrol products in controlling Fusarium basal rot and Rhizoctonia on tulips and/or iris

Fungicides are an important tool used to manage a number of diseases on bulb crops. Currently, there are only a limited number of registered fungicides for the management of Fusarium and Rhizoctonia diseases on bulbs. Fungicide resistance is also a problem that reduces the effectiveness of certain fungicides. Recently there have also been a number of reduced-risk fungicides and potential biocontrol products that have been shown to be effective against Fusarium and Rhizoctonia diseases on other crops. Four trials were conducted during this project to identify newer reduced-risk fungicides and bio-control products that are effective in controlling these diseases on bulb crops grown in the PNW. A total of 14 products were included in these trials (Table 5).

Table 5. Products tested during this project

Product and formulation	Active ingredient
Acibenzolar-S-methyl	acinbenzolar-s-methyl
CG 100	caprylic acid
Flagship 0.22G	thiamethoxam
Flagship 0.25W	thiamethoxam
Heritage 50WG	azoxystrobin
Medallion 50WP	fludioxonil
Moncut 70DF	flutolonil
Palladium 62.5WG	cyprodinil (37.5), fludioxonil (25)
Rootshield Plus WP	*Tricoderma harzianum* & *T. virens*
SP2169	proprietary
Terraclor 75WP	PCNB
Torque 3.6SC	tebuconazole
Tourney 50WDG	metconazole
Trinity 25C	triticonazol

Fusarium Trials

An outdoor forcing trial was conducted to evaluate the effectiveness of various fungicides to control Fusarium bulb rot on 'Blue Diamond' iris. To begin this trial, naturally-infested soil was obtained from a commercial bulb grower's greenhouse and evenly dispersed in 85 identical plastic bulb crates (5 crates/treatment) (Figure 12). Fungicides were applied to surface of the soil in the crates using a CO_2 backpack sprayer equipped with an 8002 LP Tee-Jet nozzle at 15 psi. The soil for each treatment was then placed in a cement mixer to incorporate the fungicide and additional inoculum into the soil. The additional inoculum was obtained by blending fully-colonized Petri plates of isolate GFW-3 (*F. oxysporum* f.sp. *gladiolii* from iris) grown on potato sucrose agar in a blender at a ratio of 50 mls water/1 plate to provide a slurry mixture that was then added to a premeasured amount of soil and allowed to rest for 3 days. Four (4) liters of the infested soil (800 cc infested soil/rep) was added to the treated soil while it was mixing in the cement mixer. In addition to the fungicide treatments, there were also steam pasturized and non-pasturized check treatments. The mixed soil was then put back into its original crate and 3 days later, 45 iris bulbs were planted in every crate. The crates were mulched with sawdust and overhead irrigated. Emergence data was taken on September 5, 2012. Flower harvesting began on October 9, 2012 and ended on November 9, 2012 (Figure 12).

Figure 12. Fusarium bulb rot iris fungicide trial. Crates at the time of treatment (top) and just prior to flowering.

Disease pressure in this trial was high. Treatments had no effect on the number of iris plants that emerged (Table 6). The number of marketable flowers per crate ranged from 32.4 to 12.2 for the bulbs planted in the steam pasteurized and non-pasteurized soils, respectively (Table 6). The ANOVA analysis of data in this test indicated that there was a highly significant ($P<0.05$) treatment effect on the number of marketable flowers, flowers >18" tall, and non-marketable cull flowers. Bulbs planted in soil treated with the high rate of Trinity, Flagship 0.22 G + Heritage, and the high rate of Tourney had significantly higher numbers of marketable flowers, flowers >18" tall, and significantly fewer culls than the bulbs planted in the non-pasteurized soil. The combinations of Flagship 25WG + Heritage and Acibenzolar + Heritage also significantly increased the number of flowers >18" tall. Flagship 0.22 G alone

significantly increased the total number of marketable flowers and the number of flowers >18" tall. Steam pasteurizing the soil was also highly effective in limiting disease development.

Table 6. Effect of fungicide treatments on iris emergence and the total number of marketable flowers, flowers >18" tall, and culls.

					Number of Flowers[2]		
TRT	TRT/PRODUCT	Rate/1000ft^2	Emergence[1]		Marketable	>18"	Cull
1	Steam pasteurized soil	-	43.8	a[3]	32.4 a	32.0 a	10.8 d
16	Trinity 2SC	8.14 ml	44.0	a	24.5 ab	24.0 ab	21.5 cd
11	Flagship 0.22G +Heritage 50 WDG	44 oz + 0.4oz	44.6	a	24.2 abc	23.4 ab	21.6 bc
14	Tourney 50 WDG	5.6 g	44.4	a	23.8 abc	23.2 abc	20.4 cd
12	Flagship 25 WG+Heritage 50 WDG	0.4 oz +0.4 oz	44.8	a	22.6 abcd	21.8 abc	22.2 abc
4	Flagship 0.22 G	44 oz	45.0	a	23.0 abc	21.8 abc	22.0 abc
10	Acibenzolar + Heritage 50 WDG	0.08g + 1oz	44.4	a	22.4 abcd	21.6 abc	22.2 abc
15	Trinity 2SC	5.43 ml	44.8	a	21.2 bcd	21.0 bcd	23.0 abc
9	SP2169	8.35 ml	44.0	a	21.0 bcd	20.8 bcd	22.0 abc
13	Tourney 50 WDG	2.8 g	44.6	a	21.4 bcd	20.8 bcd	22.4 abc
7	Palladium 62.5 WG	1 oz	44.4	a	21.2 bcd	20.8 bcd	22.8 abc
8	Torque 3.6 SC	20.4 ml	44.4	a	21.8 abcd	20.6 bcd	22.2 abc
6	Heritage 50 WDG	0.4 oz	44.6	a	19.0 bcd	18.6 bcd	25.0 abc
3	CG 100	26.0 ml	44.8	a	19.2 bcd	18.4 bcd	24.8 abc
5	Flagship 25 WG	0.55 oz	44.4	a	17.6 bcd	17.4 bcd	26.8 abc
17	Rootshield Plus WP	10 oz	44.8	a	13.6 bcd	12.8 cd	31.4 ab
2	Non-pasteurized soil	-	45.0	a	12.2 d	11.0 d	32.2 a

[1] No. emerged on September 5, 2012.
[2] Harvested between October 9, 2012 and November 9, 2012
[3] Numbers followed by the same letter are not significantly different, P<0.05, Tukey's Studentized Range (HSD) Test.

Gray Bulb Rot Trials

Terraclor (PCNB) has been the industry standard for the control of Rhizoctonia gray bulb rot and other Rhizoctonia diseases of tulips since the 1950's. There are increasing environmental concerns about this product and its availability has varied due to EPA-issued stop sales. Two field trials were planted to look at the effectiveness of potential alternatives to PCNB for control of Rhizoctonia gray bulb rot on 'Advent' tulips. Preplant broadcast treatments of Moncut and Medallion were compared to applications of Terraclor. High levels of gray bulb rot developed during these trials and all applications of Medallion and Moncut were as effective as the industry standard (Terraclor) in increasing the emergence of plants and the total number of flowers in both plots (Tables 7 and 8, and Figure 13). These materials, especially Moncut and the higher rate of Medallion also had similar affects as PCNB on increases in flowering. This project has shown that Moncut and Medallion have the potential to control gray bulb rot at rates much lower than those required when PCNB is used.

Figure 13. Control of Rhizoctonia gray bulb rot with Moncut fungicide (left) vs. a non-treated check plot.

Table 7. Plot 1- Effect of fungicides on emergence (number) and flowering[1].

Treatment #	Prod/1000ft[2]	Emergence March 28th		Flower Heights (in) on April 18th					
				10-13”		>13”		Total >10”	
3. Terraclor 75WP	3.25 lbs	25.0	a[2]	15.0	a	8.3	a	23.3	a
7. Moncut 70DF	7.5 oz	24.7	a	10.7	ab	12.7	a	23.3	a
6. Moncut 70DF	3.75 oz	24.7	a	13.7	a	8.7	a	22.3	a
2. Terraclor 75WP	1 lb	25.0	a	10.7	ab	10.3	a	21.0	ab
5. Medallion 50WP	3.5 oz	24.3	a	13.0	a	8.0	a	21.0	ab
4. Medallion 50WP	1.5 oz	22.7	a	6.7	b	10.3	a	17.0	b
1. Check	-	13.3	b	7.1	b	0.7	b	7.8	c

[1]Number of emerged plants and flowers per 5 sq. ft cell.
[2]Numbers followed by the same letter are not significantly different, P=0.05, Tukey's Studentized Range Test.

Table 8. Plot 2- Effect of fungicides on emergence (number) and flowering[1].

Treatment #	Prod/1000ft[2]	Emergence March 28th		Flower Heights (in) on April 18th					
				10-13”		>13”		Total >10”	
3. Terraclor 75WP	3.25 lbs	25.0	a[2]	15.7	a	6.7	a	22.3	a
4. Medallion 50WP	1.5 oz	24.3	a	16.7	a	5.3	a	22.0	a
5. Medallion 50WP	3.5 oz	24.7	a	17.7	a	3.7	a	21.3	a
7. Moncut 70DF	7.5 oz	25.0	a	16.0	a	3.7	a	19.7	a
2. Terraclor 75WP	1 lb	24.7	a	18.0	a	1.3	a	19.3	a
6. Moncut 70DF	3.75 oz	24.3	a	15.3	a	3.7	a	19.0	a
1. Check	-	12.9	b	7.0	b	0.1	a	7.10	b

[1]Number of emerged plants and flowers per 5 sq. ft cell.
[2]Numbers followed by the same letter are not significantly different, P=0.05, Tukey's Studentized Range Test.

Activity 8. Add a "flower bulb crop" best management section to the WSU Dahlia Website (http://dahlia.wsu.edu)

WSU researchers made recommended edits to the existing WSU Dahlia Website to reflect their most recent findings. They also expanded their WSU Puyallup Plant Pathology (puyallup.wsu.edu/ppo/bulbs/) website to include general information on their Disease Management Program in ornamental flower bulb crops as well as crop-specific information and current research.

Activity 9. Organize annual PNW Bulb Grower Educational Conference and WSU Bulb Grower Field Day

In January of 2011, 2012, and 2013, WSU researchers co-organized the Bulb and Cut Flower Section of the Wilbur-Ellis University Educational Conference. In May of 2011, 2012, and 2013 (Figure 14), WSU researchers organized a WSU BulbGrowers Field Day. Approximately 30growers attended each of these events.

Figure 14. Bulb Growers Field Day was hosted at WSU Puyallup on May 15, 2013.

Activity 10. Prepare project reports and make presentations at industry meetings

All project reports were submitted on time. Presentations were made at the industry meetings listed in Activity 9. See Section 17 for a full list of the presentation titles. Presentations were also made at a number of scientific meetings (See section 17).

- Dr. Hanu Pappu, Chair and President Samuel Smith Endowed Chair in Plant Virology, WSU Department of Plant Pathology was a collaborator on this project and provided advice relating to the proposed virus studies.
- Bee Cha, WSU's Hmong Immigrant Program Coordinator facilitated surveys with local Hmong growers.
- Drs. Lynell Tanigoshi and Beverly Gerdeman, WSU Mount Vernon, Department of Entomology provided contact information for local growers interested in participating in this project.
- See No. 16 for a list of other collaborators who provided Cash and In-Kind Matching Donations
  This project did not benefit commodities other than specialty crops. Project staff ensured that funds were used to solely enhance the competitiveness of specialty crops by regularly evaluating research progress as it related to the work plan and goals, and documented that progress in

GOALS AND OUTCOMES ACHIEVED

Goal 1. Develop and promote the use of a real-time (quantitative) PCR diagnostic test that enables growers to assess *Fusarium* and *Rhizoctonia* inoculum levels in soil and on planting stock.

The activities that were completed in order to achieve this goal were Activities 1, 3, 4, 5, 9, and 10 (see Section 4) toward the development of a *Rhizoctonia* test and Activities 1, 2, 9, and 10 (see Section 4) toward the development of a *Fusarium* test. Although a great effort was made to complete Activity 3 for *Fusarium*, the development of primers and probe for a quantitative PCR test was not successful due to high genetic homology (similarity) to other *Fusaria* (see activity 3).

An *R. tuliparum* taxon-specific real time qPCR assay (Rtul) to detect this pathogen was developed. However the assay protocol that was developed using artificially-produced inoculum failed to detect naturally-produced inoculum in field soils. It is unclear if this was due to sampling difficulties or inhibitors associated with the extraction of DNA from the natural sclerotia.

Goal 2. Identify reduced-risk fungicides and/or biologically based alternatives to PCNB and benzimidazole fungicides to control Fusarium and Rhizoctonia diseases.

The activities that were completed in order to achieve this goal were Activities 7, 9 and 10

Goal 3. Develop and promote best management practices to reduce the spread of viruses commonly found on lilies and dahlias.
Much progress has been made toward the researchers' long-term goal to provide growers with improved diagnostic and management tools to reduce losses associated with the buildup of viral and soilborne fungal diseases. A diagnostic test to detect *Rhizoctonia tuliparum* was developed, progress toward a *Fusarium oxysporum* f. sp. *tulipae* diagnostic test was made, 14 reduced-risk fungicides and/or biologically-based alternatives to PCNB and benzimidazole fungicides to control *Rhizoctonia* and *Fusarium* diseases were tested, 27 lily and dahlia grower fields were surveyed to identify which viruses affect those crops in Washington, and best management practices were promoted through presentations at industry meetings, grower visits, educational fliers, and development of website content reflecting up-to-date research findings.

Project Activity	Timeline - Goals	Timeline - Actual
Collect isolates of *Fusarium* and *Rhizoctonia* from bulb crops	October 2010 - September 2011	Completed March 2011
Conduct pathogenicity trials to identify specific taxons of *F. oxysporum*	May 2011 – September 2011	Completed March 2012
Develop primers for use in real-time PCR to identify specific taxons of *F. oxysporum* and *Rhizoctonia* spp. on bulbs	September 2011 – September 2012	*F. oxysporum* - not completed *Rhizoctonia* - completed June 2012
Develop protocols to quantify pathogen inocula in artificially-infested soil and bulbs	October 2011 – September 2013	Completed December 2012
Determine threshold levels of inoculum necessary for disease development	October 2011 – September 2013	Completed August 2013
Survey a minimum of 25 growers during early spring and summer and collect samples for ELISA and PCR testing to identify specific viruses on lily and dahlia crops	April 2011 – September 2011 April 2012 – September 2012	Completed September 2012
Conduct greenhouse and field trials to determine the effectiveness of reduced-risk and new biocontrol products in controlling Fusarium basal rot and *Rhizoctonia* on tulips and/or iris.	October 2010 – September 2011 October 2011 – September 2012 October 2012 – September 2013	Completed as stated
Add a "flower bulb crop" best	October 2012 – September	Completed September 2013

management section to the WSU Dahlia Website (http://dahlia.wsu.edu)	2013	
Organize annual PNW Bulb Grower Educational Conference and WSU Bulb Grower Field Day	January 2011, 2012, 2013 May 2011, 2012, 2013	Completed as stated
Prepare project reports and make presentations at industry meetings	October 2010 – September 2013	Completed as stated

researchers' target outcome for this part of the project was that 50% of the grower members of the Northwest Bulb Growers Association use the diagnostic test as part of their disease management program by the end of the project. Much progress has been made toward this long-term goal, technical issues prevented this goal from being met. A *Rhizoctonia tuliparum* quantitative PCR test was developed and shown to successfully detect artificial inoculum. This diagnostic test will need to be developed further to assure that it accurately detects naturally produced inoculum under field conditions (See Activites 3 and 4, and No. 7 – goal 1 above). This work will be supported with a new FNRI grant.

A great deal of effort was made to develop a real-time qPCR test to identify *F. oxysporum* f. sp. *tulipae* inoculum; however it's development has not yet been completed. Based on DNA sequence alignments performed during the project, seven regions of the *Fusarium* genome that are typically used for detection assays (elongation factor 1a, endopolygalacturonase pg1 and pg2, exopolygalacturonase pgx1, internal transcribed spacer, intergenic spacer, and mitochondrial small subunit) were not usable because *F. oxysporum* f. sp. *tulipae* is too similar to (or the same as) other Fusarium oxysporums in those regions (See Activities 3 and No. 7 – goal 1 above). The progress made to identify a genomic region unique to *F. oxysporum* f. sp. *tulipae* will prove useful to the researchers' continuing effort to develop a diagnostic test that is being funded by a new FNRI grant.

Goal 2. Identify reduced-risk fungicides and/or biologically based alternatives to PCNB and benzimidazole fungicides to control Fusarium and Rhizoctonia diseases.

The researchers' target outcome for this part of the project was to identify a minimum of two alternatives to PCNB and benzimidazole fungicides. Moncut and Medallion were identified as two potential alternatives to PCNB for the control of Rhizoctonia gray bulb rot. Four fungicides (Trinity, Flagship 0.22 G, Heritage, and Tourney) were shown to have the potential to control Fusarium basal rot. Steam pasteurization was also highly effective in limiting the development of basal rot when iris bulbs were planted into infested soil.

Goal 3. Develop and promote best management practices to reduce the spread of viruses commonly found on lilies and dahlias.

The researchers' target outcome for this part of the project was to have a minimum of 1,000 visits to best management recommendations on the website. The total number of visits to the dahlia.wsu.edu website in 2013 through the end of October was 7,591, which was up from 5910 visits in all of 2012.

BENEFICIARIES

Beneficiaries of this project include tulip, iris, lily and dahlia bulb and cut flower growers, registrants of the fungicides that were tested, and plant clinic and pest control advisors who make recommendations relating to the management of soilborne and virus diseases on bulb and cut flower crops. In addition, the information on grower virus management practices have clearly provided extension educators with specific areas where additional grower training to improve small farm grower BMP's to reduce the impact of viruses on the productivity of lilies and dahlias is needed.

- DNA sequencing of the ITS region was used to determine the phylogenetic relationships of *R. tuliparum* with other *Rhizoctona* species and groups (See activity 1).
- Pathogenicity tests were used to identified 5 isolates *F. oxysporum* f.sp. *gladiolii* from iris, 2 isolates of *F. oxysporum* f.sp. *tulipae* from tulips, and 3 isolates of *F. oxysporum* f.sp. *narcissi* from daffodils. (See activity 2).
- A *Rhizoctonia tuliparum* qPCR assay (Rtul) was developed that is taxon specific with a detection threshold around one femtogram of pathogen DNA (See activity 3).
- There was a high correlation between the amount of *R. tuliparum* DNA detected by the Rtul assay and the level of sclerotial inoculum (artificially produced) in the soil (See activity 4).
- Field studies showed there was a highly significant correlation between sclerotial inoculum levels in soil and the development of Rhizoctonia gray bulb rot on tulips and iris. This disease has the potential to reduce the number of healthy plants by 50 to 60% (See activity 5).
- Results from virus surveys of lily and dahlia at 27 farms over 2 years showed that the prevalence of viruses in lilies is moderate and the prevalence of viruses in dahlias is high. Nearly half of the lilies sampled were positive for one or more viruses. Most (73% in 2011 and 92% in 2012) of the dahlia plants sampled were positive for one or more viruses (See activity 6).
- A survey of grower BMP's, showed that most growers do not practice commonly recommended management practices to reduce the spread of viruses (See activity 6).
- Disease control trials identified two potential alternatives to PCNB for the control of Rhizoctonia gray bulb rot and four fungicides potential alternatives to benzimidazole fungicides to control Fusarium basal rot (See activity 7).
- During this project, three grower bulb conferences and three grower field days were organized (See activity 9)
- Updates on this project and disease management information were provided to growers and the scientific community via 13 publications and 17 presentations (See section 17).

LESSONS LEARNED

Growers were very appreciative of the on-farm visits, which was a big positive. The lack of information on the impact of specific viruses on the production and quality of cut dahlia flowers made it difficult to convince growers how beneficial it is for them to implement Best Management Practices.
The researchers realized the goal of designing a diagnostic test specific to *Fusarium oxysporum* f. sp. *tulipae* was lofty; however the extent of the similarity of that organism to other closely-related organisms was an unexpected road-block. The apparent inability of the Rtul qPCR assay to detect natural inoculum also limited the implementation of this diagnostic service to growers. Regarding the results of the virus survey on lily and dahlia, the researchers expected to find more plants infected with Cucumber Mosaic Virus (it was only detected in 9/259 lily samples and no dahlia samples) considering its very wide host range. The failure of growers to use common BMP to limit the spread of viruses was troubling and points out the need for information on the specific impact viruses are having on the production and quality of cut flowers.

Continuing efforts to develop a diagnostic test to detect *Fusarium oxysporum* f. sp. *tulipae* can begin where this research ended, eliminating at least seven genomic regions that are usually the "go-to" regions for specificity of fungal pathogens. Another lesson learned was the enormous role sampling technique plays in the successful application of a diagnostic test. Nearly as much time could be spent on optimizing sampling strategies, especially for a "hot-spot"-type pathogen such as *Rhizoctonia*, as on developing the test itself. Additionally, the lack of consistency between detection of artificial *Rhizoctonia* inoculum and field grown inoculum indicates that there is a DNA recovery or DNA detection difference between the two. Most likely that difference lies in the extraction of DNA from the schlerotia, or hard resting stage, of *Rhizoctonia*. Although much time was spent optimizing the DNA

extraction technique, future FNRI funded work will include optimization of that technique to equally detect *R. tuliparum* DNA from mycelium and schlerotia.

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ADDITIONAL INFORMATION

Cash Matching Donations

- $10,000 annually from the Northwest Agricultural Research Foundation (NARF), which has been used to provide partial support for Annie DeBauw to help cover some of the cost associated with the field plots.

In-kind Matching Donations

- Chemical donations from BASF Corp., Gowen Chemical Company, OHP Inc., and Syngenta Professional Products.
- Tulip, iris and daffodil bulbs were provided annually by Washington Bulb Company for use in disease control and inoculation studies
- Northwest Bulb Grower Association and Wilbur-Ellis Chemical Company provided assistance in organizing annual Bulb Grower Conferences

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- Dungan, F. M., S. L. Lupien, C. M. Vahling-Armstrong, G. A. Chastagner, B. K. Schroeder. 2013. Host range of *Penicillium* spp. (blue mold) rotting bulb crops. Phytopathology 103 (Suppl. 2): S3.
- Chastagner, G. A., K. P. Coats, A. DeBauw, H. R. Pappu. 2013. Identification of viruses in small-farm lily and dahlia cut flower crops in western Washington. Phytopathology 103 (Suppl. 3):S3.12.

WORKSHOPS/FIELD DAYS/TOURS ORGANIZED OR CO-ORGANIZED

2013

- Bulb and Cut Flower Section of the 2013 Wilbur-Ellis University, January 22, 2013. Auburn, WA.
- WSU Bulb Growers Field Day, May 15, 2013, WSU Puyallup. Puyallup, WA

2012

- Bulb and Cut Flower Section of the 2012 Wilbur-Ellis University. Auburn, WA. January 24, 2012.
- WSU Bulb Growers Field Day. Mount Vernon, WA. May 16, 2012.
- Field Plant Pathology (PLP 525) class tour. Puyallup, WA. June 13-14, 2012.
- Joint tour with WSDA Inspectors of Research Gardens at Point Defiance Park. Tacoma, WA. August 14, 2012.

2011

- Bulb and Cut Flower Section of the 2011 Wilbur-Ellis University. Auburn, WA. January 26, 2011.
- WSU Bulb Growers Field Day. Puyallup, WA. May 11, 2011.

PRESENTATIONS

2013

- Management of diseases on ornamental bulb and cut flower crops. Wilbur-Ellis University, Auburn, WA. January 22, 2013.
- Update of virus surveys on lilies and dahlias at cut flower farms in western Washington. Wilbur-Ellis University, Auburn, WA. January 22, 2013.
- New tools to help manage diseases on ornamental bulb crops. Bulb Grower Field Day. Puyallup, WA. May 15, 2013
- Identification of viruses in small-farm lily and dahlia cut flower crops in western Washington. Joint APS Pacific and Caribbean Division Meeting. Tucson, AZ. June 17-19, 2013.
- Disease diagnosis and management. Alaska Peony Grower Field Tour. Fairbanks, AK. July 15, 2013.
- Disease diagnosis and management. Alaska Peony Grower Field Tour. Soldotna, AK. July 20, 2013.
- Disease diagnosis and management. Alaska Peony Grower Field Tour. Homer, AK. July 22, 2013.
- Relationship of inoculum levels to the development of gray bulb rot on tulips and iris. 5th International Symposium on *Rhizoctonia*. Zhengzhou, Henan, China, August 22-24, 2013.

- Relationship of inoculum levels to the development of gray bulb rot on tulips and iris. 10th International Congress of Plant Pathology (ICPP 2013). Beijing, China. August 25-30, 2013.

2012

- Approaches being used to manage pests and diseases on bulb crops in England. Bulb and Cut Flower Section, Wilbur-Ellis University, Auburn, WA. January 24, 2012.
- Disease management update and molecular detection of *Rhizoctonia* on bulbs. Bulb and Cut Flower Section, Wilbur-Ellis University, Auburn, WA. January 24, 2012,
- Identification of viruses on small-farm lily and dahlia cut flower crops in Western Washington. ISHS XI International Symposium on Flower Bulbs and Herbaceous Perennials. Antalya, Turkey. March 24 – April 5, 2012
- Identification of diseases of ornamental bulb crops. WSU Bulb Growers Field Day, Mount Vernon, WA. May 16, 2012.
- Report of findings of virus survey of lily and dahlia crops in Washington. WSDA Inspectors Meeting, Kent, WA. August 8, 2012.
- Ornamental disease management research in Washington. NCERA 224 Meeting. San Juan, Puerto Rico. October 29-30, 2012.

2011

- PCNB: Current status and potential alternatives. Bulb and Cut Flower Section, Wilbur-Ellis University. Auburn, WA. January 26, 2011.
- New WSDA/USDA supported disease management project. Bulb and Cut Flower Section, Wilbur-Ellis University. Auburn, WA. January 26, 2011.

PROJECT #5

Project Title: *Global Retail Training in Care, Handling and Merchandising of WA Specialty Crops*

Partner Organization: Washington Apple Commission (WAC)

PROJECT SUMMARY

By the time Washington Apples, Northwest Pears, Northwest Cherries and Washington State Potatoes (Cooperators) reach the retail shelves in foreign markets, they are high value items that, if mishandled, can cause significant losses to the store's produce department. This makes retailers hesitant to handle the product and in turn can mean limited opportunities through these important market sales channels. Modern retailers (hypermarkets and supermarkets) in developing markets have limited exposure to the design layout and merchandising ideas of US fresh produce in their stores. Most of the fresh produce sections in these outlets are not designed to maximize sales. In addition, produce handling and training need to be intensified at the store level since most retail produce staff lack proper handling and merchandising skills. Modern retailers are increasing their share of fresh produce sales at the expense of traditional wet markets. Improved produce handling and display will accelerate this process. High quality Washington apples, Northwest Pears, Northwest Cherries and Washington Potatoes will be major beneficiaries of market share growth by the modern retail sector with our longer shelf life, better appearance, and timely delivery versus cheaper source origin produce that lacks the high quality image and characteristics of US produce.

WAC requested Specialty Crop funds to be used to provide training to key retailers in 7 emerging markets (Brazil, Russia, the Middle East, Malaysia, Indonesia, China and Thailand) in produce department layout design and produce handling, including follow-up display contests and evaluations. The Washington Apple Commission contracted with John Baker of Produce Marketing Australia, a representative of the US Produce Marketing Association, who is an accredited trainer with extensive background in care, handling and merchandising of produce items. Training was preceded by a store visit so that consultant could understand the strengths/weaknesses of the chain's current approach. To strengthen the training, Cooperator in-country representatives worked with the PMA consultant and the retail chains to conduct produce department display contests where possible to allow the participating retailers to incorporate the training into practical applications.

Recognizing that one of the main keys to maintaining the quality of Washington apples is correct care and handling practices, the WAC has attempted to educate both importers and retailers throughout the marketing regions, particularly in less-developed countries. They have found that as the retail infrastructure develops, so do the opportunities for Washington apples and other high value specialty crop items like Northwest Pears and cherries. The follow-up retail display contests were implemented with at least one retail chain per market (except in Russia where this type of promotion is not generally allowed by retailers). Unfortunately there was not interest in conducting a display contest in Brazil and Thailand. This provided incentives to utilize the training provided in a practical way to maximize the benefits to Washington apples, pears, cherries and potatoes.

During the 2009-10 season, Specialty Crop Block Grant funds were used to conduct care and handling training in China, India, UAE, Mexico, Russia and Thailand. These markets could offer huge growth potential for Washington Apples and other US fruits and vegetables. The projects involved training seminars with key retailers in:

- China-two workshops in Shenzhen, Shanghai, Beijing in November and December 2009 with 231 participants attending
- Russia-three workshops in Moscow and two workshops in St Petersburg in January 2010 with 139 participants attending

- Mexico-three workshops for the retailer Soriana held in February 2010 with 128 participants attending
- Thailand-five workshops in Bangkok in March 2010 with 255 participants attending
- India-five workshops in Kolkata, Bangalore, Pune, Ahmedabad, and Amritsar in March 2010 with148 participants attending
- Middle East-five workshops in Dubai, Sharjah and Abu Dhabi in April 2010 with 105 participants attending
- India –eight workshops in Sri Lanka and India in January and February 2011 with 352 participants attending

Due to the success of the workshops, WAC was able to expand to different retailers and cities in China, Russia, the Middle East and Thailand. This allowed them to continue support and relationships with the retailers they partnered with in 09-10 in different cities, and also creating new partnerships with retailers whom they didn't get the opportunity to work with.

PROJECT APPROACH

The Washington Apple Commission (WAC) commissioned John Baker of Produce Marketing Australia to deliver a series of retail training programs in Brazil, China, Russia, Malaysia, Indonesia, Thailand, and the Middle East. The program outline included:

1. Conduct store visits (at least one per retailer) and visit retail outlets for each of the participating retailers to assess:
    a. Current performance with the participating products, especially apples
    b. General store layout and performance in fresh produce (front and back) - receival, storage, handling, cold chain, food safety, product range, display, promotions etc
    c. Meet with store staff to determine
        i. Profile of customer base – how often and when (time of day) do they shop for regular items (top up), discretionary products (and what are they) and impulse items. This has implications for where imported products fit, "Fresh @ 5" merchandising if shopping is later in the day etc
        ii. Existing levels of knowledge and information in the areas to be covered
2. Conduct workshops (half day) customized for each participating retailer (or collectively for smaller retail groups) that will include:
    a. Product and merchandising information that may include the following products: Washington apples (the main emphasis), USA pears, Northwest cherries, table grapes, berries, summer fruit, Washington potatoes, carrots and onions
    b. Information on cold chain and food safety requirements; trends in fresh produce; developments in organics
    c. Retail concepts and ideas from other markets (USA, Australia, New Zealand, etc.) that may be applied in Mexico.
3. Follow up with store visits (half-day) to participating retailers to provide further guidance on practical applications of information from workshops, clarify any issues raised in implementation of the training and provide feedback.
4. Prepare all resource materials and make available to participants: product specific and generic information; store concepts and any other relevant training materials in English, with translations, printing and distribution to be handled by WAC.
5. Provide a written report at the end of the project with an evaluation of pre and post- project merchandising and handling activities of the participating retailers, with recommendations for follow-up activities for both WAC and/or any participating Agricultural Trade Office staff. Contractor may use participant evaluations to assist in this evaluation, including:
    a. "open book" assessment by attendees at conclusion of each workshop, to reinforce key messages and assess level of knowledge achieved

b. Participant survey of value and effectiveness of workshops and materials.

6. In markets where appropriate, the WAC representative will orchestrate a display contest competition which will enable the participants to use the skills they learned in the seminars to build effective displays.

Project partners for the workshops included Washington Apples, USA Pears, Northwest Cherries and Washington Potatoes. Each partner provided information and input into the workshops training materials and were active participants in applicable markets.

GOALS AND OUTCOMES ACHIEVED

The workshops included:

- Brazil-October 2010-Four workshops were conducted, with 131 participants attending from 13 different retail companies.
- China-November 2010 Four workshops were conducted, with 186 participants attending from four different retail companies.
- Russia-November and December 2010 Four regular workshops were conducted, with 189 participants attending from four different retail companies in Moscow and Krasnodar. In addition workshops were also undertaken in Moscow and St Petersburg on category management and managing waste for small groups of senior executives. Five people attended.
- Malaysia-Six workshops were conducted, with 195 participants attending from 15 different retail chains.
- Indonesia-Three mega-workshops were conducted, with 421 participants attending from three retail chains.
- Middle East-Four workshops were conducted, with 167 participants attending from 9 different retail companies.
- Thailand - Five workshops were conducted, all in Bangkok, with a record 255 participants

As mentioned above, the workshops were personalized for the participating retailers to be able to provide instruction on how to improve their produce department's layout and the handling of the produce.

Display Contests:

- Indonesia – The contest was conducted in December 2011 to be able to include pears and apples.
- Malaysia – The contests were held in March and April of 2011. A total of 150 stores participated.
- Middle East – The contest was held in June and July 2011.
- China – The contest was held December 2010 through Jan 2011.
- Russia – The contest was held January through April 2011

The immediate goal of the produce handling training was to increase the sales of Washington State Apples (and other fruits) to the participating retailers by 10% during the 3 month timeframe following the training by increasing their profitability and/or "value-added" benefits provided. WAC met this goal by showing an average of 189% in category sales increase. The greatest success came from a Moscow based retailer, Perekrestok, whom increased sales by 2667% while on promotion. Overall, China showed the largest increase in sales with an average increase of 168%.

However, incremental success can also be measured by the number of tactics adopted by the training participants, including:

1. Reduction of shrinkage/wastage of participating products by 2% among participating chains through proper storage, handling and rotation practices was met and exceeded expectations in all markets. All markets saw at least a doubling in their decrease of shrink, with most markets

showing a decrease of over 20% in shrink. The Middle East showed the largest reduction overall with an average of 26.9% reduction in shrink.

2. Increase in display shelf space for NW products by 5-10% (varies by time of year) through the use of good merchandising practices on average rose 34%; 24% above the performance measure goal. Indonesia showed the largest gain in shelf space at a 65% increase.

Results of the Retail Training for the 3-month period after the Training

Performance Measure	**Goal**	**Results**							
		Brazil	**China**	**Russia**	**Malaysia**	**Indonesia**	**Middle East**	**Thailand**	**Average**
Total square feet of display space in participating retailer-increase	10%	NA	15.8%	8.6%	40.0%	65.0%	39.3%	NA	34%
Total produce dept. shrink/wastage decrease	2%	NA	5.5%	5.0%	20.0%	20.0%	26.9%	NA	15%
Total Washington category sales increase	**10%**	**NA**	**168.8%**	**644.0%**	**82.0%**	**30.0%**	**18.9%**	**NA**	**189%**

Retail Display Contests did not occur in Brazil and Thailand due to retailers not wanting to perform the display contests.

Although all of the measurable outcomes were able to be quantified in the 3 months following the training, WAC expects the training impacts to carry through to future seasons. In the case of Russia, due to the long transit time (up to 2 months) and timing of the seminars, several of the participating retailers decided to purchase Washington apples as a regular stocked item in the following seasons, rather than only filling in if other origin supplies were not available.

WAC is pleased that they have been able to surpass the targeted goals for the project. In addition to the stated measurable goals, they have also been able to improve relationships with the participating retailers, which is difficult to quantify but critical in terms of the ability to implement promotional programs and increase sales. The China Representative reported, “We have made 205 store visits to the participated retail chains after the training was conducted. CRC Vanguard and Ito Yokado have followed up with 2 promotional activities namely the Apple Wrapping promotion and sampling promotion right after the retail training. RT-Mart followed up the retail training with the Apple Wrapping promotion. Pagoda followed up the retail training with the display contest that was conducted in 150 stores in Guangdong Province. We observed improvement in the way the fruits and vegetables were stored, handled and displayed; improvement in the cleanliness and tidiness in the back rooms in all the participated retail chain stores. We have also received further questions about the fruit and vegetables handing from the attendees after the training, which John Baker had helped to answer.” The Middle East Representative stated “Three months after the training, WAC Middle East rep conducted repeat audits which revealed a notable progress. Very good results were gathered from most of the

eleven retail chains that participated in the activity. Tangible positive changes are obvious in the improvement which occurred not only on the apple displays but also on other fruits or vegetables presented during the training."

In order to gauge the effectiveness of the training and determine progress towards our goals, in-country representatives obtained before and three month post-training data for shrink/wastage and display space among the participating retailers. Sales of the participating products were also measured to determine the increase in sales after the training.

In general WAC was successful in reaching its targets. The immediate goal of the produce handling training was to **increase the sales of Washington State Apples (and other fruits) to the participating retailers by 10%** during the 3 month timeframe following the training by increasing their profitability and/or "value-added" benefits provided. There was an average increase of 189% over the five markets. The greatest success came from a Moscow based retailer, Perekrestok, whom increased sales by 2667% while on promotion. Overall, China showed the largest increase in sales with an average increase of 168%, and Russian retailer, Land, showed the lowest sales increase at 0%

Reduction of shrinkage/wastage of participating commodities was more difficult to determine, as some stores were not willing to share direct numbers, however based on the data received they were able to beat their original goal of 2% to 15%. In general the Middle East showed the best increases with one participating store registering a 27% reduction of shrinkage/wastage after the training.

In terms of the increase in display shelf space for participating commodities, based on the data gathered, they were able to achieve an average of 34% increase in display space following the training.

BENEFICIARIES

Washington Apples	Yogya Group – Indonesia	Choithram Supermarkets – UAE
USA Pears	Jaya Grocer – Malaysia	Aswaaq – UAE
Northwest Cherries	Mydin – Malaysia	Azbuka Vkusa – Russia
Washington Potatoes	Giant – Malaysia	Union Coop – Russia
Pau de Acucar Group – Brazil	MBG – Malaysia	Lenta – Russia
Benassi – Brazil	Au Dhabi Coop – UAE	O'Key – Russia
CRC Vanguard, Eastern China	Abela – UAE	Big C- Thailand
Ito Yokado, Beijing China	Lulu – UAE	Carrefour – Thailand
RT-Mart, Northeastern China	Farmers services center - UAE	Siam Makro – Thailand
Pagoda, Guangdong Province China	Unifruitti Group – UAE	Tesco Lotus – Thailand
Alfa Midi – Indonesia	Sharjah Cooperative – UAE	Tops - Thailand

Based on the average export values and total volume of Washington Apples, Northwest Pears, Northwest Cherries and Washington Potatoes, they estimate that the impact of the training to be in excess of $111,033,151.46 FOB value on the respective industry shipments to the participating retailers. This assumes that the participating retailers continued to use the good handling practices learned in the training for the duration of the season.

LESSONS LEARNED

This was the third round of training conducted using Specialty Crop Block Grant funds and WAS was able to incorporate previous lessons learned to improve the training. Modifications to the presentation highlighted the superior quality and growing conditions of Washington Apples, Northwest Pears, Northwest Cherries and Washington Potatoes in order to maximize the training opportunities to educate the retailers regarding our products.

Timing continues to be critical, as the trainings ideally should be conducted while products are available in the market. In Russia, due to the transit time of almost two months and hesitancy of the importers to bring in Washington Apples due to price, there were some issues with having product available with some retailers for the promotion. In Thailand it was possible to have product available for the training, but since it was at the end of the season for most Northwest commodities, WAC was unable to follow up with a display contest.
There continues to be a high demand for this type of training, particularly in markets with quickly growing retail sectors such as China and India. Brazil and Russia are more challenging – the modern retail sector is more developed, and it was difficult to get management to agree to the display contest.

Unexpected Outcomes or Results
In Thailand prior to the care and handling seminars held in 2009-10, Washington Potatoes moved 25 metric tons into the market. During and after the seminars, Washington potatoes increased their volume to 8,660 tons with an estimated gain in sales of over $4,072,000 returned to the grower.

CONTACT PERSON
Rebecca Lyons, Export Marketing Manager
Washington Apple Commission
Phone: (509) 663-9600 Ext. 241
Email: Rebecca@waapple.org

ADDITIONAL INFORMATION
Cash Match totaled $33,119.46. In-Kind Match totaled $11,363.40.

PROJECT #6

Project Title: *Tree Fruit & Grape Acreage Survey*

Partner Organization: Washington Growers Clearing House Association (WGCHA)

PROJECT SUMMARY

This project generated user-friendly, timely, basic industry information to assist the tree fruit and grape industries in their decision-making with respect to production, renewal, expansion, consolidation, year-to-year variability, and entry/exit. Specifically, the project yielded acreage inventories by crop, variety, age, productivity and production system. The industries overall garnered the on-going benefits attainable from accurate crop estimates as they strive to maximize production and labor efficiencies while meeting the demands of finite and costly processing, handling, and shipping infrastructures and work.

All members of the industry have benefited (and will continue to benefit) from more accurate and timely industry data:

- Presenting a view of the overall industry health
- Analyzing the long-term viability and sustainability within the industries and supporting agribusinesses
- Preparing accurate crop estimates and annual crop volume
- Increasing the ability to tell the "grower story" with good data.

Significant advantages are also achieved via

- Improving accessibility to acreage data by species and varieties,
- Assessing potential risks associated with variety concentrations in a given area,
- Measuring geographic dispersion of crop damage after weather events,
- Adjusting handling capacity as well as facilitating transportation, sales, and marketing functions, and
- Evaluating the rate of entry/exit into the respective industries.

Based on input from key industry members, the survey results also provided an indication of business succession plans, variety preferences (e.g. varieties, business structures such as clubs or public), and business philosophies (e.g. investment of earnings, sources of operating credit, sources of real estate financing, impacts of industry consolidation). Specialty crop production agriculture industries and growers are better informed and better prepared with current and coordinated data.

The primary beneficiaries of this project are also the primary participants: growers of tree fruit and grapes. This is only the sixth time that a survey of this type has been conducted in Washington. Prior surveys were conducted in 1948-49, 1986, 1993, 2001, and 2006. Obviously, by replicating the effort every five years, it helps to build a historical basis for looking at acreage inventory trends and associated data.

The list sample for the previous survey conducted in 2006 included over 4,400 operations. Since that time, additional consolidation occurred within the industries but it was not known to what extent and how rapidly. Simultaneously, productivity appears to have increased but it was not known to what extent and how rapidly. This latter phenomena was graphically illustrated with the 2009 cherry crop; the combination of unknown volumes, insufficient industry capacity, and weather that forced a concentrated harvest period melded to create a "perfect storm" situation whereby at least 30% of the crop was either

left on the tree or disposed of at the warehouse. This type of situation cannot be economically sustainable**.**

As with the modifications implemented from the 2001 survey instrument to the 2006 survey instrument, the 2011 survey instrument was modified to include new topics of interest/necessity for which the industries needed a comprehensive industry input. The 2011 instrument expanded on the data requests by asking a) number of certified organic acres; b) number of acres in transition to organic; c) total acres certified in a Food Safety GAP program; d) data for the two newest AVA's (i.e. Snipes Mountain AVA and Lake Chelan AVA); e) intentions for 2011 and the next five years with respect to topwork, remove or plant; and f) grape production not harvested (i.e. due to bird/animal loss, disease loss, weather loss, or economic reasons).

This project does not build on previously SCBGP funded projects. However, the 2006 survey project was funded by USDA Risk Management Research grant funds. In addition, the Washington State Horticultural Association received SCBGP funding to simultaneously conduct an economic impact study. Together, these two projects (i.e. acreage survey and economic impact study) provide powerful information tools for producers to not only make decisions specific to their businesses but also to communicate critical issues to legislators, regulators, consumers, other participants in the supply chain, and financial institutions. These pieces represent integral ingredients in growers being able to accurately, efficiently, and effectively tell their story.

PROJECT APROACH

The following activities were completed:

PROJECT ACTIVITY	RESPONSIBLE PARTY	TIMELINE FOR COMPLETION
Build producer lists. Review lists from commissions, associations, county assessors, marketing orders, and others to maximize coverage.	Industry Organizations NASS	October 2010 COMPLETED
Design mail survey instrument to obtain conventional and organic data for all tree fruit and grape crops.	NASS	October 2010 COMPLETED
Review mail survey instrument to ensure that all necessary questions are being asked so as to generate the desired, useful data.	Industry Organizations	October 2010 COMPLETED
Design area frame. Select both area and list samples. 1. All grape growers with 1 acre or more 2. All tree fruit growers with 5 acres or more.	NASS	October 2010 COMPLETED
Print questionnaires and other survey materials. Develop electronic formats for questionnaire and other survey materials.	NASS in collaboration with WGCH & WAWGG	October 2010 COMPLETED
Publicized the upcoming survey in newsletters and numerous industry publications. Conduct survey publicity. Encourage producers to respond. Industry organizations and publications worked together to encourage growers to respond to the survey. These included but were not limited to the following: 1. Washington Growers Clearing House weekly yellow sheet. 2. Washington Growers Clearing House industry info	Industry Organizations with assistance from NASS	March 2011 COMPLETED

newsletter. 3. Washington Growers Clearing House Booth at Washington State Horticultural Convention. 4. NASS/WSDA Booth at Washington State Horticultural Convention. 5. Good Fruit Grower magazine – article published. 6. Annual Horticultural Convention – posters about the survey were displayed at the majority of sister organizations. 7. Washington State Horticultural Association weekly Horticulture Headlines. 8. Washington State Horticultural Association quarterly newsletter. 9. Washington Association of Wine Grape Growers – newsletter and emails (twice each). 10. Washington Wine Industry Foundation – newsletter and emails (twice each).		
Send pre-survey letters to orchard operators. Explain the intent and need to report. Pre-survey letter was sent to orchard (WGCH members) and vineyard operators (members and non-members of WAWGG).	Industry Organizations	December 2010 COMPLETED
Train survey interviewers. Approximately 10 phone operators and 30 field representatives were trained to administer the survey and respond to grower questions.	NASS	November 2010 COMPLETED
Conduct data collection via mail, phone, face-to-face, and electronic formats. Conduct follow-up mailings. Contact medium and smaller operations by telephone. Conduct face-to-face interviews with large operations (i.e. those believed to have >500 acres of fruit or those with significant amounts of less prevalent fruit). Booth at Washington State Horticultural Convention.	NASS	March 2011 COMPLETED
Edit and analyze data. Summarize data. Generate written report of data and findings.	NASS	June 2011 COMPLETED
Publish final report in hard copy and electronic formats.	NASS, WGCH, WAWGG	August 2011 COMPLETED
Post final report on websites of industry organizations. Utilize press releases and articles/columns to share results with industry members. • NASS press release • WGCH and WAWGG press releases • Radio interviews with four stations • Links on WGCH website and other coalition member sites; Link on WAWGG website • Good Fruit Grower publication	Industry Orgs	August 2011 COMPLETED

The full reports are available electronically at the following electronic locations:

Tree fruit acreage survey:
http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Fruit/FruitTreeInventory2011.pdf
Vineyard acreage survey:
http://www.nass.usda.gov/Statistics_by_State/Washington/Publications/Fruit/VineyardAcreage2011.pdf

Each industry specific report contains the following:

- Map
- Notes about the Data
- Acres by variety, historical, by county, by area
- Specific data per species
- Organic and Transition
- Future Intentions
- Data Collection Materials
  - Northwest Tree Fruit Coalition
  - Washington Association of Wine Grape Growers
  - Survey Instrument / Respondent Booklet
- Selected Charts and Graphs

Within the tree fruit and grape industries, two organizations provided leadership in guiding and implementing this project as well as working with NASS:

- The Washington Growers Clearing House Association (WGCH) - The Clearing House is a voluntary tree fruit grower association representing over 2,200 fruit growers. Governed by a board of tree fruit growers elected from 24 growing districts in North Central Washington, the Yakima Valley, and the Columbia Basin, it publishes a weekly bulletin tabulating prices obtained by a participating regional marketing organization as well as warehouse and marketing firms for apples, pears and cherries. Established in 1941, WGCH discusses fruit marketing, prices and supplies. The WGCH also represents growers' interests in legislative and regulatory issues at the state and federal levels.
- Washington Association of Wine Grape Growers (WAWGG) - Established in 1986, this membership organization of over 500 is a trade association of vinifera grape growers and includes a majority of Washington grape growers as its members. Membership includes wineries, researchers, associates, friends, vendors and suppliers. The organization's annual meeting is the single largest gathering of the industry in the Northwest. WAWGG has developed an extensive network of wine grape growers, processors and agri-business professionals in the state.

USDA's National Agricultural Statistics Service (NASS) conducted all survey activities, analysis, and reporting. NASS conducts hundreds of surveys every year and prepares reports covering virtually every aspect of U.S. agriculture. NASS is committed to providing timely, accurate, and useful statistics in service to U.S. agriculture.

This project was supported by the following major tree fruit and grape organizations:

- Northwest Fruit Exporters
- Northwest Horticultural Council
- Pear Bureau Northwest
- The Marketing Associations
- Washington Growers Clearing House
- Washington State Fruit Commission
- Washington State Horticultural Association

- Washington State Tree Fruit Research Commission
- Wenatchee Valley Traffic Association
- Yakima Valley Growers – Shippers Association
- Washington Association of Wine Grape Growers
- Washington Wine Industry Foundation
- Washington State Grape Society

Given that the data needs are so great and so desired within these industries, as well as affiliated agribusinesses and service providers, collaboration among these organizations was strong:

- Extensive assistance in list building of producers was supplied.
- Critical input for both questionnaire design and technical issue consultation with NASS was provided.
- Announcements of the upcoming survey in many newsletters and industry publications were publicized.
- Pre-survey letters explaining the intent and need to report were sent to orchard and vineyard operators.
- Dissemination of results to growers and affiliated industry agribusinesses.

In addition, cash match was provided by the following entities:

- Tree Top Inc.
- Northwest Farm Credit Services
- Pear Bureau Northwest
- Washington Association of Wine Grape Growers

GOALS AND OUTCOMES ACHIEVED

This project was designed to and did achieve three objectives:

1. Completed acreage and production survey for tree fruits and grapes (apples, bartlett pears, winter pears, sweet cherries, tart cherries, apricots, peaches, nectarines, plums/prunes, juice grapes, and wine grapes) that encompasses acreage planted, age, bearing and non-bearing acreage, intent to plant and/or block renewal, intent to remove and/or block conversion to another commodity, conventional production acreage, and organic production acreage.
2. Comparison of historical and current statistics by crop, geographic orientation (e.g. county, district, appellation), production system (e.g. conventional, organic), planting density (e.g. low, medium, and high), and amount harvested/not harvested.
3. Maintain sequence of regular data collection in order to be able to document trends as well as current situation. Previous surveys were conducted in 2006, 2001, 1993, 1986, and 1948-49.

The Expected Measurable Outcome for this project was achieved. The overall goal was to provide the ability to estimate crop volume through a completed acreage and production survey for tree fruits and grapes (apples, bartlett pears, winter pears, sweet cherries, tart cherries, apricots, peaches, nectarines, plums/prunes, juice grapes, and wine grapes) that encompasses acreage planted, age, bearing and non-bearing acreage, intent to plant and/or block renewal, intent to remove and/or block conversion to another commodity, conventional production acreage, and organic production acreage. The target was a full analysis of acreage and density, including a comparison of historical and current statistics by crop, geographic orientation, and production system.

The 2011 survey screened out respondents with fewer than five acres of tree fruit and total grape acreage less than one acre. Screening out of the smaller operations was an effort to focus time and resources on

records that would have more of a significant impact on the estimates. The final list sample included over 5,200 operations.

The methodology in 2011 was virtually the same as the 2006 survey, which used more advanced procedures and methodology than previous studies. The main differences were the use of an area study to measure incompleteness of the sampling list and more sophisticated adjustments for non-response and coverage. Even with the screening process eliminating the report for orchards with less than five acres, the proportion of reported data as a percentage of the total fruit acres was significantly higher than 2006, leading to higher quality results.

The modes of data collection included mail, telephone, personal interview, and online Electronic Data Reporting. Operations were given an opportunity to respond by mail beginning in December 2010. A copy of the questionnaire and respondent booklet are included in the appendix of this report and in the final survey reports for both tree fruit and grapes. The beginning date of data collection was December 1, 2010. The median date of data collection was February 15. Follow-up mailings were conducted and all medium and most smaller operations were contacted by telephone. Large operations, defined as those thought to have greater than 500 acres of fruit or those with significant amounts of less prevalent fruit, were followed up with face-to-face interviews. When possible, efforts were made to use grower electronic records.

Over 23,000 individual blocks of fruit information from approximately 2,200 growers who reported one or more blocks of tree fruit or grapes were tabulated. Most of the non-respondents were smaller-sized operations as less effort was made to follow-up with growers expected to report very small fruit acreages.

BENEFICIARIES

All members of the tree fruit and grape industries are benefiting from more accurate and timely industry data.

- Analysis of the age of orchards and vineyards (including bearing and non-bearing acreage) has a significant impact on the quality of crop analysis and the projection of crop estimates.
- Acreage and planting density data allow industry members to estimate crop volume.
- More specifically, varieties by acreage data allow for better assumptions to be made relative to yield potential and, thus, generate more accurate crop estimates.
- Assessing potential risks associated with variety concentrations in a given area, and measuring geographical dispersion of crop damage after weather events provide for improved risk management.
- Benchmarking of number of reported acres certified in a Food Safety Good Agricultural Practices program (67,376 acres) supports allocation of industry resources to facilitate grower readiness for independent, third-party certifications and continued access to markets requiring such.
- Better collaboration with other agricultural producers and organizations enhances overall sustainability of agriculture within Washington State and, therefore, encourages a greater degree of international competitiveness.
- Accurate acreage statistics provide an indication of the “health” of the industry and, thus, allow producers and affiliated agribusinesses to project both the long-term and short-term viability of the industry.
- Accurate data enables growers (i.e. those who are spending millions and paying significant amounts into the tax coffers) to make decisions that keep us viable and sustainable for the long term.

In addition, the tree fruit and grape industries are supported and lead by a number of not-for-profit organizations with primarily grower member boards of directors. The survey results provide an essential tool for setting the direction of these organizations. Strong grower participation in the survey helps these organizations to align their work with the realities of current industry varietal plantings and future growth projects. Changes in variety acreage plantings, ever more trees per acre, and the effects of accelerating industry consolidation are a few of the components that are driving the need for industry organizations to stay current with what is happening at the orchard level.

Finally, the survey results will assist in marketing. For those organizations that help drive marketing, it is vital that greater consumer demand be created through the proper allocation of grower resources. Identifying current varietal production is paramount to the long term success of Washington State growers on multiple levels:

- Confirming the ever-changing varietal plantings alerts commissions to the proper allocation of resources to promote and market tree fruits.
- Domestic and international marketing strategies must align if the industry is to grow future demand supported by the most opportune promotional activities.
- Export market access is critical to protecting domestic markets and improving grower profitability. As the varietal trends change, keeping and gaining access to current, new, and emerging markets is mandatory to the overall industry's long term success.
- Getting more healthy and nutritious Washington tree fruits into consumers' hands – at a profit to growers – is the true success. Confirming acreages and extrapolating future volumes provides the guidance necessary to stay ahead of the production curve with consumption-increasing messages.

LESSONS LEARNED

Several tree fruit industry leaders have offered their insights on the results of the survey and the project as a whole. These are highlighted as follows:

> *"The Washington Growers Clearing House Association aids in distributing the tree survey information to tree fruit growers, industry, support industries and government entities. The survey data enables growers to anticipate potential varietal production trends, evaluate potential grower returns based on future supply/demand when making decisions on what varieties to plant and in developing their business plans. Industry suppliers are able to utilize the data to determine what levels of industry support products are needed and/or what industry services to pursue. Industry organizations use the information to inform county, state and federal agencies on the strength, size and value of the tree fruit industry, which aids in determining economic benefits, in addition to needed services such as transportation, housing and/or labor needs, etc."*
> Kirk B. Mayer, Manager
> Washington Growers Clearing House Assn.

> *"Census data is of immense importance to marketers in having an indicator of what planting trends are taking place that will manifest themselves in the market place in the near or mid-term. Production follows plantings and while most marketers will know what trends are taking place within the organizations for which they market, this information gives them a clearer picture of the industry wide trends. This information will not be nearly as critical for varieties in decline because the production stops the year following tree removal; production increases will lag plantings/grafting by 3 – 10 years."*
> Bruce Grim, Marketing Manager
> The Marketing Associations

"The Washington Apple commission sees the Tree Survey as a useful tool from the standpoint of aligning our promotional activities with the varietal trends within the industry. Reacting to the varietal makeup of Washington's apple crop isn't a wise business plan, and with the Tree Survey, we are able to anticipate increased varietal volumes and match production with export varietal makeup potential.

As the domestic market stabilizes, and planting trends continue up, the export markets will be critical for the long term success of the industry. Looking through the window glass to total industry volumes for the next five years emphasizes our need to expand, maintain, and realign our activities to increase international consumer demand. Increased volumes are just one component determining the future success of WA apple growers."
Todd M. Fryhover, President
Washington Apple Commission

The tree fruit and grape industries are extremely grateful for the continued partnership of NASS and industry organizations along with the Specialty Block Grant Program to be able to successfully administer this survey and disseminate the results for the benefit of industry members. Without such support and commitment, these two specialty crop industries would not be able to engage in the important work of acreage surveys. The industries were also able to utilize the synergies garnered from collaboration and resource efficiencies (e.g. time, money, staffing).

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ADDITIONAL INFORMATION
See **Report 12-25-B-1102 Attachment A** for the following:

1. Washington Growers Clearing House press release announcing Specialty Crop Block Grant award.
2. Washington Association of Wine Grape Growers letter requesting grower participation in acreage survey effort.
3. Northwest Tree Fruit Coalition – request for grower participation in survey effort. This letter of support was sent with the survey to all growers.
4. Grape Posts (sample of three) highlighting survey and need for growers to participate.
5. Washington Grape Society announcement and request for grower participation in survey.
6. Washington Growers Clearing House – poster requesting grower participation in survey effort (mailed; displayed at all sister organization booths at Washington State Annual Horticultural Conference)
7. Washington Growers Clearing House – Industry Info 24 November 2010 – announcement of tree acreage survey; opportunity to complete survey at Horticulture Convention. This is a sample. The invitation ran in the Industry Info newsletter for two issues.
8. Washington Growers Clearing House Bulletin – 25 January 2011 – Tree Fruit Acreage Survey reminder to complete survey. This is a sample. The reminder ran for four weeks in the Bullet.
9. WAC letter supporting Specialty Crop Block Grant acreage survey results.

PROJECT #7

Project Title: *Apple IPM Transition Project*

Partner Organization: Washington State University (WSU)

PROJECT SUMMARY

This project is somewhat different from other projects funded by the Specialty Crop Block Grant Program in that it represents an ongoing effort over the last four years – 2008-2011. The first two years of this project were funded by the Washington State legislature through an allocation to the Washington Tree Fruit Research Commission, which in turn funded the Pest Management Transition Project (PMTP). In the last two years the Apple IPM Transition Project (AIPMTP) was supported by the SCBGP through funding of two one-year projects. It would be an injustice to the history of this effort to report on the impact of one year of what in reality has been a four-year project. However, WSU has endeavored to make clear the accomplishments for the current project as they relate to the plan of work that the SCBGP funded, while at the same time linking the current year's accomplishments to accomplishments and impacts over the last four years.

The genesis of the PMTP (current AIPMTP) was national regulatory action limiting the use of and phasing out certain pesticides that were deemed of high risk to human health, particularly farm workers, and the environment. A primary issue was the EPA's decision to phase-out the use of azinphosmethy (AZM) in tree fruit production. AZM has been the most used insecticide in apple production over the last four decades as a control for the key pest of apple, the codling moth, aka "the worm in the apple". Replacements for AZM and other insecticides in the same class, the organophosphates (OPs), had been or were in the process of being registered by the EPA. WSU had been conducting research on these OP-alternatives for several years. The PMTP funding provided the resources to launch an education effort targeting the apple industry on how to implement best practices using OP-alternatives. In addition, the PMTP funding provided the opportunity to connect with farm workers and environmental groups to help them understand the benefits derived from tree fruit growers transitioning to OP-alternative insecticides. A report of the PMTP can be found on the AIPMTP web site at http://pmtp.wsu.edu/downloads/PMTP_Final_Report.pdf.

It was clear that the PMTP project made great strides in helping the WA tree fruit industry implement best practices using OP-alternatives between 2008-2009, and these efforts provided much needed baseline data about practices and perceptions that would provide evidence that the original goals were met. However, efforts of the PMTP did not fulfill all of its original goals and the SCBGP provided an opportunity to request additional funding. Through the support of the WA tree fruit industry, the SCBGP provided an additional two years of funding (FY09 and FY10) and this report reflects the culmination of four years of effort, accomplishments, and impacts with emphasis on the currently funded project.

PROJECT APPROACH

Education to WA apple producers occurred in several different formats: winter meetings, newsletters, and field days, but the primary focus over the first three years of the project was on self-selected groups who committed to more intense learning and sharing of experiences. These groups were termed Implementation Units (IUs). IUs consisted of growers/managers and consultants (136 total), geographically distributed throughout the apple growing region, and representing over 94,000 acres of apple production (55%) in WA. These groups met 3-4 times a year in 2008 and 2009. In 2010 the numbers of meetings declined in frequency, and were held based on the expressed needs of the groups.

The **AIPMTP (PMTP) Handbook** served as the primary educational tool for IU members, but was widely distributed (over 600 copies) to the entire industry, including a Spanish language version. The PMTP Handbook is available on-line at http://pmtp.wsu.edu/handbook.html. It will be maintained and updated as a legacy of the current project, sustaining the continuing effort of helping apple producers adopt new IPM technologies.

Web resources. Since the beginning of the PMTP and throughout the AIPMTP, WSU has maintained a high quality and up to date web presence. The project's home page is at http://pmtp.wsu.edu/index.html from which a person can access all the educational information developed during the project, find progress reports, and access the handbook, eNewsletters, and reference tools. This Final Performance Report will be added to the web page resources.

Field day participants

Field days. In the first two years of the project (2008-2009), WSU held several field days where growers and consultants could share in the educational activities, such as monitoring pests, sprayer calibration and biological control, which related to the goals of the project. In the last two years, WSU did not formally hold field days, but did participate in field days organized by other groups.

Pest Management Fruit School. In 2009 WSU held a WSU Pest Management Fruit School where they covered the fundamentals of IPM and how to transition to use of new (OP-alternative) pest control technologies using best practices. The fruit school was a two-day event in which 183 individuals participated at four locations. WSU used modern electronic delivery technology to distribute the fruit school to three remote locations in real time.

Farmworker Outreach. A major effort of the AIPMTP project was to reach farm workers who are impacted by pest control activities in orchards. WSU worked with 30 individuals and organizations to understand the concerns and knowledge of the farm worker community and how best to reach them. Bilingual project personnel attended farm worker health fairs where we sponsored activities that helped get the word out on the relative safety of pesticides used in orchards, especially the new ones, OP-alternatives, which posed very little risk to farm workers and their families. A significant outcome of these activities was the development of a handout/poster (see right) that in a very clear way showed relevant information in ways the farm workers could understand. This poster can be downloaded from the web site (http://pmtp.wsu.edu/downloads/PesticideLabelPoster.pdf) and has been in high demand by growers and managers as a means to simply and clearly tell farm workers and applicators about the new products they are using for pest control and why they can now reenter the orchard after only 4 hours compared to 3 to 14 days when older insecticides were being used.

Assessment and Documentation. The PMTP was critical to the establishment of baseline data on perceptions and practices of apple growers and crop consultants regarding the transition away from old and to new IPM technologies. Over four years WSU implemented four major surveys of apple growers/managers (2008, 2010) and crop consultants (2007, 2009). Results of these surveys form the basis by which WSU is able to document this project's ability to meet established outcomes. This project also introduced audience participation technology, TurningPoint™. This technology allowed WSU to query different audiences with specific questions to determine what they knew and what they learned from participating in project activities. The TurningPoint™ technology is now used throughout the fruit industry by WSU Extension and other industry groups as a tool to gather needed information and to get feedback (anonymous) from clientele.

Pesticide safety poster

WSU project staff participated in the 2011 WSHA Meeting. They spoke in both the Spanish and English sessions about using the WSU Decision Aid System (DAS) for accurate pest management and control decisions, in the Spanish language session about new chemistries for Guthion replacement, and presented a poster summarizing the Apple IPM Transition Project's past four years. Staff also participated in a number of grower/consultant meetings and workshops during the winter of 2011, as well as a number of workshops and field days for specialized farm workers.

GOALS AND OUTCOMES ACHIEVED

The goals (objectives) of the three phases of the AIPMTP (AMTP) are provided below. The first is from the PMTP project conducted in 2008 and 2009. The second are the goals from the first SCBGP and the last are from the current funded SCBGP. Boiling these goals and objectives down they fall into three categories; 1) enhance and increase adoption of new IPM technologies and practices, 2) leave a legacy that will transcend the project, and 3) document how the project has changed perceptions and practices. WSU has summarized the accomplishments of the project as it evolved through time, making specific reference to the current project.

The goals of the original PMTP (2008-2009) were to:

1. Enhance understanding of new IPM technologies through educational programs and communication of research-based knowledge
2. Increased adoption of new IPM technologies through strategies that include the sharing information on successes and failures and communicating with all stakeholders on project progress
3. Document changes in practices, attitudes, and perceptions of growers, farm labor, and stakeholders

The goals of the first AIPMTP funded by the FY09 SCBGP were to:

1. Speed the adoption of new IPM technologies through educational programs and communication of research-based knowledge
2. Improve real-time pest management decisions through full use of the web-based WSU Decision Aid System (DAS)
3. Document and communicate changes in practices, attitudes, and perceptions of growers, IPM consultants, farm workers, and other stakeholders

The goals of the current AIPMTP funded by the FY10 SCBGP were to:

1. Finalize efforts on adoption of new IPM technologies through educational programs and communication of research-based knowledge
2. Complete legacy products that will transcend the life of the project, and
3. Conduct final documentation activities demonstrating changes in practices, attitudes, and perceptions of growers, IPM consultants, and farm workers.

The Expected Measurable Outcomes of the current AIPMTP funded by the FY10 SCBGP were:

1. Increase the adoption of OP-alternative technologies in IPM in WA apple
2. Enhance environmental quality by reducing OP use and increasing IPM practices
3. Improve knowledge of pesticide safety and reduced-risk insecticides among farm workers

The above goals and Expected Measurable Outcomes for this project were achieved.

Adoption of New IPM Technologies and Practices. The tree fruit industry faced a major challenge when faced with the 2006 EPA announcement of the phase-out of AZM by 2012. The initial survey of apple growers (2008) showed that their primary barriers to the adoption of OP-alternatives for codling moth control were that they would be too expensive, would not be as effective (as old products), and would cause other pest problems. In a follow up survey (2010 – a primary objective of the current project) these concerns had not changed (Table 1). The consultant survey (2009) showed the same barriers though a higher proportion of consultants were concerned about higher costs of OP-alternatives compared to growers and a lower proportion were concerned about efficacy (Table 1). These results are not surprising since the reality is that research had shown that OP-alternatives were less efficacious than products they were replacing and some had been identified as causing pest problems. Growers and consultants soon learned that the new technologies cost 1.5 to up to 3 times more on a per acre basis than the old technologies.

Table 1. What barriers do you face in using the alternatives to AZM (Guthion) to achieve acceptable control of codling moth? (Question D7 in surveys)

Barriers to adoption of OP-alternatives for control of codling moth	Grower survey		Consultant survey	
	2008	2010	2007	2009
Alternatives are too expensive	31%	33%	NA	41%
Alternatives are not as effective	28%	26%	NA	19%
Alternatives cause other pest problems	8%	9%	NA	12%

In addition to questions about barriers to the adoption of OP-alternatives, WSU asked growers and crop consultants a series of opinion questions with responses ranging from strongly agree to strongly disagree. A sample of responses is shown in Table 2.

Table 2. Indicate the extent to which you disagree or agree with each of the following statements (Question D8 in surveys)

Statement	Agree or strongly agree with statement			
	Grower survey		Consultant survey	
	2008	2010	2007	2009
The cost of codling moth control will be higher after the Guthion phase-out	91%	91%	98%	93%
Control of codling moth will be more difficult after the Guthion phase-out	68%	68%	70%	64%
Phasing out Guthion will make tree fruit production riskier for growers	60%	62%	62%	62%
Growers have effective alternatives to Guthion at their disposal	49%	51%	65%	77%

Phasing out Guthion will provide me with new apple marketing opportunities	10%	15%	15%	24%
Phasing out Guthion will encourage growers to use safer pesticides	62%	62%	68%	70%

Comparing responses to these statements from grower and consultant surveys showed pretty consistent agreement and with essentially no change, or very little, between the two years separating the surveys. Most growers and consultants felt that the cost of codling moth control would increase after the AZM (Guthion) phase-out and that control of this pest would be more difficult. Most growers and consultants agreed that phasing out AZM would make tree fruit production riskier, that is with more uncertainty. Growers were not as sure as consultants about the availability of effective AZM alternatives, probably because consultants were more informed about research on these products than most growers. It is also encouraging that more consultants agreed with this statement in 2009 compared to 2007. Few growers or consultants thought the phase-out of AZM would provide new market opportunities for apple sales, but most agreed that the phase-out of AZM would encourage the use of safer pesticides. The above results are examples of how perceptions either do not change over time or change very slowly has some basis in reality. For example, it is not surprising that growers, as well as consultants, agreed with the statement that codling moth control costs would increase since this has indeed been their reality.

When asked about ***changes in practices*** we saw some differences in grower responses between 2008 and 2010 and consultant responses between 2007 and 2009. There was a decrease in the use of OP insecticides reported by growers (2008 to 2010), however, there was a large decrease in the recommendations of consultants for use of OPs (2007 to 2009), Table 3. By contrast growers did not report any change in the use of OP-alternatives (Table 4), which is informative since they indicated a decline in use of OP insecticides for codling moth control (Table 3). We did not ask the same questions in the 2007 consultant survey so only have data from the 2009 survey in which 76% indicated that they had increased recommendation for use of OP-alternatives for codling moth control over the previous three years (Table 4). In 2008 the percent of growers using 2 or 3 applications of AZM was 73% but this had declined to 63% in 2010. These data support other data that show apple growers are using less OP insecticides and transitioning to use of OP-alternatives. But were changes in practices effective? In 2008, 57% of growers reported that fruit injury from codling moth had remained about the same over the past three years while 17% considered that injury had increased during this same period (survey question B7). In 2010, 61% of growers reported that fruit injury from codling moth had remained about the same over the past three years while 16% considered that injury had increased during this same period. So with changes in practices there was no increase, or decrease, in crop protection from the growers' perspective.

Table 3. Did your use of *OP insecticides* for codling moth change over the last three years? (Survey question B4)

Did your use ***or*** recommendations of OP-alternatives for control of codling moth over last 3-years	Grower survey		Consultant survey	
	2008	2010	2007	2009
Decreased	*50%*	***59%***	*35%*	*75%*
Remained about the same	40%	30%	33%	21%
Increased	6%	2%	30%	1%
Did not use or recommend	5%	9%	2%	3%

Table 4. Did your use of *OP-alternative insecticides* for codling moth change over the last three years? (Survey question B6)

Did your use ***or*** recommendations of OP-alternatives for control of codling moth over	Grower survey		Consultant survey	
	2008	2010	2007	2009

last 3-years				
Decreased	*12%*	*14%*	*NA*	*8%*
Remained about the same	36%	36%	*NA*	16%
Increased	47%	**47%**	*NA*	76%

When growers were asked what they knew about the AZM phase-out schedule almost all (99%) were aware of it but in 2008 only 35% knew what the last year (2012) was that they could use AZM, but in **2010 the good news was that 54% knew that 2012 was the last year they could use AZM** (survey questions D1 and D2). In addition, 65% of growers in 2008 and 2010 indicated that they were in process of decreasing use of AZM (Table 5). However, between 2008 and 2010 6% more growers said that they had stopped using AZM. While these changes might seem small they actually represent a large change in use of OP insecticides by the apple industry.

Table 5. Which of the following statements best reflects your approach to the Guthion (AZM) phase-out? (Survey question D3)

	Grower survey	
Statements	2008	2010
I am in the process of reducing my use of Guthion	*65%*	***65%***
I have already stopped using Guthion	18%	**24%**
I have not yet reduced my use of Guthion	14%	8%
I have never used Guthion, so the phase-out does not affect me	1%	1%

Pheromone mating disruption has been identified as a key component of an IPM program using OP-alternatives in the AIPMTP educational materials and activities. Most consultants (95-98%) recommended use of pheromones for control of codling moth. The percent of growers reportedly using pheromones went from 65% to 68% in 2008 to 2010, respectively, however, based on the total apple acres managed by respondents **in 2010, WSU estimated that about *86% of bearing apple acres are being treated with pheromones*.**

WSU worked to encourage the tree fruit industry to use the WSU Decision Aid System as a tool to help them improve implementation of OP-alternatives in IPM programs. The use of DAS by growers increased from 37% in 2008 to 42% in 2010. Ninety-three percent (93%) of consultants reported using DAS in 2009.

What has been presented here is a small portion of the data the project has collected over the last four years. Complete results of the grower and consultant surveys can be found on the AIPMTP web site at http://pmtp.wsu.edu/impacts.html.
One of the major areas of outreach in the project was to the Hispanic community that worked in orchards and WSU took advantage of pesticide recertification classes as a way to access this group and used the TurningPoint™ audience participation technology to capture responses. Because they conducted these activities over two winters (2008-09 and 2009-10), WSU was able to compare some of the responses to see if the education programs were making a difference in their knowledge of the AZM phase-out and OP-alternatives. A few more of the respondents knew about the AZM phase-out 80% verses 82% in 2008-09 verses 2009-10, but more were aware of the last year AZM could be used in 2009-10 (69%) than in 2008-09 (52%). The audience indicated an increase in exposure to using the TurningPoint™ system from 27% to 57% between the two periods. The questions in this survey were focused more on pesticide safety than on IPM. For those interested complete survey results can be found at our web site - http://pmtp.wsu.edu/TPsurvey2010_Sum.html.

General surveys of growers and consultants provides one view of changes in perceptions and practices but WSU also surveyed those who participated in the IUs to see what changes they had made and what

value they placed on the AIPMTP. After the first year of project (2008), WSU used the TurningPoint™ system audience participation technology to ask some basic questions about the materials they had used in their education activities. Most rated the information presented in the IU meetings as relevant (84%), sixty-one percent (61%) said participating in meetings influenced their IPM decisions, and 92% said they would participate in the following year. Participants felt that the AIPMTP Handbook was both relevant to their IPM decision making (91%) and the concepts were clearly presented (93%). Seventy-two percent (72%) rated newsletters as relevant to their IPM decisions and 97% wanted to receive the letters the following year. Field days were not rated as high as the other educational activities as it seemed harder for people to get away in the middle of the growing season to participate in them. Of those that responded, 70% liked the web site and thought it was easy to find information on it.

In 2011 WSU conducted an on-line survey of those who had participated in IUs. Most of the respondents (61%) had participated in an IU two years or more. Eighty-four (84%) percent of the respondents indicated that participating in the IU influenced their IPM decisions and 81% said the AIPMTP Handbook was a helpful resource. **Sixty percent (60%) of the respondents indicated that they did *NOT* use or recommend AZM in 2011. Ninety-two percent (92%) used or recommend mating disruption (pheromones) for codling moth control and 93% used the WSU Decision Aid System.** The major concern about using OP-alternatives was their high cost (28%) and that some of them caused problems with other pests (24%), but 31% said there were no barriers to using OP-alternatives. All of the results of this survey are at http://pmtp.wsu.edu/IU_2011_Survey.html.

Figure 2. Acre applications of organophosphate and OP alternative insecticide in WA apple orchards based on NASS data.

While it is always good to have internal baseline data to document changes in perceptions and practices in a clientele group, it is also good to have independent third-party evidence that confirms changes. WSU followed changes in insecticide use over time for WA apples that was collected in the National Agricultural Statistics Service (NASS) pesticide use surveys. For tree fruit these data have been collected every other year since 1991. Therefore, data for pesticide use in apples in WA were available for the year prior to the start of the AIPMTP (PMTP) as well as during the project. Figure 2 shows the acre applications of OP insecticides from 1991 through 2009 used on WA apple orchards. Acre application values are used to compare use of different products or pesticides groupings because newer products are used at much lower rates per acre than older products, like OPs. An acre application represents the average number of applications of a pesticide or pesticide group applied to one acre of a crop. During most of the 1990s, an average of about 4.5 applications of OP insecticides were applied to each apple acre. The use of OP insecticides declined in the last part of the 1990s due to regulatory action and to the adoption of mating disruption, which reduced the number of OP applications. Also, in the late

1990s the use of OP-alternatives began to increase as new products were registered for use on apple. The use of OP insecticides dropped dramatically between 2007 and 2009, mostly due to declines in use of AZM. This drop represented a decline in pounds of active ingredient used in apple from 499,000 pounds to 276,000 pounds. It is of interest to note that the use of OP-alternatives did not continue to increase between 2005-09. These data independently confirm the changes occurring in use of OP insecticides in apple IPM in WA. While some of the changes are due to regulatory action much of the change can be attributed to growers and crop consultants making proactive decisions to move to new technologies supported by good information and education delivered by the AIPMTP.

Leaving a Legacy of the AIPMTP. One of the project objectives was to leave a lasting legacy for the WA apple fruit industry after this project terminates. Part of that legacy will be maintaining the web site, adding to it, and evolving it as new information becomes available. Another objective of the current project was to develop and IPM manual, but with more and more information being accessed on-line, WSU opted to develop an ***on-line educational product*** that captures the essence of the transition project. This on-line resource is titled ***Integrating New Insecticides into a Strategic Plan for Codling Moth and Leafrollers***. It is an educational training document found at http://pmtp.wsu.edu/INI_presentation.html. The image above shows what a person will see when they go to the site. This narrated presentation is about a 45 minute training session with built in quizzes that must be passed in order to continue through the training.

Another legacy item already mentioned is the ***pesticide information poster*** developed to help farm workers understand the safety of new insecticide being used in WA apple orchards. This is a valuable tool for growers and orchard managers to use when explaining the characteristics of new insecticides they are using and why farm workers can reenter orchard after such a short period of time compared to older products.

WSU also had as an objective of the *current project* to conduct ***case history studies*** with which to characterize how different IPM programs implemented a transition strategy and how well they worked. Three years of IPM data was collected from seven apple orchards as part of a case history component of the project. These data have been analyzed in different ways and a report is in preparation and will be placed on the AIPMTP web site, a brief summary of results are given here. The case histories provided a cross section of IPM programs from those that would be considered successful, stable, and cost effective compared to those that were not stable and expensive. One way to assess case histories is to examine the cost of different pesticide groups over time. Figure 3 shows the accumulated cost of different pesticide groups over three years, 2007-2009.

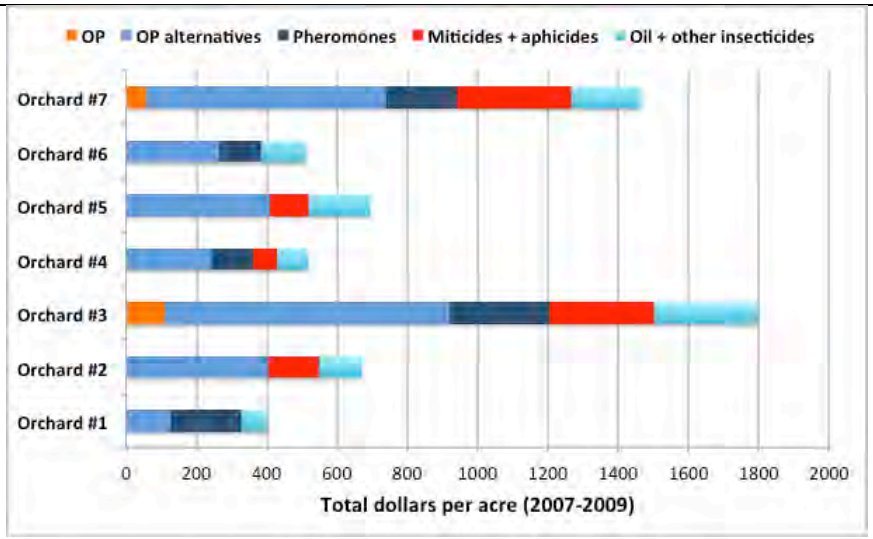

Fig. 3. Accumulated cost (2007-2009) of different groups of pesticides in seven different IPM programs.

The total cost of different IPM programs varied from $400 per acre (Orchard #1) to $1,800 per acre (Orchard #3). Note that five of the seven orchards used mating disruption, yet three of these were disrupted as noted by the need to apply controls for aphids and spider mites (red bars). It is also noteworthy that even though all the IPM programs used OP-alternatives some of them were more expensive and less stable than others. WSU's analysis of the cause of instability, (that is, the need to apply controls for aphids and spider mites), rested with the choices of OP-alternatives used. WSU has learned from another study that certain OP-alternatives can increase the risk of disruption of beneficial insects, predators and parasites, which often provide control of aphids and spider mites in apple orchards.

Growers and crop consultants were aware of the risk of increased problems with other pests due the use of OP-alternatives (Table 1). While most of their concerns were tied to reduced efficacy of OP-alternatives or their narrow spectrum of activity, the reality is that certain OP-alternatives do disrupt biological control in apple orchards and this increases the cost of IPM programs. In the case history orchards, the added cost of disrupting biological control was about 20% of the total cost of the IPM program. These case histories will provide valuable real-life examples of how best to implement OP-alternatives in apple IPM programs.

BENEFICIARIES

This project's primary beneficiaries were those growers and crop consultants who participated in IUs. They were the principle target for the educational programs and resources developed by the project. The general grower community also benefited from the project through presentations at industry meetings outlining the best practices to follow when phasing-out the use of AZM in their pest management programs. Many growers and orchard managers also benefited from the PMTP handbook, even though they did not directly participate in IU meetings. The legacy of the PMTP is the web presentation that will continue to help growers determine how best to implement the use of OP-alternatives in their pest management program.

Farm workers were another beneficiary group who worked in an environment that became of much lower risk to their health. The development of the pesticide safety poster and work done at farm worker health fairs provided this important information to this segment of the fruit industry in a way that allowed them to understand the reduced risk of new pesticides being used by apple growers.

The citizens of Washington also benefited from the PMTP project as the apple industry moved to adopt alternative products for pest control that have much reduced impact on wild life and aquatic systems. These benefits, while not immediately apparent to the public, will bear fruit over time by mitigating negative impacts of apple production on the environment.

LESSONS LEARNED

The AIPMTP (PMTP) spanned four years of intense effort in helping the Washington tree fruit industry deal with regulatory changes impacting commonly used pesticides. The duration of the project was a challenge to keep a focused approach on the problem as the industry moved towards the adoption of new technologies.

The use of a hands-on approach working with a self-identified group of tree fruit industry leaders provided a core base to educate on best practices to use in transitioning from OP to OP-alternative based IPM programs. The establishment of the IUs provided an intense learning environment, which was a key in helping growers and crop consultants grasp the nuisances of using new OP-alternative technologies. Those involved in IUs became the peer group that talked to their neighbors and colleagues, passing on lessons they learned. The idea of training key people within an industry to provide the local leadership on implementing new ideas was used in the implementation of mating disruption technology and is being used in a new project focusing on enhancing biological control in orchard systems.

A critical lesson learned in this project that has benefited other projects is the inclusion of a specialist for assessment and documentation with training in social sciences. Dr. Nadine Lehrer was hired by the original PMTP project and served throughout the four years of the project. She provided guidance on the development and implementation of rigorous survey documents and methods. She also provided expertise in summarizing survey results and in developing reports and giving presentations. In addition, Dr. Lehrer's background in working with minority communities and her fluency in Spanish provided the project access to and credibility with the Hispanic farm worker community and their advocates.

WSU introduced the use of Turning Technologies TurningPoint audience response system in this project. This technology was used as a teaching tool in IUs, workshops, and even field days. It allowed WSU to query what people knew in an anonymous way and to use the responses to teach correct answers without embarrassing anyone. WSU also used this technology to survey small groups quickly to determine how effective their educational programs were. This technology has now been widely adopted by other groups in the tree fruit industry as a valuable tool in acquiring information, evaluating teaching, and gaining perspectives from a diverse audience on a variety of issues and topics.
More and more, a good web site presence is critical, as it is quickly becoming the information source of choice for growers and crop consultants. WSU hired an excellent web and information specialist on the project who was able to get information up on the web site quickly and managed the information flow to project participants.

WSU was convinced that the PMTP Handbook would be a great teaching tool in getting across how growers and crop consultants could best transition from OP to OP-alternative insecticides in IPM programs, and this was indeed the case. However, an ***unexpected outcome*** of out project was that WSU found that people in many other states, and even in Canada, were using the PMTP Handbook as a tool to understand how to use new OP-alternative technologies and inform their clientele. The PMTP Handbook is also being used in a project on Enhancing Biological Control in Western Orchards as the source document on implementing OP-alternative IPM programs and how to craft these programs to avoid disruption of biological control.

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ADDITIONAL INFORMATION

This project leaves a rich legacy of information found primarily on the AIPMTP (PMTP) web site at http://pmtp.wsu.edu. This web site will be maintained and updated as new information becomes available on practices and tools for apple IPM. The site contains resource materials such as eNewsletters, the PMTP handbook, project progress reports, articles, reference tools, and all of the survey information which was collected by the project documenting changes in attitudes and practices by Washington apple growers and crop consultants. This site also contains links to other important web sites such as the Decision Aid System (DAS) and Enhance BioControl project.

PROJECT #8

Project Title: Assessing the Damage Potential of *Pratylenchus penetrans* on Raspberries

Partner Organization: Washington State University

PROJECT SUMMARY

The purpose of this project was to enhance competitiveness of Washington red raspberry growers by improving their control of the root lesion nematode *Pratylenchus penetrans.* We determined that red raspberry varieties did not substantially differ in their susceptibility to *P. penetrans*, and identified the conditions under which *P. penetrans* must be managed. This knowledge helps raspberry growers control nematodes on sites where they are a problem, and to better determine when to treat fields for *P. penetrans.*

This project is important, because Washington State is the nation's largest producer of processed red raspberries, with an annual crop value of $30-90 Million. Over 120 Washington growers produce red raspberries for processing, and many more produce smaller amounts for fresh market. Raspberry production is a significant feature of the agricultural portfolio in some Washington State regions, particularly Skagit and Whatcom Counties, where over 90% of the raspberries in the state are grown. *Pratylenchus penetrans* is prominent in western Washington soils. When *P. penetrans* is left unchecked in raspberry fields, significant yield loss can occur. Presently there are no nematicides labeled for post-plant treatment of *P. penetrans* in raspberry. New raspberry varieties had potential for resistance or tolerance to *P. penetrans,* but were not evaluated until this study.

This project is timely because regulatory actions have severely restricted nematode management options on raspberry. For many years *P. penetrans* management included pre-plant fumigation [typically broadcast shank-applied Telone® C-17 or C-35 (1,3-dichloropropene (1,3-D) combined with 17% or 35% chloropicrin)] and post-plant treatments with Nemacur® (fenamiphos). In 2007, Nemacur® was removed from the U.S. market; this was the only proven, effective product registered for post-plant nematode control on red raspberry. In 2012, the U.S. EPA fully implemented new Re-registration Eligibility Decisions (RED) for many soil fumigants including chloropicrin. These new fumigant regulations have a profound impact on this industry for two reasons: 1) much of the prime land for raspberry production is close to inhabited structures, and the mandatory buffer zones imposed makes it impossible for these growers to fumigate as they have done previously, and 2) an alternative nematode management practice has not been identified to successfully minimize the impact of *P. penetrans* on this crop. The red raspberry industry is at a time when long-term *P. penetrans* decision-making tools and IPM management tactics must be developed.

PROJECT APPROACH

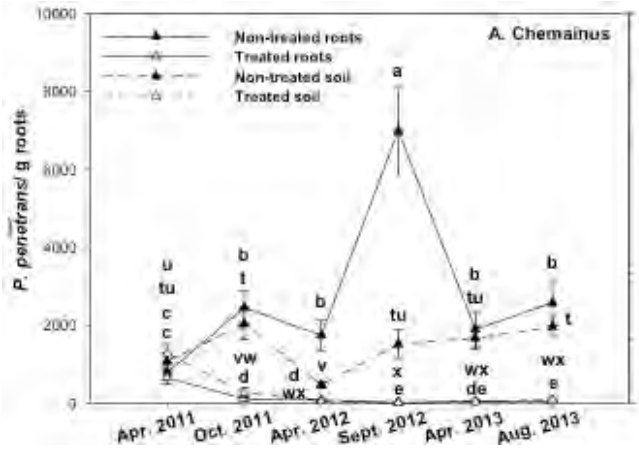

FIGURE 1. ROOT AND SOIL *P. PENETRANS* POPULATIONS IN ONE OF THE FIVE GROWER TRIALS, 2011-2013.

In year 1, we established five trials in *P. penetrans*-infested raspberry fields. Two were in fields planted with the industry standard variety 'Meeker', and one each of 'Chemainus', 'Saanich' and 'Cascade Bounty'. We applied nematicide treatments in April and August 2011 and May and September 2012. We also evaluated *P. penetrans* populations in soil and roots in April and October of each year. Our treatments successfully suppressed

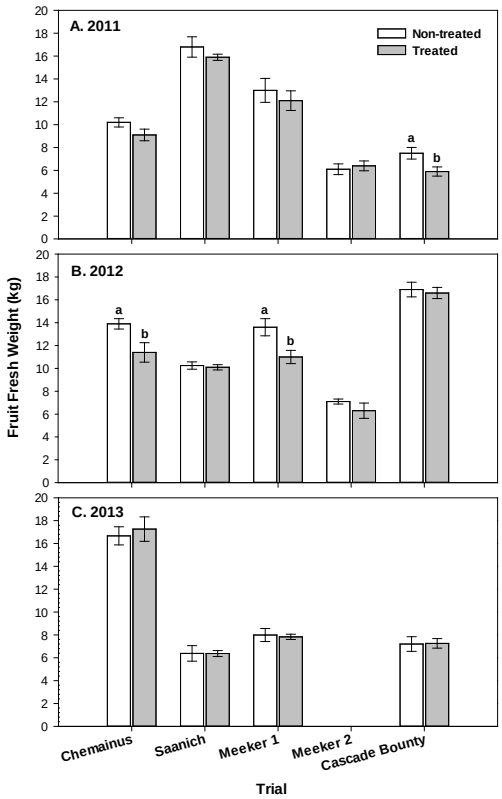

FIGURE 2. FRUIT HARVESTED PER PLOT IN FIVE TRIALS OF NEMATICIDE-TREATED VS NON TREATED PLOTS, 2011-2013.

P. penetrans in each of the trials (example shown in Figure 1). Growers currently rely on soil population data to make decisions, about nematode management, but in these (and other) studies, we found that root samples provided a better early warning of damaging P. penetrans populations than soil populations did. **Based upon these and other results, we have changed the recommended method growers use to assess P. penetrans when making management decisions. Growers are now using root assessments, rather than assessments from the soil.**

In July 2011, 2012, and 2013, we harvested raspberries a minimum of four times from each trial through the harvest season. In no case did treatment result in an increase in yields. The fact that 2013 yields were evaluated after 27 months of nematode control indicates that **nematicides were not effective in restoring productivity of nematode-infested fields like these, a significant result for growers.**

We similarly evaluated plots in which we planted these and other varieties in replicated, fumigated and non-fumigated plots in another field as described in **Objective 2** of our work plan. In contrast with the limited impact on yield in the established fields described above, nematode control had a tremendous impact on yield in this new field (Figure 3). None of the varieties yielded well when not protected in their establishment year, demonstrating that **establishment is a critical time for nematode control in raspberry.**

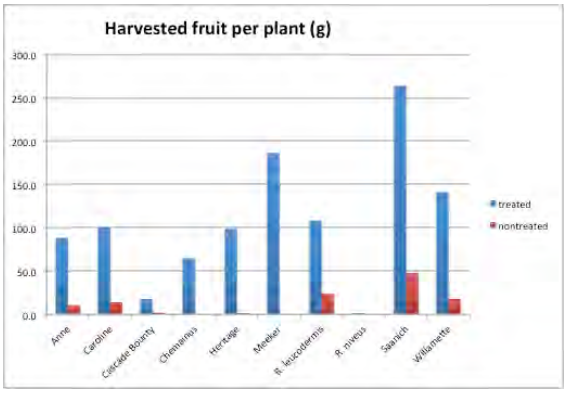

FIGURE 3. FRUIT HARVESTED PER PLOT IN TRIAL OF PLOTS TREATED PREPLANT AND DURING ESTABLISHMENT, JULY 2012.

Microplot studies comparing plant growth and nematode population increase in soils from the field studies were carried out in 2012. In these experiments, P. penetrans population densities increased more rapidly in a loam soil than in a sandy loam, but the damage (reduction in plant dry weight) was no greater in the loam soil (Table 1). While conventional wisdom is that nematodes increase most rapidly in sandy soils, there were clearly other factors at play in this study. **Soil texture alone does not determine whether a given soil is conducive to rapid P. penetrans population increases.**

TABLE 1. PLANT DRY WEIGHT AND P. PENETRANS/G ROOT IN MICROPLOT STUDIES, 2012.

	Experiment 2		
	Total dry weight (g)	Root dry weight (g)	*P. Penetrans*/g roots
Sandy loam-pasteurized	201 a	85 a	0 c
Loam-pasteurized	153 b	74 a	0 c
Sandy loam-infested	123 b	43 b	85 b
Loam-infested	142 b	73 a	538 a
	Experiment 1		
	Total dry weight (g)	Root dry weight (g)	*P. Penetrans*/g roots
Sandy loam-pasteurized	192 a	80 a	0 c
Loam-pasteurized	179 a	80 a	0 c
Sandy loam-infested	91 b	40 b	69 b
Loam-infested	124 b	56 b	335 a

In year 3 of this project, we presented information on this project at the soil fumigation field days July 19 and Sep 10 (Lynden) and at the Small Fruit Conference Dec 6, 2012, Lynden WA. We also presented this information at the North American Berry Conference, Portland OR, Jan 28-30, 2013, and at the Skagit Farmers co-op berry workshop, April 11, 2013. Information from this study was assembled in a manuscript sent to the peer-refereed journal Plant Disease, December 2013.

Thomas Walters was the project director. He has overseen the establishment of the trials, as well as the sampling, harvest and evaluations of them. He also supervised the graduate student on this project. **Inga Zasada** was in charge of the nematode evaluations in these trials. She determined appropriate sampling procedures and timing, she supervised individuals conducting nematode evaluations in the lab, and she supervised greenhouse trials.

Ziduan Han was the graduate student supported by this project. He was responsible for harvest, data collection and compilation, and for coordinating activities with the growers. With the funding from this project, Mr. Han completed his MS in Horticulture, and has gone on to a PhD program. Thank you for helping to launch this promising young scientist's career.

The scope of this project was focused on raspberry, a specialty crop. Some results may apply to other perennial crops such as tree fruit and nuts but these are also specialty crops.

GOALS AND OUTCOMES ACHIEVED

Working with raspberry growers in their fields, we developed population profiles for *P. penetrans* on the most common raspberry varieties: 'Meeker', 'Cascade Bounty', 'Chemainus' and 'Saanich'. We developed data on the impact of *P. penetrans* population densities on the growth and yield of these varieties in a range of soil types. We compared impacts of P. penetrans on growth and productivity of mature fields to impacts on newly-planted plots. We used this data to generate IPM recommendations for variety selection to manage *P. penetrans* and under what conditions this nematode must be managed. No such recommendations currently exist (*BENCHMARK*). Recommendations were shared with growers through summer field days and the Whatcom County Berry Growers' Workshop in 2011, 2012 and 2013. Updates will also be provided on the Small Fruit Horticulture website.

This is our progress in developing IPM guidelines for. *P. penetrans* in red raspberry: By establishing these trials and establishing nematode-controlled plots within them, we documented the effects of *P. penetrans* on these raspberry varieties in mature fields, and in establishing fields. We developed IPM recommendations for nematode management, including the use of root rather than soil assessments when possible, the finding that protection of young plants is more important than protection of mature plants, and documentation that soil texture alone does not determine whether a soil is conducive to rapid *P. penetrans* population increases.

Activity as proposed		**As completed through Sept 30, 2013**
Objective 1*: Evaluate P. penetrans population dynamics and fruit yield in existing fields of raspberry varieties 'Meeker', 'Chemainus', 'Saanich' and 'Cascade Bounty'*		
Identify *P. penetrans*- infested, established fields of raspberry varieties 'Meeker', 'Chemainus', 'Saanich', and 'Cascade Bounty'.	Walters, Zasada, graduate student	As proposed
Apply nematicide to protect selected plots	Walters, Particka	April and August 2011. April and May, 2012, April 2013
Evaluate plant growth, yield and *P. penetrans* populations in nematode-protected and in unprotected plots established within these fields.	Walters, Zasada, graduate student	As proposed. Also conducted destructive sampling of plants in one trial.
Objective 2*: Evaluate plant growth, nematode population densities and yield in plots within fumigated and non-fumigated sections of newly planted fields.*		
Identify three *P. penetrans*-infested fields scheduled for fumigation and replanting by 2011. Establish agreements to evaluate new plantings in fumigated and non-fumigated areas of these fields.	Walters, Zasada	completed in one field, with all varieties, not three separate fields
Two of the three fields will be planted with a single variety selected by the grower. The remaining field will be planted with replicated plots of 'Meeker', 'Chemainus', 'Saanich', and 'Cascade Bounty' in fumigated and non-fumigated areas of the field. Collect soil samples, send to commercial testing lab for analysis of soil physical and chemical properties.	Walters, Particka, graduate student	completed
Evaluate plant growth, nematode population densities and yield in plots within fumigated and non-fumigated sections of the fields.		As proposed.

Conduct greenhouse evaluations of *P. penetrans* increase rates in soils from these fields	Zasada	Originally proposed for 2011, but were completed as microplot studies in 2012
***Objective 3**: Extend knowledge developed above to the raspberry industry through field days, commission newsletters and other means.*		
Field days on grower farms	Particka, Walters, Zasada, graduate student	As proposed, except at WSU-Mount Vernon rather than in grower's field.
Present findings and IPM recommendations and solicit feedback at Whatcom County Small Fruit Workshop, in the WA Red Raspberry Commission newsletter, and on the Small Fruit Horticulture website. Survey growers at Whatcom County Small Fruit Workshop (document progress to measurable outcome).	Zasada, Walters	As proposed. Presentation conducted December 2011, also planned for December 2012. Also presented results to other agricultural scientists at 2012 Amer. Soc. For Horticultural Sciences annual meeting, and submitted manuscript to peer-reviewed journal.
Present IPM recommendations in a fact sheet *(Planned for Spring 2013)*	Walters, Zasada	Completed

By establishing these trials and establishing nematode-controlled plots within them, we are documented the effects of P. penetrans on these raspberry varieties in mature fields, and in establishing fields. We developed IPM recommendations for nematode management, including the use of root rather than soil assessments when possible, the finding that protection of young plants is more important than protection of mature plants, and documentation that soil texture alone does not determine whether a soil is conducive to rapid *P. penetrans* population increases.

BENEFICIARIES

Beneficiaries include raspberry growers in Washington State, and in other states, who have better IPM guidelines for root lesion nematode management. Secondary beneficiaries include custom fumigators, and other researchers who will be able to build upon this work.

Using guidelines developed in this project, growers will be aware of the critical need for nematode control in fields prior to planting. Approximately 1500 acres of raspberries are planted each year in Washington. Roughly half of these will need treatment prior to planting based upon our guidelines. Treating these acres prior to planting could save growers up to $3M dollars in replanting costs.

Also using these guidelines, growers will recognize that there is little benefit to treating moderate populations of P. penetrans in mature fields. Since about 1/3 of the 9000 acres of raspberries in Washington have moderate numbers of P. penetrans present, this could save growers approximately $100/Acre on 3,000 acres, or $300,000 annually.

LESSONS LEARNED

We learned that all commercial varieties in use now have a roughly similar level of *P. penetrans* susceptibility, and we learned that soil texture is not always an overriding factor in soil conduciveness to *P. penetrans*. We were also very surprised to learn that in mature plantings, control of P. penetrans does not always lead to improved growth and productivity. Our bottom line message is that all varieties are pretty susceptible to this pest, the worst damage happens early in the plant's establishment, and that soil texture didn't matter as much as we thought.

By good fortune, growers got a special use label for an effective nematicide, but only in the first (non-bearing) year of the planting. Because of this project, we knew that this was a critical time for nematode control, and have been able to encourage growers to take full advantage of this very limited label. Without this project, the growers may have underestimated the importance of early control.

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ADDITIONAL INFORMATION

An estimated $43,683 was provided by Washington State University for 10% of Walters' and a technician's wages and benefits. Furthermore, Washington State also provided $21,624 in Facility and administrative costs, as well as $62,085 in unrecovered facility and administrative costs, for a total cost share of $127,392. These funds were used to maintain research facilities and equipment for use in these trials, and to pay Walters and the technician for time required to maintain trials, collect samples, apply nematicides and collect and analyze data.

The results of this project were presented to growers December 2011 and 2012 at the annual Small Fruit Conference in Lynden, WA. We also presented results to other scientists at the annual ASHS conference in 2012

In 2013, we presented information at the soil fumigation field days July 19 and Sep 10 (Lynden) and at the Small Fruit Conference Dec 6 2012, Lynden WA. We also presented this information at the North American Berry Conference, Portland OR, Jan 28-30, 2013, and at the Skagit Farmers co-op berry workshop, April 11, 2013. Information from this study was assembled in a manuscript sent to the peer-refereed journal Plant Disease, December 2013.

PROJECT #9

Project Title: Fresh Food in Schools

Partner Organization: Washington Sustainable Food & Farming Network

PROJECT SUMMARY

Fresh Food in Schools proposed to use education, outreach and organizing to build public awareness and support for twenty school districts statewide to increase their purchases of Washington grown fruits and vegetables specialty crops. The project's purpose was to: 1) increase farm sales of Washington's fruits and vegetables, 2) increase the number of farmers selling to schools, 3) improve access to fruits and vegetables for school children and 4) foster appreciation of local agriculture. School Districts find it challenging to buy directly from local farmers. The project's goal was to improve school districts' capacity to overcome barriers to buying directly from local farmers. The project period goal was to increase specialty crop sales by $600,000. However, the long-term economic impact was projected to be much more significant in that, once successful relationships between schools and farmers were established, schools would continue to purchase Washington grown specialty crops long beyond the project period.

Fresh Food in Schools promotes a more socially equitable and sustainable food system in Washington State by asserting that our farmers can, and should feed our kids. It shifts the focus of school food purchasing from lowest cost and convenience to a preference for minimally processed and Washington grown. The project seeks to reverse two unsustainable trends in Washington, farmland loss and epidemic childhood obesity, by using grassroots organizing, education, and advocacy to support and enhance school purchasing and serving of Washington grown fruits and vegetables in cafeterias across the state. Since 1980 the number of overweight young people has tripled. Approximately 17% (or 12.5 million) of children and adolescents aged 2—19 years are obese, according to the national data from National Health and Nutrition Examination Survey, as reported by CDC. Obesity contributes substantially to the burden of preventable illness and premature death. Kids receive 1/3 of their calories at school and many children in poverty eat only at school. A diet high in fruits and vegetables can mitigate weight gain and minimize associated health effects, but less than 25% of children eat five daily servings of fruits and vegetables

In addition, the most recent census data documents a loss of 70,000 acres/year of Washington farmland, predominantly from mid-sized farms. These "Ag-in-the-Middle" farms often have the capacity to grow the quantities needed for school-sized markets. Farmers were looking for new direct markets and schools were searching for ways to improve nutrition in order to address childhood health concerns that affect learning capacity. Our premise was that if schools served more fresh, WA grown fruits and vegetables, children would develop a taste for fresh foods, improving their lifelong nutrition and helping them develop healthier eating patterns as adults. At the same time, Washington farmers would gain access to a new direct market that could increase income and enhance their farm business.

The project was conceptualized because getting Washington grown, fresh food into schools is not as easy as one would expect. Existing institutionalized food systems present numerous challenges to direct purchasing from local farmers. Many schools do not have processing equipment, staff time, or staff skilled in the handling of fresh foods, finding it easier to purchase highly processed foods from large brokers that source food nationally and even internationally. Fresh Food in Schools set out to cultivate relationships between farmers and school food buyers, and launch strong education and promotion programs to raise awareness of the health and economic benefits of serving fresh Washington-grown food within schools and communities.
This project was not built on a previously funded SCBGP project.

PROJECT APPROACH

Below is a listing of the specific activities that were performed in order to achieve our goals and outcomes.

- Develop Work Plan: WSFFN prepared a work plan which identified the key tasks necessary to successfully implement the project.
- Hire Coordinators: The project was originally conceived to have two coordinators for the entire state. However, in recognizing the large geographic span, the project divided the east side into two positions: central Washington and eastern Washington which allowed the coordinators to develop a familiarity of area farmers and school districts.
- Secure Participating School Districts: Project coordinators reached out to all school districts in their regions to solicit interest in participating in the project. 85 districts expressed interest which far exceeded our capacity, documenting a clear demand for the project services.
- Develop Detailed Work Plan: Once school districts were secured, coordinators developed their detailed work plans to ensure that each district was getting the support that was needed to increase WA grown purchases of fruits and vegetables.
- Implementation: FFS Coordinators provided a multitude of support services from finding farmers interested in selling to schools, creating nutrition information for the classrooms and cafeterias, to writing grants for additional financial resources and press releases to attract media attention. In response to feedback from school districts, vegetable costumes were purchased to encourage kids to try new seasonal fruits and vegetables, a Taste WA Day booklet was designed and produced for elementary students to explain the significance of Taste WA Day, and a large wall map of WA State was designed and printed for all of our school districts to help kids locate where their school food was grown. The project was nimble and flexible in order to respond to each school and each farm situation as needed.
  Benchmark Survey: Coordinators designed a benchmarking survey to capture the purchasing and infrastructural information from schools that would be needed to evaluate the project. It took such a long time to get completed surveys back from busy Food Service Directors, later realizing that surveys must be short, easy to complete, and administered in person to capture the information required.
- Westside Summit: A planning team was created to design and implement the first Fresh Food in Schools summit in Olympia. It was really an inspiring event, with great attendance and terrific evaluations from attendees. It exceeded the original budget because the keynote speaker from New York was more expensive than anticipated.
- Mid-Project Survey: Having learned from the first survey, this next survey was streamlined to encourage Food Service Directors to complete it. This resulted in a more successful return rate and which more easily captured the necessary data. Survey is available upon request.
- Eastside Summit: Again a planning team was created to design and secure presenters for the summit. It was held in February to improve farmer attendance. An informal survey of food service directors and farmers indicated that social networking and marketing were topics of great interest, so a speaker well versed in these topics, based out of Montana was secured. There were over 100 attendees and the majority found it very helpful for networking. Find additional information about the summit on WSFFN's website at http://wsffn.org/fresh-food-in-schools-project/february-21-2013-fresh-food-in-schools-summit-information.
- Final Survey: In order to standardize results, similar questions in our final survey as in the mid-project survey were used. Response rates were good except in Eastern Washington which had more turnover in coordinators and participating school districts. A survey for farmers was added in order to assess the value of the project from their point of view. Surveys are available upon request.

Below is a summary of the activities that were completed during the project.

Project Activity	**Who is Responsible**	**Timeline**	**Status**
Convene Meeting of Network & Partners to develop work plan	Network Executive Director (ED) & Project partners	Jan 2011	complete
Hire *Fresh Food in Schools* Coordinators	Network ED (in collaboration with Project Partners)	March 2011	complete
Identify & Secure 20 Target School Districts for program	Network ED, Coordinators, Project partners	June 2011	complete
Develop Detailed Work Plan	FFS Coordinators, approved by ED	June 2011	complete
Implement Work Plan	FFS Coordinators, ED & Project partners	June 2011 – Sept 2013	complete
Complete Benchmark Assessment Survey	FFS Coordinators	Nov 2011	complete
Hold Summit - Westside	FFS Westside Coordinator	Mar 8 2012	complete
Distribute Mid-Project Interviews & Survey	FFS Coordinators	July-Sept 2012	complete
Complete Mid-Project Evaluation	FFS Coordinators	August 2012	complete
Hold Summit - Eastside	FFS Eastside Coordinator	Feb 21 2013	complete
Distribute Post project Interviews & Survey	FFS Coordinators	June 2013	complete
Complete Post-project Evaluation	FFS Coordinators	August 2013	complete
Complete Project Final Report	Network ED, Partners, FFS Coordinators	Aug – Sept 2013	complete

Project partners include WSDA Farm to School, OSPI, WA State PTA, Faith Action Network (Formerly Lutheran Public Policy Office of WA), PCC Natural Markets and the Childhood Obesity Prevention Coalition. All partners helped distribute the coordinator job descriptions as well as the request for participating school districts. OSPI helped in our school district selection process by sharing those schools that had received federal fruits and vegetables snack grants, while PCC Natural Markets helped identify farms in proximity to our participating school districts. Partners helped distribute information about the Fresh Food in Schools Summits and served as panelists and presenters at the summits. They also identified community leaders in the district areas who were interested in health, nutrition, and agriculture to help achieve project goals.

Fresh Food in Schools worked only on fruit and vegetable purchases from farmers. Our Coordinators worked directly with fruit and vegetable farmers to connect them to schools and support purchases. We tracked the purchases of only fruits and vegetables and didn't support any transactions other than fruits and vegetables. We specifically supported only fruits and vegetables purchases because of both helping specialty crop farmers and for nutrition reasons.

The project specifically focused on promoting Washington grown fruits and vegetables specialty crops.

GOALS AND OUTCOMES ACHIEVED

Fresh Food in Schools (FFS) successfully increased school district purchases of Washington grown fruits and vegetables. Twenty school districts across the state were secured to participate in the project and three part time coordinators were hired: Acacia Larson from Seattle, Joan Qazi from Wenatchee, and Brian Estes from Spokane to implement the project. Two FFS summits were hedl; one in Olympia in

2012 and one in Moses Lake in 2013. Ellen Gray managed the project coordinators via weekly project calls and annual planning during the WSFFN fall retreats.

FFS had two project goals:

- Increase district purchasing of WA grown fruits and vegetables by increasing each district's purchasing of fruits and vegetables by $5000 per district per year;
- Increase the numbers of farmers selling directly to schools and secure 5-10 new farmers selling to each district.

FFS met its goals to increase district purchasing of WA grown fruits and vegetables and to increase the number of farmers selling to schools. In the 3rd year grant period, FFS school districts, serving 137,000 children in K-12, purchased over $1,055,000 in Washington-grown specialty crops from at least 33 farms, 9 produce brokers, and 2 major food distributors. In the 2012 to 2013 school year, participating school districts purchased $672,065 in WA-grown produce, an increase of $589,790 from the beginning of the project. In 2012-2013 participating school districts reported purchasing from 44 farm sources, an increase of 28 farms from the beginning of the project. Several farms sold to multiple school districts. It was difficult to accurately track the amount of lbs. purchased, because each food item is tracked differently depending on unit of ordering (ex: case, bunch, each, lbs). Also, it was difficult to collect purchasing data from all the FFS districts despite repeated requests so the WA grown and farm number totals should be considered a minimum amount purchased during the project, and it is highly likely that more was purchased but not tracked and reported.

Clearly, FFS helped school districts get more WA-grown fruits and vegetables into their meals. Some districts did not achieve their individual increased spending goal of $5000/district and some districts greatly exceed the $5000/district goal. Because each district varies so much in size and capacity, setting an average district increase target was more realistic than setting the same target for each district.

FFS did not meet the target of 5-10 new farmers selling directly to each district. The project was able to build 33 new farms selling directly to school districts, an increase of 20 from the previous year. In addition the project resulted in five districts purchasing directly from farmers for the first time. Smaller school districts in particular are challenged to purchase from more than a handful of farmers directly. Many districts find it easier to purchase through large produce brokers, especially larger districts with multiple production kitchens. It is challenging to develop the direct farm to school purchasing relationship. The good news is that more districts are requesting WA grown fruits and vegetables from their brokers but they may not be purchasing directly from the farmers as often as preferred. The target for increasing farm direct purchasing for each district was unrealistically high and a more realistic target might be three farms per district rather than 5-10. Most districts are just too busy to spend time soliciting farmers and reviewing lots of bids so they tend to purchase from brokers. Other qualitative policy and process outcomes, such as implementation of harvest of the month programs, nutrition fairs, wellness policies which promote local produce, farm visits, and vegetable taste-testings could be considered as measures of success since these activities encourage kids to eat more fruits and vegetables fresh from the farm.

Each school district has unique needs and their approach to the project goals varied greatly. Many districts participated in Taste WA Day in September 2012 and 2013, plus National Food Day or National Farm to School month in October both years, and have developed Harvest of the Month programs. (Please visit WSFFN website for Taste WA stories and press http://wsffn.org/fresh-food-in-schools-project/taste-wa-success-stories-across-the-state). Many districts are incorporating recipe contests and taste-testing to encourage students to eat more locally grown fruits and vegetables. Based on requests from FFS districts, adult-sized vegetable and fruit costumes were provided to be worn by cafeteria staff or high school students as a way to inspire younger children to eat featured seasonal produce. WSFFN

designed and produced 20 - 4 x 6 large TASTE WASHINGTON Wall Maps that are mounted on cafeteria walls so that photos of what is being served that day and where it is from can be rotated and posted on the map. Photos of the costumes and map are available on the WSFFN website.

None of the stated expected measurable outcomes were long-term but it was expected that the relationships between schools and farmers would continue well past the life of the WSDA grant period. The project period goal was to increase specialty crop sales by $600,000, which we exceeded by over $400,000. In addition, the long-term economic impact will likely be much more significant since once relationships between schools and farmers are successfully established, and purchasing practices are institutionalized, school sales of specialty crops will sustain long beyond the project period.

FFS had two project goals:

- Increase district purchasing of WA grown fruits and vegetables by increasing each district's purchasing of fruits and vegetables by $5000 per district per year ($600,000 over the grant period);
- Increase the numbers of farmers selling directly to schools and secure 5-10 new farmers selling to each district.

FFS Accomplishments:

- FFS increased district purchasing of WA grown fruits and vegetables by at least $1,055,000 which exceeded our goal by $455,000.
- FFS increased farm to school sales for 33 farms, 9 produce brokers, and 2 major food distributors which did not meet our goal of securing 100 new farms selling directly to schools.

FFS served 137,000 K-12 students, greatly exceeding our original estimate of 16,000 students.

FFS completed three surveys during our project period to evaluate progress toward our goals and measurable outcomes. All surveys and data are available upon request.

The FFS benchmark survey gathered data from 18 of the 20 school districts originally included in the project. This baseline survey collected data on numbers of students enrolled, numbers of schools per district, numbers of free and reduced plus reimbursable meals, food service budget, kitchen equipment, food service staff, menu planning, nutrition programs, current and desired WA grown purchasing, plus number of farmer-vendors. Information was collected about perceived benefits and challenges of farm to school as well as what resources would be most helpful for school districts. At baseline, the majority of school districts reported not buying from any farmers directly, a few districts bought from two farmers and one bought from three while another bought from five farmers directly. Only four districts reported the dollar amount spent on WA grown produce: ranging from $350 spent by Riverview, $9,300 by South Whidbey, $36,000 by Wenatchee, to $45,000 spent by Northshore School District.

A mid project survey and a final survey was conducted to assess progress towards our targets in terms of money spent on WA grown specialty crops and numbers of farmers selling to schools. The results from Western and Central WA school districts are summarized below. Not all of the Eastern WA school districts provided the complete information to the regional coordinator.

Western Washington School Dollars Spent on WA Grown: At baseline 3 of 10 districts reported purchasing WA grown produce (Riverview, Northshore, and South Whidbey). At the mid-project review, 9 of 10 districts reported purchasing WA grown produce (all but Ocean Beach, which did not return a mid-project survey). At the close of the project, all 10 school districts (Coupeville included though they were not technically part of the survey process, Ocean Beach excluded) have purchased

WA-grown produce for their meal programs. Two school districts had no appreciable change in dollars spent on WA grown or reported spending less on WA-grown in year three compared to the baseline.

- *Evergreen- Chartwells-managed so no direct farm purchasing. Close to the Oregon border many locally grown purchases from produce companies are from Oregon rather than Washington.*
- *South Whidbey – Chartwells-managed so no direct farm purchasing for meal program (small amounts for special events). Also locally grown purchasing was not a priority for the food service director, but rather the Superintendent and surrounding community.*

Seven districts increased dollars spent on WA grown produce. Of the districts that increased purchases, three fell below the $5,000 per year goal in the last year of the program:

- *Naselle – $500, only one school*
- *Riverview - $3,963.98, problem-solving how to overcome limited staff time to prepare fresh whole foods.*
- *Pe Ell – $1,800, only one school*

Four districts exceeded the $5,000 per year goal

- *Arlington – 9 schools, $9,673 increase from baseline*
- *Northshore – 30 schools, $58,500 increase from baseline*
- *Mount Vernon – 9 schools, $30,476 increase from baseline*
- *Lake Stevens – 10 schools, $53,779 increase from baseline*

Number of Western WA Direct Purchase Farms: Compared to baseline, five of nine school districts have increased the number of farms purchased from directly:

- *Naselle (+4 farms)*
- *Lake Stevens (+1 farms)*
- *Pe Ell (+4 farms)*
- *Arlington (+3 farm)*
- *South Whidbey (+1)*

Three districts did not change:

- *Evergreen* – no change, Chartwells managed.
- *Riverview* - remained at 2 despite efforts to reach out to farm community via SnoValley Tilth, and due to anticipated limitations in ability to process more fresh produce.
- *Mount Vernon* - remained at 3 despite efforts to connect to additional farms in Skagit Valley Region. Some farms non-responsive and Food Service Director reported lack of time to contact those that did respond with interest in selling to schools.

And one district purchased from less farms directly:

- *Northshore* - purchased from 0 farms vs. 2 at baseline, reportedly due to lack of sufficient supply for such a large district, and inability of farms to deliver.

Central WA $ Spent on WA Grown: At baseline 3 of 6 districts reported purchasing directly from farmers (Wenatchee, Wahluke, and Tonasket). At the mid-project review, 5 of 6 districts reported purchasing directly from farmers (all but Tonasket which was a Chartwell-managed school food service). At the close of the project, all 6 school districts (having dropped Tonasket and Oroville and added Cascade and Ephrata) have purchased produce directly from farmers.

All school districts reported more dollars spent on WA grown (except Sunnyside which didn't provide this data) in year three compared to baseline.

- *Ephrata and Cascade had no previous baseline to compare with since they were only added in the last year, but both purchased WA grown.*

Five districts increased dollars spent on WA grown produce. Of the districts that increased purchases, one fell below the $5,000 per year goal in the last year of the program:

- *Cascade – $849, first year of the project*
- *Sunnyside did not report this data*

Four districts exceeded the $5,000 per year goal

- *Wenatchee – 14 schools, $59,955 increase from baseline*
- *Wahluke – 5 schools, $28,711 increase from baseline*
- *Ellensburg – 6 schools, $10,176 increase from baseline but no money spent that year and only $2,540 increase from first to second year*
- *Ephrata – 7 schools, $26,000 no baseline since first year*

Number of Central WA Direct Purchase Farms: Compared to baseline, five of six school districts have increased the number of farms purchased from directly:

- *Wenatchee (+4 farms) and one more in Fall 2013*
- *Wahluke (+4 farms)*
- *Ellensburg (+2 farms) and one more in Fall 2013*
- *Ephrata (+3 farms)*
- *Cascade (+2 farms)*

And one district purchased from less farms directly:

- *Sunnyside* - purchased from 1 farm vs. 2 at baseline, reportedly due to lack of time to follow through on school district's side.

Originally, it was estimated that approximately 100 farms would benefit from the project, but the direct buying relationship was challenging to establish. Sales were increased for 33 new farms selling directly to schools and 9 produce brokers. It was likely there were more direct farm sales to schools than reported during survey collection. Qualitatively, farmers confirmed that selling to schools provided many benefits beyond direct market sales, including non-tangibles such as raising farm visibility in their community and nourishing school-aged children.

BENEFICIARIES

The project benefits fruit and vegetable specialty crop farmers and K-12 students. Students in targeted districts had better access to fresh, unprocessed fruits and vegetables which improved their nutrition and farmers interested in selling to schools had access to new markets improving their economic viability. Originally it was estimated that approximately 16,000 school children would benefit during the three year project but the project ended up serving 137,000 kids, greatly exceeding the original estimate. It was estimated that approximately 100 farms would benefit but the project was not able to meet that outcome. It increased sales for 33 farms, 9 produce brokers, and 2 major food distributors.

In the 3 year grant period FFS school districts served 137,000 children and purchased $1,055,000 of Washington-grown specialty crops from at least 33 farms, 9 produce brokers, and 2 major food distributors. In 2012-2013, participating school districts purchased $672,065 in WA-grown produce, an increase of $589,790 from the beginning of the project. In 2012-2013 participating school districts reported purchasing from 44 farm sources, an increase of 28 farms from the beginning of the project. It

was difficult to accurately track the amount of pounds purchased, because each food item is tracked differently depending on unit of ordering (ex: case, bunch, each, lbs). In addition, it was challenging to collect purchasing data from all participating school districts so the WA Grown and Farmer totals should be considered a minimum amount. It is likely that more was purchased, but not tracked and reported.

LESSONS LEARNED

Project staff has provided the following insights and lessons learned from *Fresh Food in Schools*. The comments are organized geographically to best reflect the different regions and approaches across the state.

Insights from Central Washington: Key to successful farm to school programs are Food Service Directors and their kitchen managers who are committed to supporting local farms and assisting their kitchen staff to do more scratch cooking. Without this unwavering commitment, it is very hard to get farm to school programs off the ground in a climate of tight budgets and compressed time. Farm to school programs involve additional work (time) for all food service from the director to the kitchen staff so a philosophical commitment to feeding kids well and knowing who grows your food is essential. *Fresh Food in Schools* helped by providing positive public relations, media, and awards to incentivize and reward this commitment.

Equally important is finding farmers who are willing to look beyond the best price in order to sell to schools and who are willing to give of their time to connect directly with schools by hosting farm visits, cafeteria taste-testing, or other educational events in schools. Farm to School can provide the benefit of a year-round market and a weekly delivery (rather than an all-day farmers market) but quality needs to be high and price often has to be low in order to be competitive. Fresh Food in Schools project helped by promoting these farms through media and events which could increase sales in other channels such as parents of school-aged children visiting farmers market stands. Potentially beneficial rules and regulations, such as the geographic preference rule for locally grown foods and the six cent per school lunch reimbursement, have proven to be cumbersome for school districts heavily invested in farm to school programs. (http://www.fns.usda.gov/cnd/Governance/Legislation/certificationofcompliance.htm) All but one FFS participating districts in Central Washington attended a Geographic Preference workshop and all were given A School's Guide to Purchasing Washington Grown Produce, which describes in detail the federal and state requirements for using federal school meal money to purchase locally grown foods. They are slowly learning how to incorporate these preferences in their bidding procedures. For districts like Wenatchee, which buy the most volume from the largest number of farmers, it requires a more centralized and less flexible bidding process than historically used. In terms of the six cent certification, those school districts with the most scratch cooking have the hardest time documenting nutrient analysis for each recipe and whole food ingredient which does not come with a label on a box of processed foods.

FFS Farm to School Summits were successful venues for airing topics of concern to schools and farmers. Additionally, the networking among school districts and between schools and farmers was consistently evaluated as extremely useful. FFS has assisted schools by introducing innovative strategies to raise awareness of the importance of healthy eating through PTA presentations, Fuel for Life nutrition fairs, harvest of the month programs, school gardens, Taste WA Day maps, booklets, and stickers, as well as book lists that connect with seasonal produce, videos, and wellness policy contests.

Insights from Eastern Washington: As farm to school matures, it will be critical to identify and specifically target those services that are most needed by school districts. Districts would benefit from a "best-practices" analysis to determine which areas of support, promotion or capacity building would

provide the most value or be the most needed. With the large school districts, the quantity of Washington grown food needed is a significant challenge. Partnering local farms with a district as large as the Spokane School District, which is the second largest in the state, serving 20,000 meals per day across 55 schools, can be challenging. A feasibility and capacity analysis within the farming and distribution industries would be helpful to support a significant shift in local food procurement from the larger districts.

Insights from Western Washington: Generally speaking most Food Service Directors are just too busy to review lots of bids, or change their purchasing behavior significantly. Especially in light of the new national school meal pattern requirements, directors over the last two years were all-encompassed with menu changes and new reporting processes. Over the grant period they tended to contract with, and/or purchase mostly from, produce companies, brokers and/or stick with their current distributors. Districts were encouraged to ask for local when using their current distributors, to consider three to four local farm options, and to connect with food hubs. We also encouraged each Food Service Director to attend one of the regional WSDA "How to Buy and Serve WA-Grown Food in Schools" workshops to become more familiar with the regulations and strategies to purchase locally grown and network with, and learn from, their peers. Five of the ten Food Service Directors attended this training in 2013, and the remaining Directors will be encouraged to attend an upcoming training in 2014.

Central WA Unanticipated Outcomes:

- Unanticipated results in Central Washington included the sharing of farm-to-school and scratch cooking practices amongst school districts through connections made by the regional coordinator and also informally through farm-to-school summits and other food service director meetings. Furthermore, work with school district wellness policies and connections with government representatives that helped to institutionalize farm to school priorities has been a welcome but somewhat surprising result.
- Dropping two school districts which were managed by Chartwells and not able to connect directly with farmers (Tonasket and Oroville) freed up time and resources to bring two other school districts into the Fresh Food in Schools project. Ephrata and Cascade schools had expressed interest in establishing farm to school programs in their districts after learning about the experiences of their neighboring school districts like Wenatchee and Wahluke. Since joining the FFS project in October 2012, Cascade and Ephrata have made substantial progress towards meeting project indicators.
- ***Cascade School District*** is a recent addition to the project and enjoys strong support from the Cascade SD Superintendent who told the new Food Service Director that his interest in farm-to-school helped secure him the job. Cascade has put on quarterly Harvest of the Month events at their three elementary schools featuring pears, apples, and asparagus from local farms. They have brought in local chefs to participate in these events and help staff see the advantages of scratch cooking. Kent Bevers, the food service director, has visited the local farmers market to connect with potential farmer-vendors who want to be on his contact list for local produce bids. One of these farms is Hope Mountain farms who provided the fingerling potatoes that were roasted and featured for Taste WA Day in all Cascade schools.
- ***Ephrata School District*** has worked closely over the last year with a couple of local farmers to host various farm to school events. They built two school gardens at the elementary schools and a local farmer helped students plant seeds and learn about how food grows. For their end of the year barbecues last June, Ephrata staff served locally grown foods to students, parents, and staff while three local farmers offered taste tests of radishes, greens, and beans. Ephrata Schools were selected as one of only eight $1,000 Farm to School Month planning grant recipients nationwide, and the only district from Washington State. With a match from WSFFN, Ephrata School District was able to invite Chef LJ Klink to give a one-day knife skills and scratch cooking training for food service staff in August. Their Taste WA Day

featured "carrots with tops on" from Cloudview Ephrata farm and Farm to School Month in October highlighted local agriculture with FFA students and sent 17 classrooms of elementary students on farm field trips. I-Fiber news reported on the excitement that accompanied Ephrata's Food Day events:*http://www.youtube.com/watch?v=kUJG639ycng&feature=share&list=PLytlIp3or3g1Blbe9s88eI4RaJExSncql*

- ***Ellensburg School District*** hired a new food service director with a keen interest in farm-to-school when their previous director retired. Despite limited experience and school kitchens that were out of service due to remodeling, Allissa Eiser (FSD) was able to set up at least three local farmers as vendors in her first year and buy directly from them. Ellensburg has conducted several farmers-in-the cafeteria tastings, a nutrition fair featuring locally grown carrots, three Taste Washington Day events, and student competitions for eating healthy lunches. Allissa has visited two local farms to find out how their produce is grown and has been innovative in using social media to promote Ellensburg's fresh school lunches. For all these reasons, she was selected as one of WSFFN's local food champions. *(See newsletter article about latest Taste WA Day)*
- ***Wahluke School District*** is one of the stars of farm to school because school food service director, Diane Hyndman, has sought ways to institutionalize this program and become far less dependent on outside assistance. Last year, all three Wahluke elementary schools were awarded a gold medal with distinction through the Healthier US Schools Challenge (HUSSC) program and this year, Wahluke District is revising their wellness policy to include a provision to use local, fresh produce whenever possible. Diane has held a chef training for her staff to promote scratch cooking and created a year-long harvest of the month schedule with featured produce on the lunch menu at least 3 times in the month. Farmers are invited into Wahluke cafeterias often to sample produce and librarians share 'fun facts' or read stories like Sylvia's Spinach, in conjunction with the cafeteria tasting. Taste WA Day is a perennial favorite for Wahluke students and this year, Wahluke schools had an all-Washington grown meal including ground pork, navy beans, and a variety of fresh fruits and vegetables.
- ***Wenatchee School District*** is probably the largest volume buyer of farm direct produce in Central Washington. With dedicated kitchen managers willing to support scratch-cooking and a director trained in culinary arts, Wenatchee Schools food service tries to serve Washington grown foods everyday not just on Taste WA day. They instituted a new bidding process for farm-vendors and bought close to $90,000 worth of farm-direct produce last year. Wenatchee runs an established Harvest of the Month program in all 7 elementary schools, a farmer in the cafeteria taste-test program in the secondary schools, nutrition fairs, and end-of-the-year barbecues with local foods every June. Food Service director, Kent Getzin, shares his support for local farms and scratch cooking skills with other school districts statewide and nationally through the Farm to School peer leadership group. Wenatchee School Board approved a revised wellness policy that prioritizes locally grown foods and the Superintendent approved funding for their Farm to School video (http://home.wsd.wednet.edu/?q=content/food-services). They are moving towards forward-contracting with farmers, locally grown protein sources, food waste reduction, and a new culture of wellness in their schools.
- ***Sunnyside School District*** participates in farm-to-school mobile tours, summits, and workshops. As a Provision 2 school district, Sunnyside provides free lunches to all students and fresh fruit and vegetable snacks. The district buys from four local farms which are featured in cafeteria signage and on their nutrition services website. Sunnyside high school students serve as fresh produce mentors for younger students during Taste WA or harvest of the month events.

Eastern WA Unanticipated Outcomes:

- Cheney School District elected to prioritize WA grown procurement as part of a broad-based shift in their nutrition and student health programming and policy. This culminated in the district establishing a Harvest of the Month program which is featuring a new WA grown item every month of the school year. The program was inspired by the farm to school work being supported in neighboring districts by FFS. Cheney's shift initially focused only on scratch cooking, which while fantastic for students, did not focus on WA sourcing or a priority on connecting with farmers. As the school was introduced to the work of FFS, they became excited about the model and invited FFS's direct support. Being able to offer this support helped Cheney quickly scale up its vision to the Harvest of the Month model, and to begin seeking out WA grown items to source on a more constant basis.
- For the last 2 years, the Empire Health Foundation, a hospital-system associated foundation with one of the more substantial endowments in NE WA and serving 5 counties in the northeastern part of the state has put a major focus on school meal programs and nutrition. While supportive of local purchasing and interested in collaboration, it was secondary to getting whole foods into schools, with an emphasis on scratch cooking. The enthusiasm from several partner school districts connected to FFS (Othello, Spokane & Cheney), the Foundation has shifted its interest toward WA grown produce and currently has a staff person supporting Cheney and Spokane District efforts to conduct Harvest of the Month programs. This shift likely came with the Foundation recognizing the community support associated for farm to school, and general enthusiasm for ideas like Harvest of the Month. After attending the 2013 FFS summit in Moses Lake, Othello District's nutrition services director told EHF that she would prioritize WA grown procurement in her cooking as she thought it was an important way to advance their scratch cooking efforts.
- Many districts have emphasized the desire to purchase WA grown fruits and vegetables but prefer to work through regional distributors including produce companies and larger members of the supply chain (Sysco, FSA, etc). The conversations have stimulated the distributors to identify more WA grown products and to emphasize those partnerships.

Western WA Unanticipated Outcomes:

- FFS decided to drop several school districts that were not compliant with our original letter of agreement. Dropping one of these districts (Ocean Beach), allowed our western Washington coordinator time to support a start up farm to school effort in ***Coupeville School District***. This district has a strong work group comprised of community, farmers, teachers, food service director, and Health Department staff. The group has met regularly since March 2013 and has already completed the WSDA farm to school start up kit, set goals and objectives, and executed their first Taste WA Day event at all three schools to kick-off farm to school! The event caught the attention of the Superintendent, who has requested a meeting to discuss how the school district can work even more cooperatively to support these efforts; as well as the PTA and School Board, which have requested the group to present about farm to school efforts at their next meetings in November.
- ***South Whidbey School District*** staff was invited the Good Cheer Food Bank to revive the school garden program, and work toward getting school garden produce into school meals! Cary Peterson, Director of Good Cheer, recently presented to the food service staff, and is working with Chartwells school garden representative on becoming a pilot/model program for getting produce from school gardens into the cafeteria.
- ***Mount Vernon School District*** recently joined with other school districts in the region to hire a shared nutritionist, specifically to work on streamlining menus, farm to school purchasing, and wellness policies.
- ***Arlington Public Schools*** developed a fabulous request for quotes that institutionalizes the inclusion of local growers when ordering and contracting for food. They also applied for

and received a grant from the Stillaguamish Tribe that helped them install salad bars in all nine schools to increase capacity to serve fresh, locally grown fruits and vegetables. Arlington Public Schools received a Fresh Food in Schools Champion Award in 2013. This district has also been selected by the Washington State Department of Agriculture (WSDA) to pilot a forward contracting process!

- ***Lake Stevens School District*** Food Service Director Mollie Langum received a Fresh Food in Schools Champion award in 2012 for her work integrating WA-grown purchasing into every day food service, serving fresh and locally grown on salad bars in all schools on a daily basis through DoD Fresh.
- ***Northshore School District*** has implemented a Harvest of the Month program to highlight at least one locally grown item during lunch each month.
- ***Riverview School District*** Regularly participates in Taste Washington Day each September, bringing Future Farmers of America students from high school into the elementary schools to prepare and help students taste the freshest produce from farms just down the road. Last year elementary students visited nearby Oxbow farm to help plant potatoes in Spring, returned in fall to help with the harvest, then sampled their own potatoes at lunch – roasted, crispy and delicious!
- ***Pe Ell School District*** hosted a Taste Washington Day lunch on September 25, 2013, and counted amongst their guests First Lady Trudi Inslee. The Superintendent and Principal both participated by cutting fruit to order for the students at the fruit bar. Missie Holmes, Food Service Director, received a Fresh Food in Schools Champion Award in 2012, for her dedication to cooking everything from scratch and purchasing from nearby farms as much as possible.
- ***Naselle-Grays River Valley School District*** declined to renew their Chartwells contract in 2012, returning to a self-managed system. The staff is a dynamic duo that purchase from local farmers as much as possible, and cook everything from scratch! Barb Cenci, Food Service Director, received a Fresh Food in Schools Champion Award in 2012.

Evergreen School District piloted their first Harvest of the Season event, bringing culinary students from high school to an elementary school to wear fruit and vegetable costumes, and encourage students to try spanikopita with WA grown spinach, roasted potatoes and fresh pears.

- **School district size:** Larger districts tend to have more challenges with purchasing directly from farms because they have less staff time to make multiple smaller orders, and because it has been difficult to find farms of the right size to fill and deliver the amount of produce requested at once. Smaller districts have time to make multiple small orders and develop relationships with farms, but order small quantities that may not qualify them for delivery from larger farms or farms from farther away in the state. These schools also often tend to be in rural, isolated areas where delivery may be challenging in general. Strategies to overcome this issue included locating and touring new farms with FSDs in smaller - midsize districts, and encouraging FSD's to start by requesting WA-grown from their local produce companies and current distributors.
- **Scratch cooking limitations**: Many Chartwells managed schools, and others, have limited equipment for processing whole fruits/vegetables. Schools that do have equipment, have limited staff time to dedicate to processing whole fruits/vegetables due to tight budgets. Strategies to overcome this issue included helping to locate grants to purchase kitchen equipment or local processors to process whole foods, and connecting food service programs to other resources such as Future Farmers of America Students, Culinary Program students, and parent volunteers who can help process fresh produce and volunteer in cafeterias.
- **New School Food Regulations**: While fabulous for the health of our kids, and a great tie-in with farm to school goals since it mandates increased fruit and vegetable variety and

servings – has tied up FSD's time and resources for the last two years, making it more difficult to get F2S on some FSD agendas. It is just lower on the priority scale, and tougher to reach FSD's, even those who are really on board with F2S.

- **Chartwells Managed Districts**: Overall, Chartwells schools have proven to be difficult to work with due to company policy that requires farms to have $5 million in liability insurance and GAP certification in order to be a supplier (even though the produce companies they contract with source from farms that do not always meet these criteria). So districts with Food Service operations managed by Chartwells contractors do NOT purchase directly from farms, though they may source WA Grown through their produce company/other food supplier. One Chartwells district circumvented this in a small way by purchasing direct from a farmer for food samples served outside of the normal food program (South Whidbey), but this is a small amount, and not a usual practice. We have attempted to work with farms to get them information about GAP workshops in their region, so they can learn more and potentially get certified. We also encouraged farmers to collaborate to bring a GAP auditor out together and split the travel costs, to reduce cost to area farmers. So far smaller farmers in Western WA have not taken advantage of this, and we continue to work with them to problem solve. One larger farm on Whidbey Island is in the process of getting GAP certified, and Coupeville School District plans to purchase directly from them as soon as the certification comes through! We have also attempted to develop relationships with Chartwells Food Service Directors in larger school districts to try to overcome the obvious barriers, by purchasing more WA Grown through local produce companies (such as Duck) or larger distributors (such as FSA).
- Some of our expected measurable outcomes were not reached in each school district (numbers of farmers added or dollar amount increased) because this was challenging for smaller-sized districts in contrast with larger districts. Also, some districts had unforeseen circumstances, such as new food service directors or on maternity leave, kitchens that needed remodeling, changes in Provision status which required extra paperwork, and all districts experienced new USDA guidelines. These circumstances took time and focus away from nascent farm-to-school programs.
- Two partner districts - East Valley of Spokane and Northport SDs - both were nearly entirely unable to participate in the partnership. Furthermore, most Eastern WA districts provided little or no baseline or mid-term data, and all districts had a difficult time implementing their letter of agreement. Not all districts were really prepared to undertake a farm to school program, and several, while enthusiastic, did not understand what was needed, even though they had theoretically agreed to terms and had been signed up for collaboration earlier in the project. These limitations made navigating relationships and delivering goals very difficult in some situations. That said, Othello, Cheney and Spokane Districts have a fantastic 2013-14 school year underway.

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ADDITIONAL INFORMATION

See Report 12-25-B-1102 Attachment F for Additional Information

To date a total of $70,000 cash and $24,000 of volunteer hours have been contributed to the project. $50,000 has been contributed to the project by a grant from the Washington Women's Foundation and $10,000 was contributed by a grant from the Whatcom Community Foundation. These grants and additional cash and organizational support from WSFFN allowed staff to manage the project, provide supplies as needed, enabling the project to be continued at a reduced level after the WSDA grant was

completed. In addition, numerous volunteer hours were donated to help with the FFS Summits as well as Board member's volunteer time to guide and direct the organization. WSFFN Volunteers and project partners have donated approximately 960 hours valued at $25/hour for a total in-kind contribution of $24,000.

Fresh Food in Schools generated a tremendous amount of publicity around its outreach activities and champion awards and successfully raised the awareness of local agriculture and the benefits of the farm to school movement. The project was mentioned in articles across the state, some of which we have included as attachments to this report. Project coordinators have participated in the following outreach opportunities: PTA Annual Statewide Conference (SEATAC), WSNA Conference (Vancouver WA), Tilth Producers of WA workshop (Yakima WA), WSDA Farm to School bus tours (Snohomish, Chelan Counties), GAP Farmwalk (Whatcom Co), Puget Sound Wholesale Market (Skagit Co), Farm to Table (Pierce and Yakima Co), a CPPW Farm to School Workshop (King Co), Washington Center's Bioregional Sustainability Conferences in Wenatchee and Spokane, Washington School Nutrition Association's annual conference, PCC Annual Membership Meeting, an Everett based conference for Pre-School owners and managers.

WSFFN produced a short video summarizing the *Fresh Food in Schools* project: http://www.youtube.com/watch?v=qjUgUZJcxFM

WSFFN produced a Taste WA Booklet to help younger readers learn about Taste WA day. WSFFN also produced a 6x4 ft. wall map for cafeteria walls that allow the location of the food grown to be located on the map. Both resources are available on our website. www.wsffn.org

Wenatchee School District, one of our participating districts also produced a video on their successful farm to school program which highlights our FFS Coordinator Joan Qazi. http://www.youtube.com/watch?v=zJDgINrCakw

Ephrata School District food day assembly and their farm to school monthly activities were highlighted in this newscast: http://www.youtube.com/watch?v=kUJG639ycng&feature=share&list=PLytlIp3or3g1Blbe9s88eI4RaJExSncql

It has been an exciting and rewarding project to implement and WSFFN is grateful to WSDA for supporting the project.

PROJECT #10

Project Title: Reducing Barriers to Farmland Access for New and Beginning Farmers

Partner Organization: Cascade Harvest Coalition

PROJECT SUMMARY

The future of Washington's specialty crop industry depends on the ability of the next generation of farmers to access farmland and establish economically viable farming operations. This project, *Reducing Barriers to Farmland Access for New and Beginning Farmers*, connected current and future specialty crop producers with each other and resources, building new skills, relationships and pathways towards successful farmland transfer. Primary barriers and needs which beginning farmers and current farmland owners encounter when accessing and transferring farmland are financing for land purchase and capital investment, gaps in experience and knowledge transfer, a need for innovative farmland transfer arrangements and connection to current or aspiring farmer populations. This project worked to address these financial, knowledge and legal needs that beginning farmers and farmland owners face and helped build new skills, business relationships and connections between the two groups and supporting organizations.

Despite the importance of agriculture and increasing demand for locally produced food, if Washington follows national trends, 70 percent of farmland will change hands in the next 20 years as the average age of farmers in the state approaches 60 (57 and 58 years, respectively, in Washington and the Puget Sound region) – a crisis that, if not addressed, will forever change the face of Washington agriculture. Most current farmers do not have plans for transitioning their farmland to the next generation and many will end up selling their land for non-farming uses. This is particularly critical for Washington's specialty crop producers who farmed nearly 945,000 acres and generated a farm gate value of just over $4 billion in 2007. This represents 28% of the value of all agricultural products sold in Washington in 2007 (USDA Ag Census 2007). Without effective ways of bringing in new farmers, this farmland and the value of crops is threatened. Sustaining a healthy specialty crop industry depends on the ability of farmland owners to identify profitable alternatives to non-farming development. Providing new and beginning farmers and farmland owners with the resources they need to identify and structure successful land tenure arrangements is critical to protecting Washington's agricultural land resources.

This project did not build on any previously funded SCBGP project.

PROJECT APPROACH

- A total of 15 workshops and Joint Networking Sessions (JNS or networking events) were completed, serving approximately 603 participants; including 141 specialty crop producers, 305 land seekers, 183 landowners and 115 agriculture support staff or others. 195 of the 603 participants joined workshops through online webcasts from around Washington State and the nation. Content of workshops and networking events were developed based on participant needs and continually modified to bring in new resources or address important focus areas.
- Research was compiled on alternative land tenure models focusing on successful transitions in Washington and the US. This document was entitled, "Farmland Changing Hands" and focused on local and national case studies of successful farmland transfer; including working with a land trust to reduce the cost of purchasing land, leasing land from a public entity, owner financed sales and innovative lease arrangements. This document was also translated into Spanish and shared online.
- Web-based pre-workshop 'readiness' surveys were developed and used to collect responses which helped shape future workshops, networking events and the development of new resources. Workshops on legal and insurance issues around leasing, alternative ways to

purchase farmland and succession planning were pursued because of needs identified in surveys.

- FarmLink gave presentations at 17 workshops and conferences, providing outreach on land transfer models and other useful transition resources to over 486 attendees. FarmLink spoke with hundreds of aspiring and beginning farmers as well as landowners looking for more information and ideas about how to reach their land transfer goals.
- The FarmLink website was upgraded to manage on-line registration tools, provide online land transfer resources and to list and map properties available for lease, sale, partnership or other type of transfer as well as to share profiles of members seeking farmland. The upgrade will allow landowners and land seekers to more easily communicate with each other and to connect to resources.
- FarmLink assisted in 7 land linkages during this project period, representing land leasing agreements or property purchases between farmland owners and land seekers. It was found that making linkages was difficult given the diverse needs and skills of participants and that it was more realistic for FarmLink to work closer on creating connections that could help land seekers and landowners overcome barriers and move towards farmland tenure. The initial target of 25 land linkages was expanded to include enrollment in educational and experiential programs and courses, showing participant's desire to get the skills they need to work towards developing a sustainable farm operation.
- WSU Extension – WSU Extension provided webcasting technology and staffing to live stream and record workshops online. This webcast ability allowed specialty crop growers and beginning farmers from around Washington State and the nation to view workshops held in any location or view after the workshop had ended. Webcast participants were able to see live video of the presenters, see PowerPoint presentations, participate in online surveys and ask questions through a chat feature throughout the workshops. WSU Extension staff also provided valuable input about local speakers for workshops and advised on development of relevant workshop content.
- Project Steering Committee – The project steering committee was comprised of the following organizations: Cascade Harvest Coalition, WSU Extension, WA Young Farmers Coalition, Snohomish Conservation District, Pierce Conservation District, Coldwell Banker Bain, NW Farm Credit Services, Grow Food, Viva Farms, Kulshan Community Land Trust, PCC Farmland Trust, King Co Agriculture Programs, Office of Farmland Preservation, Full Circle Farm, Tahoma Farms/Terra Organics, Sno-Valley Tilth, Evergreen State College, Willie Green's Organic Farm, Cha's Farm, Island Meadow Farm and Re-Leaf Landscape Design. The steering committee helped provide input on content and timing of workshops and networking events as well as reviewed the "Farmland Changing Hands" document. Steering committee members also participated in this project through their partnership to help promote workshops and invited FarmLink to present at their events when appropriate. These organizations continue to assist with resources and connections for project participants.

Approximately 141 specialty crop producers attended workshops and networking events funded by this project. Because of the high demand and usefulness of farm transition information provided at workshops, networking and outreach events, this project also naturally served other essential participants from the farm community, including some commodity producers, forest owners and agricultural service and support providers. However, the majority of participants this project served were either looking to or currently operating diversified farms, often on smaller acreage, focusing on the production of at least one or more specialty crops. Priority for workshop registration and workbook availability was given to specialty crop producers. Additionally, a small registration fee of $10-15 was occasionally charged to cover additional food costs for non-specialty crop registrants.

Workshop and networking participants filled out a registration questionnaire administered through Brown Paper Tickets that asked specifically about production interests. The fees raised were used to cover the costs of the workshop for non-specialty crop producers. However, it should be noted that the majority of participants were specialty crop producers or those interested in producing specialty crops. Non-specialty crop producers were primarily agriculture support professionals (e.g. farmland trust, Farm Credit Services, Conservation District, WSU Extension, etc.) that were in attendance to provide support or as land owners looking to transfer land to new farmers.

GOALS AND OUTCOMES ACHIEVED

"Goal: 200 participants will have improved: understanding of the risks/benefits of alternative land tenure models and ways that non-ownership tenure arrangements can lead to farm ownership; awareness of tools to keep farmland ownership costs down and other asset management tools; assess their priorities and identify which attributes of a farm property are necessary, desirable or optional and other business and strategic planning tools; and skills to effectively communicate expectations and long-term goals" (K531 Contract).

This goal was ultimately achieved through workshops/JNS, development of the "Farmland Changing Hands" document and website tools and updates.

FarmLink completed all 15 workshops—5 Beginning Farmer, 5 Farmland Owner and 5 Networking Events—developing workshops based on needed skills and resources identified by landowners and land seekers. Centrally located sites were chosen to accommodate local farm populations as well as support local partnerships with other agricultural organizations. Networking events were held on farms that offered good examples of farm management, had undergone successful transfer arrangements or were available for lease, sale or partnership.

This project also included research about alternative farmland transition models. FarmLink researched local and national case studies of alternative ways landowners and land seekers had successfully arranged farm transfer or land access. The document was made available as a hard copy or online and was also translated into Spanish and shared with Latino farm programs as possible. This research was used as a basis for curriculum in workshops and presentations.

The FarmLink website was upgraded to manage on-line registration tools, provide online resources and to provide a list and map of properties available for lease, sale or another type of transfer as well as to share profiles of members seeking farmland.

Workshops and Networking Events:
Beginning Farmer Workshops

1. 5/2/2011 - FarmLink Land Seeker workshop, Everett
2. 12/5/11 - Beginning Farmer, Spokane
3. 2/2/13 - Farmland Changing Hands Workshop, Sequim
4. 8/21/13 - Resources for Aspiring Farmers, Everett
5. 9/30/13 - Ground Rules of Leasing Farmland, Olympia

Farmland Owner Workshops

1. 9/22/11 - Landowner Workshop, Everett
2. 10/24/12 - Ground Rules of Leasing, Lynden
3. 3/21/13 - Ties to the Land Succession Planning I, Monroe
4. 3/28/13 - Ties to the Land Succession Planning II, Monroe
5. 9/23/13 - Alternative Farmland Purchasing Options, Burlington

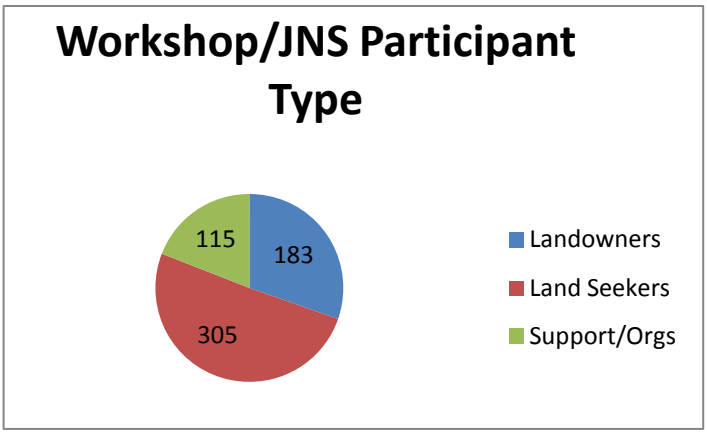
Joint Networking Sessions (JNS)

1. 6/22/11 - FarmLink Matchmaking Event (Full Circle Farm), Carnation
2. 3/10/12 - FarmLink Matchmaking Event w/PCC (PCC Farmland Trust property), Orting
3. 6/2/12 - FarmLink Matchmaking Event (Dog Mnt. Farm), Carnation
4. 12/8/12 - FarmLink Matchmaking Event (PCC Farmland Trust property), Puyallup
5. 5/4/13 - FarmLink Matchmaking Event (Weiks Nursery), Kent

About workshop participants:

Workshops and networking events worked with approximately 603 landowners, land seekers and agricultural support staff/others. Over 195 participants joined workshops online through webcasts. Approximately 141 of the 603 participants were specialty crop producers. Approximately half of workshop and networking event participants—305 land seekers—were either already farming specialty crops or indicated they were working towards specialty crop production. Landowner participants also were specialty crop producers or had land they wanted to transfer to a new farmer. Overall a majority of participants were interested in starting, growing or transferring land to smaller-scale (5-40 acres) diversified farming operations including specialty crop production.

Workshop/JNS Participants: Landowners, Land Seekers & Agricultural Support Orgs/Other				
	Total	**Landowners**	**Land Seekers**	**Support/Orgs**
Y1 - Total	122	17	74	31
Y2 - Total	93	15	53	25
Y3 - Total	388	151	178	59
Total	**603**	**183**	**305**	**115**



Workshop/JNS Participants: Specialty Crop Producers		
	Total	**Specialty Crop Producers**
Y1 - Total	122	11
Y2 - Total	93	7
Y3 - Total	388	123
Total	**603**	**141**

Workshop/JNS Participants: Webcast Users		
	Total	**Webcast**
Y1 - Total	122	17
Y2 - Total	93	6
Y3 - Total	388	172

Total	**603**	**195**

One of the project tasks was to conduct beginning farmer and landowner outreach about workshops and to share the new research and tools developed through the project. This grant allowed FarmLink to leverage additional dollars to pursue over 17 outreach presentations, reaching an estimated 486 aspiring, new and retiring farmers, farmland owners and agricultural support staff and organizations. FarmLink gave presentations at community and partner events about finding and transferring farmland and shared resources. "Farmland Changing Hands," findings were also shared in these presentations.

Presentations by WA FarmLink	**Estimated Number of Attendees**
3/3/12 - Farmland Purchasing Options & Due Diligence w/ Pierce Conservation District, Gig Harbor	30
3/14/12 – Seattle Tilth Farm Works Incubator Class, Kent	30
3/17/12- Mentorship Event w/Sno Valley Tilth, Carnation	30
5/3/12 – Agriculture Commission Summit (King, Pierce, Snohomish, Kitsap), Woodinville	55
8/11/12 - Bainbridge Island Networking Event w/ Kitsap Conservation District, Bainbridge Island	17
8/21/12 - FarmLink 101 Workshop w/WSU Snohomish County Extension, Everett	47
9/28/12 - Inland NW Small Farm Expo, Spokane	25
10/1/12 - WA Office of Farmland Preservation Summit, Snoqualmie	40
11/28/12 - WA Association of Conservation Districts Annual Meeting, Cle Elm	30
2/9/13 – Kitsap Small Farm Expo, Bremerton	25
3/16/13 – San Juan Co. WSU Small Farm Expo, Friday Harbor	25
3/17/13 – Vets Café, Olympia	8
4/2/13 – WSU Cultivating Success, Succession Planning, Snohomish Co. WSU, Everett	18
4/4/13 – Seattle Tilth Farm Works Incubator Program, Kent	17
4/26/13 – American Farmland Trust, Planning for Agriculture in the Puget Sound Region Conference, Seattle	28
6/2/13 – Mother Earth News Fair, Puyallup	43
9/27/13 – Ground Operations, Veterans in Farming Movie Screening, Tacoma	18
Total	**486**

<u>Performance Measure</u>
"Performance Measure: Web-based post-workshop surveys will be developed and implemented to measure increased awareness and understanding of the various land tenure models and risk management

tools, as well as see what steps workshop participants have taken with regard to managing specific risks, and to document new beginning farmer/landowner relationships one-year after the workshops".

Surveys completed before and after workshops helped shape future workshop content and the development of new resources. Surveys also measured behavior change, areas where knowledge increased and asked if participants were specialty crop producers.

Respondent quotes from workshop surveys:

What has this workshop inspired you to do?

"Provided greater scope of what it is to become a farmer. Great planning and beginning strategies to think about before purchasing or leasing land." – land seeker

"I am considering taking the Cultivating Success courses, whereas I hadn't thought much about farming education before." – land seeker

What are your barriers?

"I've recently inherited farmland, so understanding fair values and terms / conditions of leases is the most daunting. Many of the potential "farmland seekers" I've been talking to want long contracts, so I want to be sure I develop an mutually beneficial agreement if it's going to exist for years." – landowner

What do you want to see in future workshops?

"More discussion of farming mentorship programs, or advice specifically geared to beginning farmers, lessons learned, best practices, etc.." – land seeker "lease to own" – land seeker

- Outreach is ongoing. More and more aspiring and beginning farmers and current farmland owners are seeking information and connection as they work towards farmland transfer. In Year 3 of the project, FarmLink received over 65 new calls or emails from landowners or land seekers who had not yet participated in a workshop and were looking for information, connections and resources.

- Land linking is a long-term goal and process. The database of land seekers and landowners created through this project alongside updates to the website will allow for increased communication, better distribution of resources and more future land linkages.
- All activities indicated in the initial project contract were completed (see Question 7 for details on activities). Workshop participation exceeded the goal of 200 participants with approximately 603 workshop and networking event attendees. Outreach was also well supported through 17 presentations and the development of new partnerships including local Conservation Districts, farm non-profits and national farm organizations. FarmLink worked most with community partners, especially local WSU Extension offices, Conservation Districts and beginning farmer programs, to identify potential landowners and land seekers to attend workshops and for linking. These new and strengthened partnerships were an added accomplishment of this project.

<u>Target</u>

"Target: 25 relationships made through an updated criteria - a relationship can include a program participant who made a connection outside the FarmLink membership. Connections could include:

- 1. Enrollment in agricultural course or program placement: i.e. WSU Cultivating Success, an incubator farm (Seattle Tilth, Viva Farms, etc.), Community College business or skills courses, Evergreen State College, etc.

- 2. Farmer-landowner link – forming a new lease, sale, employment or partnership arrangement" (K531 Contract Amendment 2013).
- The initial target of 25 land linkages was amended after Year 2. FarmLink conservatively reports 7 direct land linkages resulting from this project. The target was amended to include the enrollment of participants in educational or experiential farm programs and courses. It is estimated that at least 20 enrollments were due to connections resulting from project activities. Another 18 non-enrollment connections were reported by survey respondents including, forming a farm partnership, a land purchase, lease arrangements and employer/employee agreements.

- Staff realized during the project that important linkages were being made as participants needed to build experience, education and skills. Each landowner and land seeker had unique needs and barriers. Staff also realized that making a solid match takes time and immense energy from both parties to complete. FarmLink learned it was more realistic for the participant and program staff to approach farmland transfer from the perspective of a continuum. Every landowner or land seeker came to the project with a diverse set of needs and FarmLink worked with them one-on-one and through workshops and resources supported by the project to help them take a next step, ultimately leading towards future farmland tenure.

- FarmLink was successful in directly aiding in 7 farmer-landowner links; 2 matches in the first Year, 2 matches in Year 2 and 3 matches in Year 3. These matches included 5 farmland lease arrangements and 2 property purchases by beginning farmers. This is a conservative number, reporting only those linkages where FarmLink had provided direct matching services. There are more connections with which FarmLink had provided assistance. Landowners and land seekers who participated in the project had very diverse backgrounds, expectations, levels of farming experience and future plans. Staff worked with each member one-on-one to find resources and connections for whatever participants needed to move them closer to accessing or transferring land. When asked about behavioral change, workshop attendees reported being ready to take a next step towards their goal. Post workshop surveys indicated that participants also met new landowner or land seeker contacts.

FarmLink - 2/2/13 - Sequim - Farmland Changing Hands

Did you meet anyone who you plan to contact after this event? (may not apply to webcast attendees)		
Answer Options	**Response Percent**	**Response Count**
Yes	66.7%	18
No	33.3%	9
	answered question	**27**
	skipped question	**9**

FarmLink administered a survey at the end of Year 3 of the project asking respondents to indicate connections they made during the project—connections included forming a land tenure arrangement or seeking more education and experience. 52 respondents indicated they had made 38 connections (some made multiple connections); 20 had enrolled in an education course or program, 7 had formed a new farm partnership, 3 had set up farm leases, 3 had enrolled in an incubator farm program, 3 had been hired as an employee or intern on a farm, 1 had found an employee to work on their farm and 1 had purchased a farm.

FarmLink Connections Survey 9_2013

What connections have you made through WA FarmLink over the past 3 years? (Please mark all that apply)		
Answer Options	**Response Percent**	**Response Count**
None	34.6%	18
Enrolled in an agricultural education course or program (i.e. WSU Cultivating Success, Evergreen State College, Community College, etc.)	38.5%	20
Joined an incubator farm (Seattle Tilth Farm Works, Viva Farms, Greenbank Farm, etc.)	5.8%	3
Purchased a farm property	1.9%	1
Leased a farm property	5.8%	3
Formed a new farm partnership	13.5%	7
Hired as an employee or intern on a farm	5.8%	3
Found a farm employee or intern	1.9%	1
N/A	13.5%	7
Other (please specify)		20
	answered question	**52**
	skipped question	**0**

This survey also asked respondents to report any increase in knowledge around farm transfer issues. Out of 52 respondents (allowed for multiple responses), 21 indicated an increase in their understanding about ways to purchase, lease or transfer farmland, 20 indicated a better knowledge of local farm networks, 16 learned more about succession planning, 15 indicated an increase in understanding about business and financial resources and 33 gained a better general understanding of overall resources.

FarmLink Connections Survey

After working with staff or attending workshops, did your understanding increase in any of the following areas: (Please mark all that apply)		
Answer Options	**Response Percent**	**Response Count**
Ways to purchase, lease or transfer farmland	40.4%	21
What to look for in a farm property	28.8%	15
General resources available to help you accomplish goals	63.5%	33
Ability to access your priorities and goals for farming	21.2%	11
Business and financial planning resources	28.8%	15
Succession planning resources	30.8%	16
Local farm networks and organizations	38.5%	20
No increase in understanding or knowledge	17.3%	9
Other (please specify)		5
	answered question	**52**
	skipped question	**0**

Surveys were also administered at the end of every workshop and JNS. Participants were asked about a next action they would take after attending the workshop as well as if their knowledge had increased in the areas addressed at the event. Participants generally felt they had increased their knowledge after workshops and were inspired to pursue a next step.

FarmLink - 2/2/13 - Sequim - Farmland Changing Hands

After today's event, do you plan to...? (mark all that apply)		
Answer Options	**Response Percent**	**Response Count**
Learn more about options for farmland transfer	78.1%	25
More actively seek farmland	50.0%	16
Find an internship or mentorship opportunity	18.8%	6
Start or continue to work to transition your farmland to a tenant or new owner	28.1%	9
Other (please specify)		8
answered question		**32**
skipped question		**4**

FarmLink 101 WSDA K531 8_21_2013 Workshop Evaluation

After attending this event, did your knowledge increase in the following areas...?		
Answer Options	**Response Percent**	**Response Count**
Ways to purchase, lease or transfer farmland	90.9%	10
What to look for in a farm property	81.8%	9
Resources available to help you get started	100.0%	11
No increase	0.0%	0
Comment:		1
answered question		**11**
skipped question		**8**

BENEFICIARIES

Hundreds of aspiring and beginning farmers, current and retiring landowners and partners found connections and resources they needed to work towards successful farmland and business transfer or a new and viable farm business. FarmLink was also encouraged by the enthusiasm of local community partners to share and assist in developing new resources for land transfer because of efforts that began with this project.

Respondent quotes from the end of project survey:
"Made an informal connection with a potential future landowner. Enrolled in Eco Ag at Evergreen." – land seeker

"Three members of our staff have attended the Cultivating Success courses. We have hosted several FarmLink networking events on several of our properties that were for sale or lease. We are continually expanding our network of farmers, soon to be farmers, and folks interested in partnering on conservation projects with us." – land trust

"All of the FarmLink PowerPoints and documents have been hugely helpful in explaining the legal territory of land ownership, and the names for the kinds of succession models available!" - landowner

This project worked to address pressing needs of current farmers to transfer businesses, develop succession plans and find successors as well as large barriers of knowledge, connection and financing faced by beginning farmers. The economic impact of this project is difficult to quantify; however, the resources and connections are invaluable. (See Questions 7, 9 and 10 for more quantitative data from activities.) As stated above, the specialty crop industry in Washington represented over $4 billion in

sales in 2007. Agriculture is a significant economic driver for Washington State and local rural communities. The ability to access and conserve prime farmlands is a foundational piece to the viability of the agricultural economy.

LESSONS LEARNED

- It is important to note that land seekers were not solely "young farmers." Aspiring and beginning farmers were a diverse group of individuals coming from a wide range of age, race and financial backgrounds, including an inspiring mix of young students, refugee and minority farmers, veterans and recent retires seeking a next career.
- There has been some good growth in resources and interest in the area of land transfer. Farmers and agricultural support organizations are actively looking for connections and more opportunities for overcoming current barriers. Long-term land linkages require landowners and land seekers to be able to overcome barriers and meet the unique needs of their desired farm operation.
- There remains an identified lack of funding support to provide technical assistance for current and beginning farmers. This is a critical need that poses a threat to the timely continuation of this work.
- Making local connections in the community in which one wants to farm, identifying clear expectations for both landowner and land seekers entering into an agreement and developing trust and good communication between both parties is essential for the success of creating and maintaining a land transfer/use agreement. Also, having a clear exit plan for a land arrangement safeguards the interests of both parties.
- There is still a lot of education and outreach needed to make connections and build sufficient resources that will help with farmland transition over the next decade. This project was able to scratch the surface. Much work remains to provide current landowners with better options for land transfer, facing the frequent need to sell farmland for non-farm use.
- Workshop participation and the desire for these resources were much higher than anticipated. Some workshops which begun through this project are now being replicated and instituted into other programs by partners.

The initial target of 25 land linkages had to be amended after Year 2. FarmLink conservatively reported 7 direct land linkages resulting from of this project. The target was amended to include connections made between landowners and land seekers with educational or experiential programs and courses. (See Question 9 for details on needed target amendment)

Awareness continues to grow about resources and general hope for a next generation of farmers. Soon to retire farmers should know that there are beginning growers who would like to farm and that there are increasing options for land transfer, offering them ways to keep land in farming, see their businesses continue and afford to retire. New land seekers should know that there are current farmers who want to partner to pass on successful farm businesses and a growing number of resources to assist them in this transition.

CONTACT PERSON

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ADDITIONAL INFORMATION

Total Grant Request: $189,282.30
Total Cash Match: $16,126.24

Total In-kind Match: $181,125.31

- Link to "Farmland Changing Hands:" http://www.cascadeharvest.org/files/u1/Farmland_Changing_Hands_0.pdf
- Capital Press Article: http://www.capitalpress.com/content/SB-historic-farm-preservation-121412-art
- Mother Earth News Fair 2013: http://www.motherearthnews.com/fair/washington-finding-and-transferring-farmland.aspx#axzz2klp7LbSM
- WSU webcast website: http://whatcom.wsu.edu/ag/videos.html
- Link to updated FarmLink website: http://farmlink.cascadeharvest.org/
- Ground Operations – Veterans in Farming - Movie Blog: http://www.groundoperations.net/veterans-farming-in-washington/

Photos:
Joint networking events: Dog Mountain Farm, Carnation (top left), Full Circle Farm, Carnation (top right), PCC Farmland Trust/Sturgeon Farm, Orting (bottom row).

PROJECT #11

Project Title: Local Process Improvements for Horticultural Pest and Disease Control

Partner Organization: Yakima Valley Growers-Shippers Association

PROJECT SUMMARY

The control of apple maggot, an insect pest in commercial apple production, is vital both to prevent lost production and to quarantine requirements for the export of apples. In Washington State, control of this pest is enforced by county horticultural pest and disease boards. These boards have at times adopted different policies and practices and have significantly different financial resources, making regional control of this pest difficult to accomplish. The goal of the project was to assist county pest board managers in identifying these different enforcement standards and procedures, to recommend best practices, and to identify opportunities to improve available resources to pest boards to carry out control work.

Maintaining control of this pest and ensuring that no fruit infested by apple maggot enters the stream of commerce is a pre-condition of access to most export markets.

This project was not built on a previously funded SCBGP project.

PROJECT APPROACH

Under the initial grant proposal, interviews were conducted with representatives of county horticultural pest and disease board to inventory their current practices and policies, to identify perceived problems, and to collect suggestions for improvements. These were collected into a published inventory of county board practices and a set of recommendations or policy options improved funding and operation. The resulting report was circulated to industry and relevant local and state government agencies. As a result of the report, the fruit industry decided to pursue legislation, which became law in 2013, making $150,000 of grower funds in the State's Fruit and Vegetable Inspection Account available for apple maggot control work by county pest boards in the Yakima inspection district. The report also identified funding for the Wenatchee district as a problem, as that inspection account had no surplus available. In cooperation with WSDA staff, this grant was amended to add $51,890 in unused SCBG funding for the purpose of controlling apple maggot in Chelan County.

Dr. Mike Willett, Vice President of Scientific Affairs at the Northwest Horticultural Council, was a key partner in reviewing county pest board policies to verify their efficacy and compliance with international quarantine standards. Mr. Jim Quigley, Administrator of the Fruit and Vegetable Inspection Program at WSDA and Ms. Mary Toohey, Assistant Director for Plant Protection--and both now retired--provided valuable advice and clarifications of state law relating to pest management and the availability of funds for this purpose. In the supplemental phase of this project, the Chelan-Douglas Pest Board was a critical partner in carrying out the removal of trees that were contributing to the spread of this pest in Chelan County.

Specifically, extended interviews were conducted with the directors of county pest boards in tree fruit producing counties and, in some cases, with representatives of their boards of directors to identify processes and policies that were effective in the timely control of these pests. The interviews also explored problem areas and/or deficiencies related to internal policies, communication with other state and local authorities, and resource management issues. To generate additional perspectives on effective pest management practices, pest control officials in California and Florida were also interviewed and the differences between these states' agricultural pest control systems and that of Washington were analyzed by the consultant. The data collected through these interviews was compiled into report form and

circulated to industry to comment through multiple channels, including at a meeting of industry stakeholders on pest management issues (the Apple Maggot Working Group), and electronically to industry associations and commissions. After this opportunity to comment, the report was then distributed in final form. In the supplemental phase, the Yakima Valley Growers-Shippers Association contracted with the Chelan-Douglas Pest Board to carry out the removal of non-commercial trees that served as host material for apple maggot, thereby increasing the presence of this pest.

Two expected measurable outcomes were planned and completed in the project. The first was an inventory of best practices identified through interviews with each county pest board. The second was an inventory of those areas needing improvement and possible means of addressing these deficiencies. Both inventories were completed, as mentioned above, and were published as a single printed report. While several best practices were identified, individual county pest boards did report that they were constrained to follow the legal guidance of their county prosecuting attorneys. This reduced the likelihood of these best practices being adopted directly and in their entirety by individual county pest boards, but also offered an opportunity for industry follow-up outside the scope of the grant by arranging a continuing legal education class for county prosecutors on these issues.

No grant funds were used for lobbying activities. The grant funds only paid for the consultant who did data collection and interviews with county pest boards to identify their best practices and areas where their processes or capacities were deficient for effective control of insect pests in tree fruit. One of the issues identified in the report was that some, but not all counties, have a per-parcel tax to fund these activities. In counties with tree fruit production but where pest boards are unfunded, the ability to implement the best practices identified in the grant is severely impaired. In this case the study funded by the grant identified a problem, that the industry acted upon, but the grant funds were not used to cover any of the costs of the advocacy/lobbying necessary to secure funding for these low-resource counties. This advocacy work was funded directly out of YVGSA member dues, which cover the costs of an existing contract lobbyist in the state capital who has been on retainer for many years

The project did not benefit commodities other than specialty crop.

GOALS AND OUTCOMES ACHIEVED

Data was collected on current county pest board practices and interviews conducted to identify opportunities to improve the system. These were compiled into report form and circulated to industry to comment, and then distributed in final form. In the supplemental phase, the Yakima Valley Growers-Shippers Association contracted with the Chelan-Douglas Pest Board to carry out the removal of non-commercial trees that served as host material for apple maggot, thereby increasing the presence of this pest. The Board surveyed for the presence of these trees in the Leavenworth and Wenatchee areas, and was able to remove 184 trees in the Leavenworth area and 150 in the Wenatchee area. 111 certificates for the replacement of removed trees were issued to homeowners in the Wenatchee area.
All goals set in the project were accomplished. As the initial phase of the project focused on collecting information and presenting recommendations for later follow-up, this was easy to measure. While not actually a goal of the grant, a key recommendation in the report was seeking additional funding for county pest boards. This was accomplished through the second phase of this grant dealing with the removal of trees in Chelan County and in the successful transfer of funds by the Legislature from the WSDA Fruit and Vegetable Inspection Account to be used for apple maggot control.

BENEFICIARIES

All commercial tree fruit growers in Washington State were beneficiaries of the project through the enhanced and more efficient control of apple maggot. The boards and administrators of county pest boards have ready access to alternative and recommended practices and procedures that were not previously readily available.

In addition to the 334 trees in Chelan County that previously harbored apple maggot and have now been removed, improved and timely control in all counties reduces overall pest pressure on commercial growers. Reduced pest pressure means fewer applications of pesticides over time, reducing production costs and increasing international competitiveness. Furthermore, access to export markets is contingent upon successful control of apple maggot and other plant pests and diseases. The 2012 Washington apple crop's farm-gate value has been reported at $2.25 billion, of which 1/3 was exported.

LESSONS LEARNED

The overall project was highly successful, but encouraging changes in individual counties' procedures has been a longer-term and more challenging process. Each county's attorney is certain that his or her opinion on proper procedure is the correct one, and pest board administrators are reluctant to directly challenge their legal counsel. Formal continuing legal education for these county attorneys is an ongoing process the industry is pursuing outside the scope of this grant.

As described above, the initial study phase resulted in an amendment providing supplemental funds to directly carry out control work in Chelan County.

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ADDITIONAL INFORMATION

The in-kind match consisted of staff time. Dr. Mike Willett of the NHC provided more than 30 hours of consulting time over the course of the grant, equal to $2,167.50. Jon DeVaney, Executive Director of the Yakima Valley Growers-Shippers Association provided grant administration services, oversight to the study contractor and the Chelan-Douglas Pest Board, and related time consulting with industry and county pest boards on the adoption of the recommendations. This in-kind match for Mr. DeVaney was not less than 147 hours at a value of $10,731.

PROJECT #12

Project Title: Increasing Demand, Production Capacity and Competitiveness

Partner Organization: Sustainable Connections

PROJECT SUMMARY

A collaboration between Sustainable Connections (SC) and the Northwest Agricultural Business Center, the *Increasing Demand, Production Capacity and Competitiveness of NW Washington Specialty Crops* project was designed to significantly increase the overall demand, production capacity, and competitiveness of Northwest Washington specialty crops to supply retail, wholesale and institutional markets through targeted marketing and promotion, along with business development, technical and production assistance.

Although consumer, retail, institutional and wholesale demand for local specialty crops had been growing steadily since 2002 and large-scale food buyers were progressively more interested in sourcing local specialty crops, a significant gap existed between buyer knowledge of and access to locally produced vegetables and producer capacity. Local specialty crop farmers relied on limited direct market outlets like farmers markets and Community Supported Agriculture (CSA) models. [1]

To address these issues, Sustainable Connections and NW Agriculture Business Center (NABC) developed a partnership designed to achieve the following Expected Measurable Outcomes:

Goal 1: Increase production capacity and niche market potential for Northwest Washington's new and established specialty crop producers through business development, technical and production assistance for season extension, and creating the infrastructure necessary to conduct value-added processing of specialty crops.

Goal 2: Increase market demand and competitiveness of locally produced seasonally available specialty crops in Whatcom County for participating growers by the end of the grant term, via expanded "Think Local First" place-based branding and promotional efforts.

Sustainable Connections' 2009 survey of its Food & Farming producer members and found 70% were interested in expanding into retail and wholesale markets, with 55% saying access to resources and support was very important for them to scale up production to serve larger markets. It was also found that existing marketing programs designed to promote specialty crop producers focused on the state or region, were not present at crucial point-of-sale or local media outlets, and offered no evidence of brand recognition or behavior change in the market. Sustainable Connections' success in launching and growing a successful Think Local First marketing campaign for retail shoppers offered a great model for developing a local food consumer marketing campaign highlighting specialty crop producers. Household surveys indicate Think Local First has achieved 70% brand recognition throughout Whatcom County, driving 60% change in shopping behavior.

This project did not build directly on a previously funded SCBGP project although it has been complementary and supportive to many aspects of the continuing work of both the Sustainable Connections' Food & Farming Program and the Northwest Agriculture Business Center.

[1] Ag Census data, adjusted for inflation, indicate Whatcom County direct sales were up 94% from 2002-2007. This trend means that in 2007 Whatcom County alone had 83 more farmers looking for markets locally than it did in 2002, and that farmers are now more dependent on the direct market than ever.

PROJECT APPROACH

To reach their stated outcomes, Sustainable Connections and NW Agriculture Business Center jointly developed a work plan and assigned activities based on their organizational strengths. Northwest Agriculture Business Center provides northwest Washington farmers with the skills and the resources required to profitably and efficiently supply their products to consumers, retailers, wholesalers, foodservice operators and food manufacturers. Sustainable Connections' Food & Farming program supports new farmers, connects food buyers to local farms and fishers, and is a resource for building a sustainable local food economy.

Goal 1: Increase production capacity and niche market potential for Northwest Washington's new and established specialty crop producers through business development, technical and production assistance for season extension, and creating the infrastructure necessary to conduct value-added processing of specialty crops.

NW Agriculture Business Center (NABC) managed five major task areas towards achieving Goal 1:

- ***Task A: Feasibility study and business planning for value-added processing facility/distribution center owned and operated by a producer-owned business entity***

Activities – NABC conducted feasibility studies, prepared draft business plans, offered workshops on producer-owned business models, recruited producer-owners to form a business entity, completed business and market plans, established a business, sourced capital, and assessed initial operating results.

Results – While a stand-alone fresh vegetable processing facility was deemed infeasible, a modified feasibility study found an existing enterprise with multiple income streams could start-up and operate a processing facility. Cloud Mountain Farm Center, a nonprofit education and training center, was found to be an excellent partner. The Center currently produces specialty crops, and (thanks to a $49,649 USDA Rural Business Enterprise grant NABC secured) will offer processing and distribution services to producers beginning in 2014. Six specialty crop producers are interested in providing commodity product for the processing facility, and in exploring some form of ownership based on operating performance.

- ***Task B: Sales expansion to supermarkets,* and**
- ***Task C: Sales expansion to institutional and food service buyers***

Activities – NABC provided 28 specialty crop producers from Island, Skagit, Snohomish, and Whatcom counties with marketing assistance to support expanded sales into supermarket and institutional channels.

Results – Surveys and data collected from NABC's Local Orbit software indicate total new sales during the project period exceeded $1.2 million, creating 30.5 FTE jobs and retaining 80.5 FTE jobs due to NABC's technical support and assistance. Crops ranging from conventional and organic row crops to berries, tree fruit, mushrooms, and honey were distributed to Haggen, Inc., The Markets LLC, PCC Natural Markets, Town & County Markets, Whole Foods Markets, Bon Appetite, Educare, Overlake Hospital, Seattle Senior Services, United General Hospital, and UW Medical Centers.

- ***Task D: Season extension***

Activities – NABC provided season-extension workshops, training, and technical assistance to increase specialty crop producer capacity.

Results – Having offered a season-extension workshop attended by 17 specialty crop producers in 2012, NABC moved to a supporting role providing technical assistance to Cloud Mountain Farm Center. The Center conducts field trials to identify varieties of greens that can be grown through shoulder seasons, and tests new technologies to improve the seeding, yields, harvesting, and food safety methods for leafy greens.

- ***Task E: Transition to Value Added curriculum with GAP class component***

Activities – NABC offered 28 value-added classes

Results – Over 210 specialty crop producers attended the 28 classes. Topics included To Market! To Market!; Floral, Nursery, and Medicinal Herbs; East Asian Medicinal Herb Production; Value-Added Prepared Foods; Access to Capital; Winter Orcharding; Fall Orcharding; and Market Feasibility and Your Product. A number of these classes addressed either the need (market and risk management driven) or the methods (production and operations management) to consider Good Agricultural Practices and actual third-party certification. Survey results generally indicate that 75% of the participants found the workshops and classes "Very Helpful" and 24% "Somewhat Helpful."

Goal 2: Increase market demand and competitiveness of locally produced seasonally available specialty crops in Whatcom County for participating growers by the end of the grant term, via expanded "Think Local First" place-based branding and promotional efforts.

Sustainable Connections (SC) managed one major task area towards achieving Goal 2:

- ***Task F: Increase market demand and competitiveness of specialty crops in Whatcom County***

Activities – Sustainable Connections created and launched the Eat Local First campaign, focused on helping buyers of all kinds find food made with local farm products through collective marketing, labeling, and advertising of local agricultural products and food items with a majority of local ingredients. Staff also worked to expand existing promotion of direct market opportunities for specialty crop producers at farmers markets and via CSAs, and track sales.

Results –Nearly 300 agricultural producers and food-based businesses in Whatcom County now utilize Sustainable Connections' services (almost double the number served in 2009), and producers alone report the relationship generates at least $900,000 in new sales annually. Additionally, consumers recognize Sustainable Connections' role in connecting them with local food businesses.

During the grant term, Sustainable Connections planned, researched, and launched the Eat Local First Campaign, designed to increase business-to-business connections among specialty crop producers and wholesale buyers at local grocers and restaurants, while serving as a marketing resource for specialty crop producers, and providing buyers with an easily identifiable local food label. Staff worked closely with participating restaurants and grocery food buyers, offering one-on-one meetings, helping to make connections with specialty crop producers, and sharing marketing best practices to get the most out of their participation in the campaign. SC featured Eat Local First participants in the monthly e-newsletters, listed participants on the website, and promoted through social media. www.eatlocalfirst.org features lists and links to all the ways consumers and buyers can find out about sourcing local food, with average monthly traffic between 250 and 400 visitors.

SC hosted the Northwest Washington Farm-to-Table Trade Meeting each February in Bellingham - the regions' largest annual trade meeting and a forum for local food producers and food buyers of all kinds to come together, network and make business connections. The Trade Meeting brings between 130-150

attendees each year, and features valuable one on one networking consultations, relevant workshops and speakers, as well as trade tables and connections. Attendees consistently report making new and lasting business connections as a result of the event. In 2013, follow-up survey respondents (20 respondents out of 135 attendees) reported that they would spend/sell around $40,000 in local food through February 2014 as a result of the Trade Meeting and reported making valuable connections with an average of 3.75 new businesses. Many respondents also said they would make changes in their business/buying habits because of the event including: more proactive contract purchasing, a wider ranging effort to connect with farms and purchase more local products, set up my business & buyers more efficiently, and more confidence to go after CSAs, restaurants/ wholesale markets. SC also hosted chef tours in summer 2012 and 2013, taking chefs from local restaurants and buyers from retailers out to specialty crop producer farms to connect with new farmers and become better acquainted with the products they offer. Chef attendees reported new business connections were made that have resulted in more local food purchases.

Since Eat Local First's 2011 launch with 30 early adopters, nearly 90 retailers and farmers are now participating in the campaign, utilizing the marketing resources, events and shared best practices offered to help grow their businesses and gain better access to retail and wholesale markets. Eat Local First retail participants reported spending 33% of their food budgets with local farms and producers in 2011, increasing to 38% in 2012. Sustainable Connections worked with Applied Research Northwest to conduct a 400 Consumer Household baseline survey in 2010 and a follow-up survey in 2013 to gauge consumer shopping behavior when it comes to local food. The initial survey aided in providing baseline data for campaign planning strategies, and a 2013 follow up provided performance measure for campaign successes thus far. According to the 2013 survey, the Eat Local First Campaign achieved 57% brand recognition throughout Whatcom County in just two years, and 73% of shoppers reported an increase in their local food purchases. More people now state that they almost always think about the source of their food and more look for information about where their food comes from, than in 2010. 64% of respondents said it's easier now to find local food than in 2010.

Community Supported Agriculture awareness has grown from 45% in 2010 to 58% in 2013. Sustainable Connections worked with farmers and businesses to ramp up community and business support of Community Supported Agriculture and incorporate the model into a workplace environment throughout the year. SC shared best practices and resources, hosted two member luncheons based around CSAs each year, co-produced the Whatcom County CSA Farm List, and started a CSA census. SC created the *Farmer Resource Guide: Tips & Best Practices on Planning & Marketing a Workplace or Group CSA* as a resource for CSA farmers. It has been a great tool for farmers in thinking about how to improve upon their CSAs, and has received much positive feedback from local CSA farmers. It has been distributed via email and posted as a resource on the Sustainable Connections' website. http://sustainableconnections.org/bizdev/workplace-csas A formal toolkit for businesses interested in signing up for a workplace CSA is currently in the works as well, pulling together resources and tips SC has been sharing throughout the past few years.

In addition to promoting CSAs and workplace CSAs, Sustainable Connections partnered with the Bellingham Farmers Market to co-promote "Eat Local for the Holidays", sharing holiday menus and highlighting farmers and vendors selling and sourcing local food.

Taken together, Sustainable Connections and NW Agriculture Business Center's activities are increasing awareness and demand for local food. Note: Specific results and evaluation are detailed in 'Goals and Outcomes Achieved' and 'Beneficiaries' sections, below.

NW Agriculture Business Center provided a depth of technical assistance including marketing, business planning, organizational development, infrastructure development, accounting, budget and grant writing, and securing additional funding resources that provided support for this project. Throughout the three-

year term of this project at least eight individual NABC staff members were involved and contributed support that created significant positive impacts for specialty crop producers.

Local small farmers and independent food businesses look to Sustainable Connections for support in driving growth through the proven approach of market development, community education, and business connections. Sustainable Connections offered a variety of services in these areas, and initiated the Eat Local First campaign to engage businesses as well as consumers.

Supporting project partners who aided in promotions and educational activities included Cloud Mountain Farm Center, Community Food Co-op, and Bellingham Farmers Market. Important funding partners included Sustainable Whatcom Fund of the Whatcom Community Foundation, USDA Agricultural Marketing Service, and USDA Rural Business Enterprise.

Project staff took attendance at workshops and kept track of the number of specialty crop producers participating. Reimbursement was only requested for the share of activities that benefited specialty crop producers. Match funds paid for the share of expenses benefiting non-specialty crop producers.

GOALS AND OUTCOMES ACHIEVED

Goal 1: Increase production capacity and niche market potential for Northwest Washington's new and established specialty crop producers through business development, technical and production assistance for season extension, and creating the infrastructure necessary to conduct value-added processing of specialty crops.

Results: NABC's purpose is to provide technical assistance that will help agricultural producers with 1) feasibility studies, and market and business plans; 2) education and support to help producers with plans and strategies for value-added product development; 3) develop needed infrastructure; 4) access to new markets, 5) access to financial resources necessary for business development; and 6) develop multi-producer owned businesses. Over the course of nearly four years (the time it took to prepare and submit the grant project, approval, and then the implementation) the more articulated components of this project and work plan were subject to some change. Within that context NABC delivered strong and positive results towards achievement of this goal. These results include:

Feasibility Studies, and Market and Business Plan Development

- A completed feasibility study for Whatcom Vegetable Processing (September 2011)
- A completed feasibility study and business plan for USDA RBEG grant application (January 2012)
- Prepared budget models for Nooksack Valley Farmers Cooperative's CSA program (2011 &2012)
- Provided support for four specialty crop producers from Jefferson, Skagit, and Whatcom Counties to prepare and submit USDA Value Added Grant Program applications and proposals (awarded from 2011-2013)
- Prepared a market and business plan for Whatcom County a producer of value-added medicinal herbs (2012)
- Reviewed and provided feedback to Whatcom County Producer on its business plan and loan application to a community-based loan fund (funded in April 2013)

Education and Support for Value-added Product Development Strategies

- Prepared the curriculums, marketed, and implemented 28 Transition to Value Added classes attended by 213 specialty crop producers (November 2011 through September 2013)

- Coordinated the presenters and curriculum, marketed and implemented *"Technologies and Techniques to Help Specialty Crop Producers Take Advantage of Shoulder Seasons and Year-Round Markets,"* a one-day workshop attended by 17 specialty crop producers.
- Provided support for preparing the Cloud Mountain Farm Center's WSDA Specialty Crop Block Grant project *"Providing Extended Season Education and Technology for Specialty Crop Growers"* (funded for October 2012 to September 2014). This grant project is providing new technology and equipment, and hands-on training for 10 specialty crop producers as well as hands-on GAP training and development of farm plans. A "Leafy Greens Field Walk" was attended by 17 specialty crop growers in June 2013.

Develop Needed Infrastructure

- Provided development support and financial resources for the establishment of a fresh vegetable processing facility at Cloud Mountain Farm Center (2011-2013). The facility is nearly completed with equipment and product testing to be conducted Nov. 2013 through March 2013 and full operations implemented for the 2014 growing season. The Center is planning to become a local/regional food hub.
- Provided marketing and infrastructure assistance for the NVFC's CSA program with St. Joseph Medical Centers/Peace Health including the design and development web pages and payment systems, and accounting for and transferring 192 CSA share payments to the cooperative. (2011-2012).
- Developed, tested, and implemented NABC's Local Orbit, a web-based business-to-business platform which supports a direct business connection between individual farms and grocery, restaurant, and institutional buyers (2011-2013). This platform is currently being used by 52 specialty crop producers and at least 160 buyers have used the site to purchase local products.
- Supported the establishment of two regional food hubs, 21 Acres in King County, and Bow Hill Blueberry Farm in Skagit County (2012-2013). The users of NABC's Local Orbit are using these two food hubs to aggregate and distribute product.
- With the help of NABC's business planning support a Whatcom County specialty crop producer was able to purchase needed equipment to cultivate, harvest, dry, and package medicinal herbs for market (2012).

Access to New Markets

- NABC provided 28 specialty crop producers with access to new markets resulting in $700,511 in sales for the calendar years of 2011 and 2012. It is reasonable to assume that sales to new markets will exceed $1.2M for the three calendar years of 2011 through 2013 although this year's data is not yet available. This support has come in the form of direct relations between NABC staff and the grocery, restaurant, and institutional food service buyers, as well as the NABC's Local Orbit platform. (Note: a listing of all specialty crop producers and they types of service provided is provided as an attachment to this report).

Access to Financial Resources Necessary for Business Development

- Preparation of three grant proposals to the USDA for a Rural Cooperative Development Grant to support NABC's work to develop multi-producer owned businesses (funded 2011 through current). Note: NABC is a designated USDA Rural Cooperative Development Center
- Preparation of two grant proposals to the Whatcom Community Foundation to support NABC's food system development work (and to be used as required matching funds for State and Federal grant projects). Funded in March 2011 and January 2012.
- Supported the preparation and applications to the USDA Value Added Program for four specialty crop producers from Jefferson, Skagit, and Whatcom Counties. All were funded in 2011-2013.

- NABC USDA RBEG Proposal "Whatcom County Value Added Vegetable Processing"-January 2012 (funded April 2012)
- Supported the business planning and application process for a Whatcom based specialty crop producer for a two loans submitted to Farm Services Agency (both were funded in 2012)

Develop Multi-Producer Owned Businesses

- Prepared for presenters and curriculum, marketed and held two educational classes on multi-producer business structures including cooperatives, LLCs, and B Corporations (2010-2011). These two workshops were attended by 51 specialty crop producers and ag-support professionals.
- Supported the process for the incorporation of the Nooksack Valley Farmers Cooperative (NVFC) including articles and bylaws development, providing for legal review, and the filing of incorporating documents with the State of Washington. (January through March 2011).
- Provided technical assistance and organizational development consulting to support the formation of the Seattle Wholesale Growers Market, a multi-state cooperative of nursery and floral producers (incorporated in February 2011).
- Provided ongoing business and organizational development support, and prepared the 2011 Federal Income Tax filing for NVFC (2012)
- Provided technical assistance and organizational development consulting for the Snoqualmie Valley Farmers Cooperative, LLC (2012)
- Provided ongoing technical assistance and market development consulting to the Seattle Growers Wholesale Market (2012-2013).

Goal 2: Increase market demand and competitiveness of locally produced seasonally available specialty crops in Whatcom County for participating growers by the end of the grant term, via expanded "Think Local First" place-based branding and promotional efforts.

Results: To achieve Goal 2, Sustainable Connections completed the following activities:

Launched Eat Local First campaign – a year-round way to connect farmers and food businesses with local marketing support, providing a branded label to help consumers find and eat more local, seasonal food.

- Created Eat Local First branded social media and promotional materials
- Increased campaign participation from 11 in 2011 to 90+ by mid 2013; buyer participants report spending 38% of 2012 budgets on local food, well above the 2-4% county average
- Expanded annual Eat Local Week to September Eat Local Month in 2011, with joint declaration of Whatcom County and City of Bellingham; features 40+ food businesses and 18 food-themed events, continued each year through 2013
- Distributed 55,000 Whatcom County Farm Tour and September Eat Local Month guides in every printed newspaper in the county, engaging all ages in cooking, farmers, seasonality, and more
- Co-promoted Eat Local First messages and events with key partners – Community Food Co-op, Cloud Mountain Farm Center, Whatcom Farm to School, Whatcom Food Network, Bellingham Farmers Market
- Launched Eat Local for the Holidays promotions with Bellingham Farmers Market
- Hosted Farm Familiarity Tours in partnership with Bellingham Whatcom County Tourism introducing hoteliers and restaurant staff to local food producers
- Hosted Chef Farm Tours to better acquaint local chefs and grocery buyers with local food producers

- Grocers begin integrating Eat Local First brand in displays and marketing materials

Launched Workplace CSA Initiative – a new sustainable business practice that engages businesses in Eat Local First campaign, connects local food to employee wellness, and measures food economy impact.

- Developed website best practices materials and tip sheets for consumers, employers, and farmers to make setting up and managing Workplace CSA memberships as easy as possible for all involved
- Increased healthy eating and connection to local agriculture and generated $31,000 in farmer direct sales to 3 farms through 4 employers with 78 participants in 2010 pilot, increasing to $175,000 through 36 employers, 12 farms and with 397 shares in 2012.
- Completed first annual Whatcom CSA Census in 2012 finding 25% of total CSA shares sold in Whatcom County are going to workplaces (400/1600)

Connections –Doubled annual Farm to Table Trade Meeting participation, reaching 135 farmers, buyers, chefs, health and education professionals and facilitated hundreds of new trade relationships.

- Convened industry peers for networking and sharing of best practices, highlighting farm innovations.
- Increased farm sales and connected eaters to the seasons, farmers and our agricultural roots while celebrating our local food culture.
- Printed and distributed record number (33,000) of Whatcom Food & Farm Finder, the comprehensive guide to local food to 250+ locations in a seven county region. Developed related tourism itineraries inserts, promoted regionally in print and hosted on the Tourism and SC websites.
- Completed Farmer Survey, Annual Participant Survey and Eat Local First Consumer Household Survey –

Both Expected Measureable Outcomes are considered long term.

Increasing production capacity and niche market potential – Regarding the goal of establishing a producer owned facility, funding has been secured, investments have been made, and the facility has been built. Now all participants including NABC, Cloud Mountain Farm Center, participating farms, and participating market partners need to work together to ensure the new enterprise's operational and financial viability. Also, the intended goal of this project was to have some level of ownership from a multi-producer owned business entity. Six specialty crop producers are willing to be engaged with the processing center going forward. Building on its experience with the Nooksack Valley Farmers Cooperative, NABC is committed to work with this group and Cloud Mountain Farm Center towards a structure of producer ownership, likely a producer-owned marketing cooperative.

Increasing market demand and competitiveness - One of the overarching goals of the Eat Local First Campaign is to increase the amount locally grown food both produced and also consumed in Whatcom County to 10% by 2020. The 2007 WSDA Ag Census estimated only 2-3% of the direct market share in Whatcom County was also produced there. The 2012 Ag Census data will provide a sense of where the community stands and potentially how effective the Campaign has been. Gains in the food system to date both in regards to increase in sales, business relationships and community awareness show positive movement in the target direction.

Eat Local First Ongoing Goals

a) Develop a place-based brand and labeling strategy and associated advertising campaign for producers and buyers to use in association with materials that increases the identification and purchases of local food.

b) To engage targeted campaign participants in changing shopping and buying behavior
c) Track sales over time at grocery stores and in consumer reported buying habits regarding healthy and local food.
d) Increase community and consumer awareness about local farms and the value of the food economy.
e) Increase the number of producers and buyers participating and increase demand over time.

Sustainable Connections and NW Agriculture Business Center came very close to accomplishing the goals established for the project. The only performance measure that is still pending completion is the establishment of a producer-owned processing facility. However, the facility is in place and discussions regarding a producer-owned model are in process. As described above, all activities were carried out, and a comparison of target and actual accomplishments is described below.

Goal 1 targets established: Fifty percent (50%) of specialty crop growers participating will report growing three new crop types, or providing one new value-added product for the local market, or the addition of two more months to their annual growing season.

Valued-added & season extension achievement: As mentioned above, over 210 specialty crop producers attended 28 workshops throughout the course of the grant, averaging 105 specialty crop producers per year. NABC followed up with attendees to track their progress towards the target. While some work is ongoing, over 70 producers have achieved one of the targets listed. Examples include:

- **Alpenfire Cider-**Reintroduced improved and rebranded vinegar product and began to use a regional distributor for WA State-wide distribution.
- **Bellewood Acres**-Opened a retail store and distillery which features some variety of spirits made with some specialty crops. The retail store provides a much more robust venue for sales of fresh apples harvested from their 35-acre farm.
- **Cloud Mountain Farm Center**-Completed the construction of a value-added processing facility and extended its season for leafy greens by two months (Nov.-Dec. 2012).
- **Finnriver Farm & Cidery-**Introduced 8 new value-added products in 2013 and purchased and transplanted 900 apple trees of different varieties to support their production of hard cider products (2012-2013)
- **Lavender Wind Farm**-Opened a processing kitchen and is making dozens of lavender-oriented products, selling the product online and at its season farm store.
- **La Conner Flats Farm-**Installed 8 additional high hoop houses in 2012-2013 and went into year-round production of fresh market vegetables, increasing their season by four months.
- **Pelindaba Lavender Farms-**Introduced 5 new lavender based value-added products into the market in 2012 and 3 additional products in 2013
- **Red Mountain Organics**-As a brand new operation**,** produced at least three new crop types in 2012 and 2013 including organic broccoli and cabbage, and California Poppy.
- **Sakuma Brothers, Inc**.-Introduced fresh cider and tested Skagit Valley-grown teas with new markets
- **Sherman's Pioneer Farm Produce**-Introduced three new value-added squash products including pureed and spiced filling for Whole Foods Market's in-deli made ravioli
- **Spooner Farms**-Introduced retail potted nursery plants in lieu of bare-root stock this season.
- **Terry's Berries**-Added four months to their annual growing season and are now producing product year-round

Establishment of a producer-owned facility
NABC provided technical assistance in collaboration with Cloud Mountain Farm Center for the design and development of the processing facility (near completion with equipment installation scheduled for

November 1, 2013). The facility is owned by the nonprofit Cloud Mountain Farm Center. This was not what was envisioned as the grant proposal called for a multi-producer owned cooperative to own the facility. NABC is still working towards this goal with the six specialty crop producers who are interested in providing commodity product for the 2014 season. This is one of the primary grant projects which will be partially funded by NABC's 2013-2014 USDA Rural Cooperative Development Grant. The plan is to isolate the accounting for the entire valued-added processing operation including marketing, cost of goods, operating expenses, distribution, and administrative expenses. Results will be reviewed with the participating farms to gauge the willingness to form a legal entity to own the product and marketing business, while contracting with Cloud Mountain Farm Center for processing and distribution services.

Goal 2 Targets established:

1. 60% of local farmers and 60% of local buyers county-wide will recognize the brand.
2. 40% of primary grocery buyers county-wide will report increasing their locally produced food purchases as a result of the brand.

Achievements:

1. 94% of producers and 57% of local buyers county-wide recognize the Eat Local First brand
2. 73% of grocery and restaurant buyers reported increasing their locally produced food purchases

SC worked with Applied Research NW to conduct a baseline Household Consumer Survey in 2010 to inform campaign planning and provide baseline data for performance measures. A follow-up survey was completed in summer 2013 to estimate awareness, interest and local food budget, as well as program recognition. In planning the campaign, it was found that rather than focus on the baseline measures of crops from the producer end, it was more feasible to gather data from restaurants and retailers participating in the campaign on % of the businesses' food budget was spent with local farms and food producers, and still produce a similar impact. Campaign participants provide this information when signing on to participate, and the % is re-assessed each year.

- Eat Local First retail participants reported spending 33% of their food budgets with local farms and producers in 2011, increasing to 38% in 2012.
- More people now state that they almost always think about where their food is grown, raised, caught or produced while grocery shopping – up 15% from 2010
- More people now look for information about where their food comes from than did in 2010.
- 64% of respondents said it is now easier to find local food than it was in 2010.
- Awareness of Community Supported Agriculture has grown from 45% in 2010 to 58% in 2013.
- 70% of buyers see the Eat Local First program and Food & Farming Program as very or extremely valuable in increasing sales of locally produced food.

BENEFICIARIES

Specialty crop producers from six counties including King, Island, San Juan, Skagit, Snohomish, and Whatcom have benefited from efforts and results of this project. These farms have ranged in size from two acres to more than 300 acres. The products have included berries, floral and nursery products, honey, mushrooms, row crops, and tree fruit, as well as many value-added products including apple brandy fresh made flower bouquets fresh cider, hard cider, berry preserves, black and green tea, whipped honey, and pureed spiced squash for filling. They received hands on technical assistance and education that provided support for business planning, gaining access to needed capital for business start-up or expansion, access to new markets, and needed infrastructure.

Specialty crop producers benefitted from:

- Increased access to marketing resources and promotion through the Eat Local First campaign (promotion via website, newsletter, social media, Eat Local First twist ties, posters, labels, stickers, signage)
- Prime opportunities to meet buyers and access new wholesale and direct markets at events like the Farm-to-Table Trade Meeting, Chef Tours, Eat Local First Workshops, and CSA member luncheons
- Increased sales and shares sold for those offering Community Supported Agriculture shares
- Direct connections with new restaurant and grocer accounts through the Eat Local First Campaign

Additionally, specialty crop buyers benefit from increase awareness of and access to local product.

Goal 1 data:
At least 28 specialty crop producers, 30.5 FTE staff (new hires), and 80.5 FTE staff (retained) have benefited from elements of this project, with total new revenue of $1.2 million estimated. Through TVA workshops and classes 213 specialty crop producers have had the opportunity to gain knowledge and experience in a diversity of agricultural business practices including marketing, value-added processing, season extension, Good Agricultural Practices, business planning, access to capital, orchard management. As of the end of this grant project period 52 specialty crop producers have taken advantage of the opportunity to market and distribute their products through NABC's Local Orbit, and the two established food hubs located in King and Skagit Counties. Looking forward, at least 10 producers will potentially benefit from the establishment of the vegetable processing facility at Cloud Mountain Farm Center.

On the buyer side several hospitals, local and regional grocery chains, and a college campus have benefited from elements of this project. St Joseph Medical Centers and their staff (192 shares over two years) have benefited from farm-to-business CSA programs. At least 160 buyers have made at least one purchase through NABC's Local Orbit. These buyers include Aging and Disability Services-Seattle Human Services, Bon Appetite (University of Seattle Dining Services), Delridge Child Care, Lifelong Aids Alliance, Overlake Hospital Dining Services, Round Table Pizza (Mt. Vernon), and University of Washington Medical Centers. A remarkable diversity of the region's population has been positively impacted and connected to this project.

Goal 2 data:
- 50% of farmers say their overall sales as well as sales to local restaurants and other wholesale accounts have increased in the past year, from September 2012-September 2013.
- 74% of producers think the demand for local foods increased in 2012.
- 62% of producers saw an increased demand for such foods directly in their business, 36% increased their supply to customers.
- 94% of producers are familiar with the Eat Local First Campaign.
- 50% of producers see Eat Local First and Food & Farming Program as very or extremely valuable in increasing sales of locally produced food
- 81% of buyers think the demand for local foods increased in 2012.
- 71% of buyers think the availability of locally produced food increased in 2012.
- 50% of buyers saw an increased demand for local foods directly in their business, 73% increased their supply to customers
- 70% of buyers see the Eat Local First program and Food & Farming Program as very or extremely valuable in increasing sales of locally produced food.

From 2010 to 2012, CSA shares sold to workplaces grew from 78 to 397 shares, generating over $321,000 in sales for CSA farmers and accounting for one quarter of the CSA shares sold in Whatcom County.

LESSONS LEARNED

Goal 1 Lessons:

NABC provided technical and organizational development assistance to the Nooksack Valley Farmers Cooperative. Results in this effort were mixed and ended somewhat negatively. The cooperative and 10 participating farms incorporated in March 2011 and worked together to operate a cooperative-to-business CSA program with the staff of Peace Health Medical Centers. NABC provided technical support creating a web page and electronic sign-up process, and provided an accounting for CSA share purchases. Total annual CSA shares for the 2011 and 2012 growing seasons amounted to 192 with total revenue of $96,000. NABC provided technical assistance for the preparation of the cooperative's 2011 Federal Income Tax filing. NABC developed operating budgets and a grant proposal in the amount of $24,333 (funded by the Whatcom Community Foundation March 2012) to provide operating support for the start-up of the NVFC CSA program with Peace Health Medical Centers and staff. This CSA effort was meant to serve as a gateway for the cooperative to sell to institutional markets. Even with significant facilitation and organizational development support the cooperative's members could not overcome internal competitive fears or gain sufficient organizational alignment to continue for the 2013 season, although four of the ten members are willing and committed to work with and provide commodity product to the value-added processing facility for 2014.

In retrospect the effort to form this group was much too driven by external community forces and not enough from the internal desire of the individual producer members, or the cooperative itself. The members were all vendors at the Bellingham Farmers Market, and even though they were congenial at first, competitive concerns surfaced during the second year. Four of the former members are willing to continue exploring ways to "cooperate" and to supply commodity product for the first year of operations for the vegetable processing facility at Cloud Mountain Farm Center (2014 season). NABC, through its Rural Cooperative Development Grant program, has resources committed to work with this group through the 2014 season. The lesson learned-a cooperative works best when driven by the desire, energy, and a high level of commitment to participate from its members. It's a "bottom up" or "inside out" rather than a "top down" or "outside in" proposition.

Goal 2 lessons

- One on one consultations and meetings with producers and food buyers has proven key and highly effective in facilitating connections. Through launching the Eat Local First Campaign and approaching businesses to participate, SC found that many local restaurants and grocery stores are interested in sourcing local food and ingredients for their establishments, but often do not know the best way to do that, or have the right contacts with producers. In meetings with local farms, SC has been able to relay the importance of marketing their local products and better been able to connect producers with new local markets.
- People want local food and spend the majority of their food budgets in grocery stores and at restaurants. SC's 2010 household survey showed consumers need a way to easily identify local food – the Eat Local First brand offers this. Grocery and restaurant partners are willing to participate in Eat Local First, but staff and systems are slow to change crucial point of purchase labeling. To ensure long term success, SC has found and is well-suited to provide 1:1 support to ease implementation challenges.
- Businesses benefit from best practices marketing workshops, fact sheets, and collaborative advertising assistance to better tell their Farm-to-Table story authentically and effectively.
- The biggest constraint in the food economy today is very few mid-scale producers achieving efficiencies of scale and diverse operations, and/or a willingness to sell at wholesale rates.

Working with partners like NABC and Cloud Mountain Farm Center, SC sees an opportunity to support increases in efficiency and scale, growing wholesale activity.

- CSAs experience attrition rates of 25-30% annually. Businesses that work directly with SC staff in setting up Workplace CSA programs are more likely to find value and retain CSA members. Farmers need collective advertising support to help with retention and general customer knowledge and education about CSAs.
- Businesses and producers are excited about and seeking more changes to make direct connections through workshops, tours, events and other opportunities to do more business to business networking.
- Many marketplace relationships are established through repeated trade and tour events.
- Deepening education and outreach, and increasing materials for sourcing from new farm businesses are increasingly of value. Producers and buyers indicate access to more examples of wholesale successes (i.e. case studies) would be beneficial – SC will be exploring these in 2014.
- Access to capital and a lack of processing infrastructure continue to be limiting factor for more trade – SC's relationships with partners like NABC and CMFC help inform the conversation.
- An unexpected positive result came from NABC's producer-educational work with its Transition to Value Added classes. A large track of these classes involved provided a series of classes on product and business development for makers of hard cider, and orchard management classes for producers of apples for the making of hard cider. Many of these cider makers sought marketing assistance through NABC. As these relationships built the cider makers form the Northwest Cider Association and asked NABC to provide executive management, marketing, and accounting support which has been provided since 2012. The Association has grown from 9 cider makers since its start in 2011, to 32 Pacific Northwest cider makers currently.
- A positive result realized in this project was driven by specialty crop producers' desire to enter into new markets and the intense level of market demand to access locally produced food. NABC's regional ties, producer educational activities, and regional infrastructure benefited many producers involved with this project. This led to the collaborations that started the 21 Acres Food Hub and the North Sound Food Hub (located at Bow Hill Blueberry Farm), and the development and launch of NABC's Local Orbit, a web-based business-to-business purchasing and sales platform. A total of 160 buyers have purchased locally produced products from 83 sellers including 52 specialty crop producers.

- **Goal 1 -** One measurable outcome was to form a producer-owned business to own the processing center. Although a producer cooperative was formed, after two years of business operations, the cooperative determined to cease operations.

- **Goal 2** - Working with larger grocery stores in fully incorporating a new branding and labeling campaign year round can be challenging. For grocers with complex marketing campaigns, incorporating signage and labels in addition to the stores' branding in a consistent way was a challenge to consistently display year-round. Focusing on promotions and product labeling in a blitz style marketing campaign around September Eat Local Month and Eat Local for the Holidays promotions has been an effective strategy in grocery settings. It was the original hope that grocers could incorporate local foods into their PLU system, so a customer might see something on the bottom of their receipt that tells them how many local items are in their bag, or the amount spent on local food, which is still a hoped for outcome in the future.

- While the 57% buyer brand recognition is slightly lower than the 60% target, the Eat Local First recognition is expected to continue to increase as more producers utilize branding materials and consumers see increasing numbers of branded products available. Additionally, Sustainable Connections will promote the campaign to consumers annually through its partnership with

Bellingham Farmers Market, through annual events like September Eat Local Month and Farm Tour, and through new marketing pieces like an agritourism driving map.

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ADDITIONAL INFORMATION

Match funds totaled $193,046

NW Agriculture Business Center provided $120,134 in matching cash funds for this project. These matching funds came from a combination of WA Department of Commerce grant funding, grant funding from the Whatcom Community Foundation, and internally generated program income. The funds were used to pay for staff time to conduct feasibility studies for the now-built processing plant, help provide for two years of NABC's Transition to Value Added classes, as well as to provide staff support to specialty crop producers seeking access to new markets.

Sustainable Connections' cash match totaled $72,912. Match funds came from a combination of USDA Farmers Market Promotion, Whatcom Community Foundation, and Whatcom County Tourism grant funding as well as program sponsorship, advertisement, and participation fee income. Funds were used to pay salaries, benefits and taxes, travel, graphic design, research and evaluation consultant, and printing and marketing expenses.

- NABC Technical Assistance to Specialty Crop Producers
- Eat Local Month guide
- Eat Local First application
- Eat Local First Facebook
- Eat Local First newsletter

PROJECT #13

Project Title: Management of *Rhizoctonia* in onion bulb and pea crops

Partner Organization: Washington State University

PROJECT SUMMARY

Empirical evidence indicated there has been an increase in the prevalence of seedling blight in onion and pea crops planted in the Columbia Basin soon after incorporation of winter cover crops such as wheat or barley. Strips of cover crop are left standing in the spring to protect emerging onion seedlings from wind/sandblasting. Stunted patches range from <1 m to >10 m in diameter. Symptomatic onion plants remain stunted, resulting in smaller bulbs at harvest. Grower profits for storage onions are dependent on jumbo and colossal-sized bulbs, so reduction in bulb size from this disease has significantly affected crop yields and grower income. Symptomatic pea plants mature earlier than healthy plants, affecting tenderometer readings and reducing prices growers are paid for peas. The primary factor promoting this disease is the decomposing cover crop residues present in the soils into which onion and pea seeds are planted. However, cover crops are essential on sandy soils in the Basin to prevent soil erosion in winter/spring and sandblasting of emerging onion or pea seedlings. *Rhizoctonia* spp. colonize the decomposing cover crop residues and then move onto the roots and crowns of onion and pea seedlings growing through the residues. The problem does not occur in the absence of cover crop residues. Symptoms can resemble injury from nematodes and *Pythium* spp., so accurate diagnoses are important. Pathogenicity tests by the principal investigators have shown the primary pathogen causing this problem to be *Rhizoctonia* species. L. Patzek, WSU PhD student, T. Paulitz, USDA ARS plant pathologist in Pullman, and L. du Toit, WSU plant pathologist, identified diverse *Rhizoctonia* species and anastomosis groups (AG) associated with this problem in onion and pea crops in the Columbia Basin. Once introduced into soil, *Rhizoctonia* can survive many years as a saprophyte and/or as a pathogen on crops. Patches typically appear in the same areas of individual fields in subsequent year.

Efforts to manage Rhizoctonia seedling blight in onion and pea crops have been limited because of a previous lack of recognition of the specific causal agent, limited understanding of the epidemiology of the disease, and the necessity for winter cover crops to prevent soil erosion and protect seedlings against sandblasting in the spring. Previous research by T. Paulitz on a similar problem in cereal crops in the Palouse of Washington demonstrated that delaying planting of a crop 3 to 6 weeks after incorporating the previous crop largely eliminated the problem. Longer durations may be needed in cold or dry soils because of slower microbial degradation of residues in cold or dry soils. Because of the patchy nature of this disease and the difficulty of generating adequate disease pressure by inoculating soils, large-scale research trials were initiated in 2008-09 at River Point Farms in the south Columbia Basin, using center-pivot circles of onion bulb crops in fields with a history of this disease as replicate plots to assess efficacy of fungicide seed treatments and banded, incorporated applications, soil fumigation, and timing cover crop herbicide application relative to planting onion crops for reducing losses to this problem. Promising preliminary results demonstrated the need to evaluate these practices further under grower-cooperator conditions.

The objectives of this project were to assess management practices for *Rhizoctonia* in onion bulb and pea crops in the Columbia Basin. Specific practices evaluated included: a) soil fumigation; b) seed treatments; c) fungicide drench applications; d) timing herbicide application and cover crop incorporation 4, 2, or 0-1 week prior to planting onion crops ('green bridge' duration); e) identifying primary *Rhizoctonia* species that infect onion and pea crops; f) evaluating onion and pea cultivars to identify more resistant or tolerant cultivars; and g) evaluating cultivars to identify characteristics that minimize *Rhizoctonia* inoculum increase following incorporation of cover crops (cereals and other cover crops such as vetch).

Approximately 27,000 acres of onion bulb crops and 40,000 acres of green pea crops are grown under irrigation in the Columbia Basin of central Washington and north-central Oregon annually. Onion crops have farm gate values of $4,000-$7,000/acre and pea crops of $500-$700/acre. The Columbia Basin ranks second in the USA for production of storage onions, and third for peas. A majority of onion and pea crops in the Columbia Basin are grown on very sandy soils. This has necessitated the use of cover crops to avoid having to replant entire fields in the spring as a result of major losses to sandblasting of onion and pea seedlings during very windy spring conditions. Widespread adoption of winter cereal cover crops preceding spring planting of vegetables like onion and pea is a relatively recent phenomenon (last 5-10 years) as the acreage of vegetables planted on very sandy soils has increased. However, significant losses to seedling blight/stunting caused by *Rhizoctonia* spp. occur when onion or pea crops are planted soon after incorporating cereal cover crops, because *Rhizoctonia* spp. rapidly colonize roots of the dying cereal crops, resulting in a very significant increase in the amount of soilborne inoculum for subsequent colonization of the roots of onion and pea seedlings. Symptomatic pea plants mature earlier than healthy plants, affecting tenderometer readings; symptomatic onion plants remain stunted, producing smaller bulbs at harvest. These effects reduce prices growers are paid. Pea growers have indicated that stunting can range from 5-30% of individual fields. One grower near Paterson, WA estimated the problem affects 5-20% of his pea and onion acreage. The research manager for one of largest onion operations in the USA, located in the south Columbia Basin, estimated this disease reduces their onion yields by an average of 2 tons/acre for ~50% of their 5,400 acres annually. At a value of $115/ton, this totals a loss of $621,000/year for that farming operation. Some growers in the Columbia Basin have indicated a similar problem can occur in sweet corn grown on sandy soils, so this project may also benefit the specialty sweet corn industry (>90,000 acres of sweet corn in Washington in 2009, valued at >$170 million; >29,000 acres in Oregon in 2008, valued at >$34 million).

Losses caused by *Rhizoctonia* in onion and pea crops represent an emergency situation with no effective alternative: the causal agent of stunting in onion and pea crops associated with cover crops was only recently recognized, there has been no prior research on this disease in onion and pea, and there remains a necessity for winter cover crops to prevent soil erosion and protect against huge losses of seedlings to sandblasting in spring. This project addressed funding priorities #1 (Pest and Disease Control) and #3 (Protecting Key Resources – Land, Water and Labor) of the WSDA Specialty Crop Block Grant. The project had an integrated approach to developing an effective management program for *Rhizoctonia* in onion bulb and pea crops in the Columbia Basin (fungicide seed/ broadcast treatments, Telone fumigation, timing cover crop kill and incorporation relative to planting onion seed, selection of tolerant or resistance cultivars, and identification of cover crops/cultivars that minimize development of *Rhizoctonia* in soils) for managing this disease without compromising the use of cover crops to prevent soil erosion and sandlbasting. If the use of cover crops is limited because of this disease, wind erosion will become more significant and air quality will suffer.

This project did not build on a previously funded SCBG project.

PROJECT APPROACH

2010-11 Onion and pea field trials

Four field trials were completed in 2011 in grower-cooperator field sites in the south Columbia Basin that had a history of stunting in onion and/or pea crops. The objective of these trials was to assess the efficacy of potential management practices on seedling blight in onion and pea crops caused by *Rhizoctonia*. Refer to the 2011 quarterly reports for additional details on the trials.

Field R708 near Irrigon, OR was planted to an onion bulb crop in March 2011. Four replicate plots of each of the following treatments were set up in a block design by the grower-cooperator in the 125 acre,

center-pivot irrigated field in which patching had been observed in previous onion bulb crops: a) Quadris and Rezist fungicide banded, incorporated sprays applied over the bed just prior to planting onion seed in spring; b) Telone II soil fumigation in wide strips (each at least 36 beds wdie) across the diameter of the field in fall 2010 or spring 2011; c) winter wheat cover crop sprayed out in two replicated strips (each 4 beds wide) 4 weeks or 1 day prior to planting onion seed in spring 2011; and d) check plots. Fungicide seed treatments were not included in the field trials because of the lack of significant results from seed treatments in 2010 field trials preceding this project. Instead seed treatments were evaluated in greenhouse and growth chamber studies which are significantly less expensive than field trials. In addition, the grower-cooperator set up additional treatments in two replicated plots each in Field R708 that were not part of this original proposal: e) application over the onion beds of Quadris + Rhizoburst (latter is a commercial microbial soil inoculant); f) application of Rezist (microbial growth stimulant) over the onion beds at planting; g) application of Actinogrow (a commercial microbial plant growth stimulant) over the onion beds; and h) Quadris broadcast and incorporated over the onion beds before planting primed vs. non-primed onion seeds to see if priming onion seed, which speeds up germination and emergence, might reduce incidence and/or severity of stunting. All treatments were applied and the fields maintained by the grower-cooperator. Soil samples were collected from plots in spring 2011. Baiting and isolations for *Rhizoctonia* spp. from these samples was postponed as the PhD student on the project, Maxwell Handiseni unexpectedly left the project (his GPA after spring semester was below the minimum required to remain in Graduate School at WSU), so samples were placed in storage until a postdoctorate was hired to do baiting and real-time PCR assays to quantify *Rhizoctonia* spp. On 14 and 30 June 2011, the number of patches in each plot, size of each patch, and severity of stunting/patch were measured. Patches typical of those caused by *Rhizoctonia* spp. were observed, but the disease was not as severe as anticipated based on the grower-cooperator's observations in previous years. Also, distribution of the patches resulted in moderate disease pressure in two of the four replications, and very low disease pressure in the other two replications, which weakened the statistical analyses. One of the main difficulties encountered with field trials for this disease was determining where patching might occur in order to know where to place replicated plots to achieve statistically sound evaluation of treatments. Disease assessment results are shown in Table 1. A decision was made not to collect yield data from the plots because the limited disease pressure and uneven distribution of disease meant insignificant yield differences among treatments.

Field R022, a center-pivot irrigated field near Boardman, OR. The grower-cooperator set up 12-bed-wide strips of each of primed and non-primed seed of the onion cv. Vaquero planted across the diameter of the field to assess the potential of priming onion seed for reducing losses to stunted patches from *Rhizoctonia* spp. In addition, 12 bed-wide strips of the cultivar Joaquin were planted and either sprayed with Rhizoburst + Quadris (as described for Field R708) or not sprayed (check plot). These trials were not part of the original proposal, but the grower-cooperator included the trials to complement the trial in R708, particularly given the uncertainty of where disease might occur in a field. Disease was rated on 14 and 30 June 2011.

Field K-11 near Patterson, WA was planted to a pea crop in April 2011. Four cover crop herbicide spray and incorporation timing treatments were set up relative to planting pea seed (details noted in the quarterly reports). Soil fumigation treatments were not included because the grower-cooperator indicated this was not economically viable for processing pea crops, even though an offer was made to pay the cost of fumigation treatments to evaluate the potential impact on stunted patches and pea yield. Similarly, the cooperator requested not including Quadris fungicide treatments in the trial because he considered the expense for this treatment economically infeasible for pea ($56 to $112/acre). Therefore, only the cover crop green bridge treatments were evaluated, with the cover crop incorporated 15, 8, 3, and 1 day(s) prior to planting pea seed on 23 April 2011. The grower-cooperator did all of the treatments. The incidence of patches was assessed on 15 June 2011. Unfortunately, stunted patches only developed in a low-lying area at the southern end of the field, i.e., distribution of patches did not permit

evaluation of the green bridge treatments, as confirmed by aerial, infra-red images of the field obtained from the grower-cooperator. Rather than abandoning the trial, the GPS location and size of each of 10 large patches was marked in the field on 23 June to assess the impact of stunted patches on pea yield, which had not previously been evaluated. On 7 July, plants were harvested from a 1 m section of 4 rows in the center of each of the 10 patches, and from a 1 m section of 4 rows outside each patch. Pea seed was shelled, weighed, and tenderometer readings measured. The roots and stems of four plants were dug from within and outside each of the 10 patches to isolate *Rhizoctonia* spp. Sixty isolates of *Rhizoctonia* were obtained from these plants, from which rDNA was sequenced for species and anastomosis group (AG) identification associated with stunted patches in pea.

Field ANW 364 near Paterson, WA was planted to an onion bulb crop in March 2011. Quadris was banded at 9.5 oz and 19.0 oz/acre over the beds and incorporated with a rototiller immediately prior to planting onion seed, in each of six replicate plots/treatment in a randomized complete block design (RCBD). Control plots received no Quadris but were rototilled similarly. Each plot was 12 beds wide x ¼ mile long. The grower-cooperator set up the plots and maintained the trial with the surrounding crop. The number of patches, area of patches, and severity of stunting in the patches were rated on 29 June 2011.

Results: Assessments of impacts of the various treatments on onion or pea yields were completed only in the onion trial in ANW 364 because disease data from each trial showed the distribution of stunted patches in the other three trials (R708, R022, and K-11) would not enable statistical differentiation of treatment effects. At least half of R708 with two replicates of treatments had no patching, and the amount of patching in the remaining two replications was moderate, which reduced statistical power of the analyses (Table 1). Similarly, although there was significant patching in the area of R022 in which primed vs. non-primed seed treatments of Vaquero were located (12.5% of the plot area had patches in the control plots), the incidence and severity of patching for each treatment did not differ significantly between primed vs. non-primed seeds (Table 2). However, in the replicate plots of Joaquin treated with Rhizoburst + Quadris, no patches were observed on 6/30/2011 compared to a significant area of stunted plants in the control plots (Table 2).

Table 1. Evaluation of various treatments on stunting caused by *Rhizoctonia* spp. in an onion bulb crop (Field R708) near Irrigon, OR in the south Columbia Basin.

	Disease rated on 6/14/2011		Disease rated on 6/30/2011			
Treatment	**No. of stunted patches/ acre**	**Stunted area (% of plot)**	**No. of stunted patches/ acre**	**Severity of patches (1-3 scale)**	**Stunted area (% of plot)**	**Patch index (severity x area)**
Control	102 a[#]	14.7 a	118 a	1.43 ab	2.3 a	3.14 a
Telone fumigation (middle plots)	81 ab	5.1 abc	121 a	1.52 ab	1.7 ab	2.53 a
Telone fumigation (inner plots)	14 d	0.7 cd	68 a	1.52 ab	1.4 b	2.18 a
Telone fumigation (outer plots)	-[*]	-	18 c	0.95 b	0.2 d	0.33 d
Cover crop glyphosate spray 4 weeks before planting onion seed[&]	65 abc	3.3 bcd	49 ab	1.27 ab	0.6 cd	0.68 cd
Cover crop glyphosate spray 1 day before planting onion seed[&]	33 bcd	2.4 bcd	25 bc	1.50 ab	0.5 cd	0.60 cd
Quadris broadcast at planting	25 cd	1.0 cd	18 c	1.25 ab	0.4 cd	0.47 cd
Rezist broadcast at planting	76 ab	4.9 bcd	63 a	1.32 ab	1.0 bc	1.41 bc
Rhizoburst + Quadris[$]	0 d	0.0 d	0 d	0.00 c	0.0 d	0.00 d
Actinogrow[$]	90 a	6.9 ab	120 a	1.62 a	1.6 ab	2.62 a

[#] Within each column, means followed by the same letter are not significantly different based on Fisher's protected least significant difference (LSD at $P = 0.05$).
[*] Telone fumigated plots located towards the outer edges of the field were not rated on 6/14/2011.
[&] Each of the cover crop treatments was only applied to strips 4 beds wide, whereas most other treatments were applied to at least 12 beds/strip/replication.
[$] Only two replicate plots were set up by the grower-cooperator for the Rhizoburst + Quadris and the Actinogrow treatments.

In R708, check plots averaged 102 stunted patches/acre on 6/14/2011 and 118 patches/acre on 6/30/2011. Interestingly, the average number of stunted patches in the three sets of Telone soil fumigation plots (4 replicate plots/set) was only significantly less than that of the control plots for the outermost Telone plots. The middle and inner fumigated plots did not have significantly fewer patches than the control plots, illustrating how much distribution of the disease in a field plots can affect ability to detect efficacy of treatments. There was no significant difference in numbers of patches when the cover crop was sprayed with glyphosate 4 weeks vs. 1 day prior to planting the onion bulb crop, but the very narrow size of these plots, and the plot locations in the field did not facilitate effective evaluation of these treatments. Rezist and Actinogrow did not reduce the number of patches compared to the control plots. However, a banded, incorporated application of Quadris at the time of onion planting reduced the number of patches 4-fold on 6/14/2011 and >6-fold by 6/30/2011. No patches were observed in plots treated with Rhizoburst + Quadris, although there were only two replicate plots of this treatment.

The cumulative area of stunted patches was 14.7% in the control plots on 6/14/2011, but by 6/30/2011 had decreased to 2.3%, which may have occurred as some stunted plants 'caught up' in growth with adjacent asymptomatic plants, particularly in patches with low severity ratings of 1 out of 3. Of the three sets of Telone plots, the outer and middle sets of replicated plots had significantly less patched areas than the control plots, but not the middle Telone plots rated on 6/30/2011. On both rating dates, all the other treatments except Actinogrow had significantly reduced the area of patches compared to the control plots, with the greatest reduction in area of patches observed in plots treated with Rhizoburst + Quadris, Quadris alone, Telone (in the outer plots), and the two cover crop green bridge treatments. Severity of stunting in the patches averaged 2.3 out of 3.0 in the control plots, and the patch index was 3.14 in the control plots. Only Rhizoburst + Quadris and Telone applied in the outer section of the trial reduced the severity of patches significantly compared to the control plots. Results for the patch index were similar to those for the area of patching in each plot.

Overall, the distribution of stunted patches in R708, limited plot width (4 beds/replication) of cover crop green bridge treatments, and only two replicate plots of Actinogrow and Rhizoburst + Quadris treatments reduced strength of the statistical analyses and robustness of data interpretation from this trial. Nonetheless, results indicated that several treatments, particularly Quadris banded over the beds at planting, and possibly Quadris + Rhizoburst or Telone II soil fumigation reduced stunting in onion bulb crops. The results supported observations from Quadris evaluated in ANW 364 (Table 3), and Rhizoburst + Quadris treatments in R022 (Table 2).

Table 2. Evaluation of primed vs. non-primed seed of the onion cultivar Vaquero, and application of Rhizoburst + Quadris in a planting of the cultivar Joaquin vs. non-treated plots in a commercial onion bulb crop (Field R022) near Boardman, OR.

	Disease rated on 6/14/2011		**Disease rated on 6/30/2011**			
Cultivar and treatment[*]	**No. of stunted patches/ acre**	**Stunted area (% of plot)**	**No. of stunted patches/ acre**	**Severity of patches (1-3 scale)**	**Stunted area (% of plot)**	**Patch index (severity x area)**

Vaquero – non-primed seeds	27 z	12.5 z	65 z	1.42 z	1.8 z	2.6 z
Vaquero – primed seeds	32 z	10.3 z	75 z	1.34 z	2.0 z	2.9 z
Joaquin – control	-	-	80 a	1.52 a	2.6 a	4.3 a
Joaquin – Rhizoburst + Quadris	-	-	0 b	0.00 b	0.0 b	0.0 b

* Treatments applied to each cultivar were set up as separate trials. Within each column, means followed by the same letter for a specific cultivar are not significantly different based on Fisher's protected least significant difference (LSD at $P = 0.05$).

Priming Vaquero seeds had no significant effect on incidence, severity, or area of stunting in R022 (Table 2). However, plots of Joaquin treated with Rhizoburst + Quadris had no patches in any plot, whereas control plots of this cultivar averaged 80 patches/acre, 1.52 severity of stunting, and 2.6% of the plot area stunted (Table 2). These results support the lack of patches observed in two replicate plots with Rhizoburst + Quadris in R708.

In **ANW 364**, onion bulbs were windrowed manually in August by a grower-cooperator crew and Jordan Eggers (OSU Hermiston AREC). Bulbs in each plot were harvested in September. The grower-cooperator used a different truck for each plot to keep adjacent plot yields separated and avoid mixing plot bulbs with the surrounding crop. Truck weights (tare and loaded) were recorded, and statistical analyses completed (Table 3).

Table 3. Evaluation of banded, incorporated application of Quadris just prior to planting onion seed for management of stunting caused by *Rhizoctonia* spp. in an onion bulb crop (Field ANW 364 near Paterson, WA)

	Patch ratings (6/29/2011)				
Treatment	**Cumulative patch area /plot (ft^2)**	**Number of patches**	**Severity of patches (0 - 3 scale)**	**Patch index (area x severity)**	**Bulb yield (tons/acre)**
Control	949 a	35.0 a	1.89 a	1,990 a	31.2 a
Quadris at 9.5 oz/acre	382 b	17.3 b	1.53 b	487 b	31.3 a
Quadris at 19.0 oz/acre	303 b	15.3 b	1.46 b	379 b	29.7 a

Both rates of Quadris application reduced the number of patches by ~50%, the size (area) of patches by ~60%, and severity of patches. The effects were not statistically different ($P < 0.05$) for the half vs. full rates of Quadris application. Although Quadris significantly reduced the number and severity of patches, final bulb yield was not affected significantly because the total amount of patching/plot was minor in relation to the size of each plot (303 to 949 ft^2 of patching in 0.6 to 0.7 acres/plot = 0.7 to 2.2% patching/plot).

In pea **Field K-11**, patches only developed in a low-lying, pie-shaped wedge covering ~10 acres at one end of the field, which did not have any bearing on the green bridge treatments. As described in the quarterly reports, the GPS location and size of each of 10 large patches was measured in the field on 23 June 2011 to assess the potential impact of patches on pea yield. The impact of *Rhizoctonia* on pea yield had not previously been evaluated. *Pea yields showed no significant difference inside vs. outside each patch, because the plants compensated for poorer stands inside each patch by producing more peas/plant. Furthermore, the field had a very severe outbreak of white mold (caused by Sclerotinia sclerotiorum), which was more severe outside the patches because of the density of plants outside patches, which confounded assessment of the impact of patches on pea yield.* However, pea tenderometer readings were affected significantly by the patches, with peas maturing earlier inside vs. outside stunted

patches. A collection of 60 isolates of *Rhizoctonia* obtained from roots/stems of pea plants within and outside each patch represented the first extensive set of isolates of this pathogen from pea in the Basin. The pathogen was readily isolated from pea plants inside and outside patches. The isolates were identified to species and anastomosis group (AG) later in the project (see below).

An additional ~30 isolates of *Rhizoctonia* were obtained from two organic pea trials in grower-cooperator fields in the Columbia Basin near Boardman, OR and Soap Lake, WA, as part of a different project by Lindsey du Toit's program (organic treatments evaluated for control of damping-off in pea). The PhD student on that project, Ana Vida Alcala, obtained *Rhizoctonia* isolates when isolating for *Pythium* spp. in her trials. The *Rhizoctonia* isolates were identified to species and AG later in the project.

Onion seed treatment trial

As noted in the 2011 quarterly reports, onion seed treatments were not included in the 2011 field trials because of insignificant effects of seed treatments in the 2010 onion field trial. Instead, seed treatments were evaluated in a greenhouse trial in Pullman in April-June 2011 by PhD student, Maxwell Handiseni, just prior to his leaving WSU. Onion seed of two cultivars, Redwing and Talon, were treated with each of the following fungicides, in addition to mefenoxam (Apron) for control of *Pythium*, another soilborne vegetable pathogen:

1) thiram (Thiram),
2) fludioxonil (Maxim),
3) azoxystrobin (Quadris),
4) sedaxane (new fungicide from Syngenta Crop Protection),
5) fludioxonil + azoxystrobin + sedaxane,
6) boscalid + pyraclostrobin (Pristine), and
7) non-treated seed (control treatment).

Seeds with each treatment were planted in soil inoculated or not inoculated with an isolate of *R. solani* AG-8, and maintained at 15°C to mimic cool spring planting conditions. A completely randomized design (CRD) was used with five replications (one seed/conetainer/treatment/replication). After 6 weeks, onion seedling height, root rot (scale of 0 to 8), and seedling dry weight were measured. Statistical analyses were completed (dry seedling weights could not be analyzed as the student pooled seedlings for a single dry weight/treatment).

<u>Results:</u> *R. solani* AG-8 caused significant stunting of onion seedlings, root rot, and reduction in seedling dry weight compared to plants in non-inoculated soil. For the cultivar Talon, only fludioxonil (Maxim) and boscalid + pyraclostrobin (Pristine) seed treatments increased seedling height compared to plants that grew from non-treated seed in inoculated soil. Only boscalid + pyraclostrobin seed treatment significantly reduced severity of root rot compared to control plants. For Redwing, only azoxystrobin (Quadris) seed treatment significantly increased seedling height compared to non-treated seed planted in inoculated soil, but root rot ratings were reduced by three treatments: azoxystrobin, boscalid + pyraclostrobin, and fludioxonil + azoxystrobin + sedaxane. *Overall, results demonstrated that some fungicide seed treatments can reduce damage to onion seedlings by* Rhizoctonia. *However, the efficacy appears limited and the duration of efficacy is probably limited further by the small amount of active ingredient in seed treatments.* This may explain why seed treatments in the 2010 onion field trial did not significantly reduce the number or size of stunted patches, whereas a banded application of Quadris over the beds in ANW 364 in the 2011 trial significantly reduced the amount of disease. Further progress on evaluation of seed treatments will resume when a postdoctorate has been hired, including looking at in-furrow drench applications of fungicides at the time of planting onion seed, similar to the way in-furrow drench applications of azoxystrobin are used to control *Rhizoctonia* in potato crops.

Soil assay for *Rhizoctonia* and efforts to develop a soil bioassay to assess the risk of stunting:
Growers have expressed interest in finding a way to determine the risk of stunting for individual fields at least the fall prior to planting onion and pea crops, in order to select fields with lower risk of stunting. To determine if it is even possible to assess the risk of stunting in regions of a field where stunting has occurred vs. adjacent healthy areas, soil samples were collected in June 2011 from inside and outside stunted patches of plants in an onion crop and a pea crop in the south Columbia Basin. A subsample of each soil was sent to each of: 1) Western Labs, ID that has a real-time PCR assay to quantify *R. solani* AG-8; 2) OSU Hermiston IAREC's diagnostic lab; and 3) a lab at the South Australian Research & Development Institute (SARDI) in Australia, to test for *R. solani* AG-8 and other *Rhizoctonia* species using DNA-based methods. In addition, a subsample of each soil was: 4) sent to Tim Paulitz' lab in Pullman, WA to quantify *Rhizoctonia* spp. using a soil toothpick baiting assay; and 5) placed in pots and planted with pea seed to try and develop a plant bioassay for assessing the risk of stunted patches in a field.

Results: *Only the Australian lab detected a significant quantitative difference in the amount of* Rhizoctonia *detected in soil samples collected within each patch vs. soil sampled outside each patch.* Western Labs and the OSU Hermiston lab use protocols that test a very limited amount of soil (up to 5 g soil/sample), whereas the SARDI lab protocol can quantify pathogens in up to 1 kg soil/sample. The inability of the assay completed by the former two labs to quantify differences in amount of *Rhizoctonia* inside vs. outside the patches probably reflects the *difficulty of using molecular assays that can only accommodate very limited amounts of soil to assess quantitatively the risk of a pathogen that is unevenly distributed in soil, particularly for predicting risk in individual fields as large as 150 acres*. The toothpick baiting assay and the bioassay also did not detect significant differences in amount of pathogen and degree of stunting for soils sampled within vs. outside of patches. These biological assays were carried out in June, long after the appearance of patches in the original fields from which the soils were sampled. Research by an Australian team (S. Anstis and T. Wicks at SARDI) and by Paulitz' lab has shown that the initial 'flush' (increase) in *Rhizoctonia* inoculum in a field immediately after incorporation of crop residues is followed soon thereafter by a rapid decline in amount of inoculum as the cover crop residues are decomposed. Viable inoculum levels of *Rhizoctoni* in soils sampled inside vs. outside patches may no longer have been significantly different by the time soil samples were collected (although the amounts of DNA of the pathogen still differed, according to the SARDI lab assay). This highlighted the difficulty of predicting risk of stunting from *Rhizoctonia* spp. without knowing where to sample the field for testing if the sampling must be done prior to patches developing, or even the season prior to planting so that growers can assess which fields to prepare that fall for planting winter cereal cover crops preceding spring planting of onion and pea crops.

Development of a *Rhizoctonia* nursery for smaller-scale field trials
Following difficulties experienced with the sporadic distribution of stunted patches in grower-cooperator onion and pea fields, Phil Hamm offered a field location of ~1 acre at the OSU Hermiston AREC to set up a *Rhizoctonia* nursery. The site was planted with a wheat crop harvested in August 2011. The wheat stubble was burned on 27 September 2011, and a winter oat crop planted on 7 October 2011 (instead of wheat to avoid confounding take-all, a common wheat disease). Oat seed was mixed with inoculum of *R. solani* AG-8 prepared by Lindsey du Toit's program. The inoculum consisted of wheat or rye seed colonized by four isolates of *R. solani* AG-8 originating from the Columbia Basin. The wheat and rye seed were soaked overnight in water, autoclaved twice at 24 hour intervals, cooled, and then inoculated with isolates of the fungus. After the seed was fully colonized (3-4 weeks), the seeds were dried and the dried inoculum stored at 4°C until used to inoculate the field. Inoculum (93 lb) was mixed with winter oat seed and planted in-furrow to create a conducive environment for the pathogen to colonize the winter oat cover crop. This nursery was used in 2012 to set up smaller-scale onion field trials in half of the inoculated field, and the other half was planted with a spring wheat crop in 2012 that was inoculated a

second time with *R. solani* AG-8 at planting to increase disease pressure further for a second season of nursery field trials in 2013 (see 2012-13 activities described below).

2011-12 Onion and pea field trials

After PhD student, Maxwell Handiseni, left the project unexpectedly in June 2010, permission was received from WSDA SCBG staff to advertise for a postdoctorate research associate. After interviewing multiple rounds of applicants in 2010-11, Dr. Dipak Sharma Poudyal was hired on 15 May 2012. Sharma Poudyal helped make rapid progress in 2012-13, particularly following the significant delays with some aspects of the project I the 11 months between the PhD student leaving and Sharma Poudyal being hired. Six onion field trials, two pea field trials, and soil risk assessment for stunting in each of nine fields planted to onion bulb crops in 2012 were completed in grower-cooperator fields in 2011-12. The fields had a history of stunting in onion and/or pea crops, and sites selected for risk assessment ranged from low to high risk based on growers' observations in prior years. Refer to 2012 quarterly reports for additional details on each trial.

Onion 'green bridge' trial (Field ANW 444): Effect of interval between application of glyphosate to a winter cover crop and planting onion seed on stunting caused by *Rhizoctonia*.

The winter wheat cultivar Madsen was planted in strips as a cover crop on 10 October 2011 in a grower-cooperator field near Paterson, WA. Spring 2012 treatments consisted of preplant applications of GlyStar Plus (glyphosate) to the cover crop at 48 oz/acre at three intervals, i.e., 3, 17, and 27 days prior to onion seeding on 20 April 2012 (Fig. 1). The experiment was a RCBD with each treatment replicated six times. Each plot was 12 beds wide (each bed 22 in. wide with two double-rows) and 0.27 to 0.24 miles across the diameter of the center-pivot irrigated field. The treatments were applied, and the crop/trial maintained by the grower-cooperator. Onion stunting was rated at the 5 and 7 true-leaf growth stages (18 June and 3 July, respectively) for eight center beds/plot to avoid effects of herbicide drift between adjacent plots. The number of patches/plot was counted, and length and width of each patch measured to estimate patch size. Severity of onion stunting in each patch was rated (1-3 scale: 1 = a majority of plants in the patch stunted <33%, 2 = a majority of plants 33-66% stunted, and 3 = a majority of plants >66% stunted compared to adjacent healthy plants). Results were standardized to accommodate variation in plot size across the field. Analyses of variance were calculated and treatment means compared using Fisher's protected least significant difference (LSD).

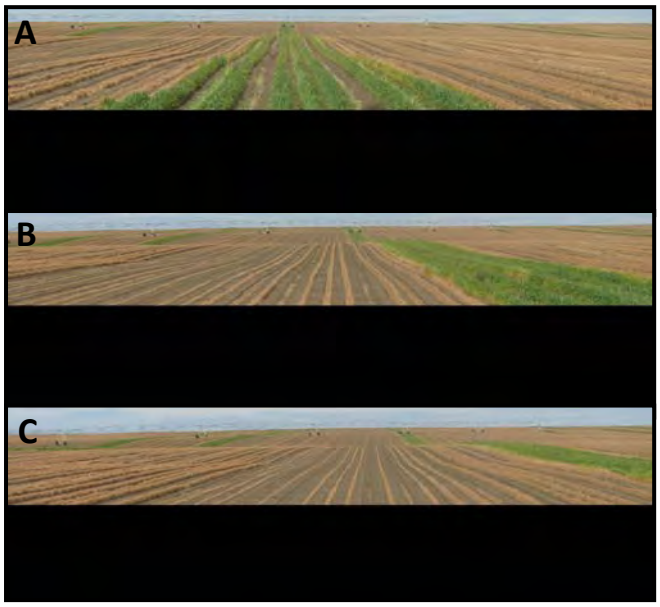

Fig. 1. 2012-12 Green bridge trial. Strips of winter wheat cover crop were sprayed with herbicide 3 days (A), 17 days (B), or 27 days (C) prior to planting an onion bulb crop in the Columbia Basin. Six replicate strips/treatment, each 12 beds wide, were set up in a randomized complete block design. The photos show one replicate plot of each of the three treatments, and were taken on 26 April 2012. Onion seed was planted between strips of cover crop on 20 April 2012. Onion seedlings are barely visible between the winter wheat rows in these photos. Note the size difference in cover crop among the herbicide (green bridge) treatments. Wheat plants in 'C' may be too small to provide adequate

protection of onion seedlings against wind-/sand-blasting. Results: At the five true-leaf growth stage on 18 June, plots in which the cover crop was sprayed with herbicide 3 days prior to onion seeding had more patches, greater cumulative patched area, more severe stunting, and a greater severity index than plots in which herbicide was applied 17 or 27 days prior to onion seeding (Table 4). Application of herbicide 17 and 27 days before onion planting reduced the number of stunted patches 32 and 55%, respectively; cumulative patched area and percentage of cumulative patched area 46 and 54%, respectively; severity of stunting 11 and 15%, respectively; and patch severity index 53 and 59%, respectively, compared to plots with herbicide applied 3 days prior to planting onion seed. Overall, there was no significant difference in patch parameters between the 17- and 27-day herbicide treatments, except number of patches/acre which was less in plots sprayed with herbicide 27 days vs. 17 days prior to onion seeding.

By the 7 true-leaf stage, the number of stunted patches of onion plants was reduced by 22 and 70% in plots sprayed 17 and 27 days before planting onion seed, respectively, compared to plots sprayed 3 days prior to planting; however, the number of patches did not differ between plots treated with herbicide 3 vs. 17 days prior to planting (Table 4). Similarly, cumulative area of patches was reduced 31 and 70% in plots sprayed with herbicide 17 and 27 days prior to planting, respectively, compared to 3 days; and percentage of plot area with stunted patches was reduced 31 and 70%, respectively, although only the 27-day herbicide treatment caused a significant reduction compared to the 3-day treatment. Average severity of stunting and stunting severity index were decreased significantly by applying herbicide to the cover crop 17 or 27 days prior to planting onion seed: the former by 19 and 20%, respectively, and the latter by 40 and 74%, respectively, compared to applying herbicide 3 days prior to onion seeding.

Table 4. 2011-12 Onion cover crop 'green bridge' trial (Field ANW 444).

Timing of cover crop herbicide application (days prior to planting onion seed)[a]	No. of patches/acre	Cumulative patch area (ft^2)	Stunted patch area (% of plot)	Severity of stunting (1 - 3 scale)[b]	Severity index[c]
			18 June 2012		
3 days	56.1 a[d]	885 a	2.1 a	1.6 a	1,572 a
17 days	38.2 b	476 b	1.2 b	1.4 b	733 b
27 days	25.1 c	406 b	1.0 b	1.3 b	650 b
			3 July 2012		
3 days	23.4 a	516 a	1.3 a	1.6 a	839 a
17 days	18.2 a	388 ab	0.9 ab	1.3 b	501 ab
27 days	7.4 b	155 b	0.4 b	1.3 b	215 b

[a] Randomized complete block design with six replicate plots/treatment. Each plot was 12 beds wide x diameter of ~125 acre, center-pivot irrigated field.

[b] Mean severity of stunting on a 1 to 3 scale, where average height of plants in a patch was: 1 = at least 2/3 the height of adjacent, healthy plants; 2 = 1/3 to 2/3 the height; and 3 = <1/3 the height of adjacent, healthy plants.

[c] Severity index = (severity rating of each patch) x (area of that patch), summed for all patches in a plot.

[d] For each rating date, numbers within a column followed by the same letter are not significantly different based on Fisher's protected least significant difference at $P = 0.05$.

As the onion crop matured, severity of stunting became less evident. Results from the two rating dates revealed an inverse relationship between timing herbicide application to the cover crop and incidence and severity of stunting. *Therefore, a longer duration is advised between applying herbicide to a cereal cover crop and planting onion seed in the Columbia Basin to minimize the degree of stunting caused by Rhizoctonia spp. in onion bulb crops.* This reflects the fact that, in the first few weeks after killing a cover crop with herbicide, a rapid increase in *Rhizoctonia* inoculum occurs in the soil as the fungus colonizes freshly decomposing root and crown tissue of the cover crop. As decomposition proceeds, other soil microbes may colonize the residues and the amount of *Rhizoctonia* declines rapidly.

2012 Onion fungicide (Quadris/Fontelis) trial (ANW 238)

This trial was a repeat of the 2011 Quadris trial in ANW 364, except a single rate of each of Quadris (19 oz/acre) and Fontelis (penthiopyrad, at 24 oz product/acre) were applied and compared with non-treated control plots instead of two rates of Quadris. The experiment was set up as a RCBD with six replications per treatment in ANW 238 near Paterson, WA. Each plot was 12 beds wide (each bed 44 in. wide and planted with two double-rows of the onion cultivar Mercury) x the diameter of the field (~0.5 miles). Each fungicide was banded over the top of the bed and incorporated 4 to 5 inches deep with a rototiller 1 day prior to onion seeding. The treatments and crop/trial maintenance were all done by the grower-cooperator. The number of patches of stunted onion plants, area of stunted patches, and severity of stunting in the patches (1-3 scale described above) were rated at the 5- and 7-true-leaf stages. Analyses of variance were computed and treatment means compared using Fisher's protected LSD.

Results: By 5 June, plots treated with Quadris had 24% fewer stunted patches, 33% less stunted area, 18% less severe stunting, and 44% reduced stunting index compared to non-treated control plots (Table 5). In contrast, plots treated with Fontelis did not exhibit a significant reduction in incidence or severity of stunting compared to control plots. Similar results were recorded at the seven true-leaf stage on 19 June.

Table 5. 2012 Onion banded, incorporated fungicide trial near Paterson, WA (Field ANW 238).

Fungicide (banded, pre-plant incorporated)	No. of patches/acre	Cumulative patch area (ft^2)	Stunted patch area (% of plot)	Severity of stunting (1 - 3 scale)	Severity index[b]
			5 June 2012		
Non-treated control…….	73.1 a[c]	1,205 a	2.3 a	1.7 a	2,193 a
Fontelis (24 oz/acre)…..	73.6 a	1,193 ab	2.3 a	1.6 ab	1,981 a
Quadris (19 oz/acre)…..	55.3 b(P=0.078)	809 b	1.6 b	1.4 b	1,219 b
			19 June 2012		
Non-treated control…….	41.4 a	625 a	1.2 a	1.7 a	1,142 a
Fontelis (24 oz/acre)…..	46.9 a	600 a	1.2 a	1.5 a	987 a
Quadris (19 oz/acre)…..	30.4 b(P=0.054)	430 b(P=0.070)	0.8 b(P=0.065)	1.6 a	728 a

[a] Mean severity of stunting on a 1 to 3 scale, as described in Table 1.

[b] Severity index = (severity rating of each patch) x (area of that patch), summed for all patches/plot.

[c] For each rating date, numbers within a column followed by the same letter are not significantly different based on Fisher's protected least significant difference at $P = 0.05$ or the probability level indicated in superscript font.

It was disappointing to observe no significant effects of Fontelis as preliminary data from greenhouse trials by S. Anstis and T. Wicks in South Australia suggested Fontelis might have greater efficacy than Quadris. However, it was encouraging to see a second year of large-scale field trial demonstrate the value of Quadris for managing this disease. Severity of stunting in this trial was less than in the 2011 trial with this grower-cooperator, in which Quadris reduced the number of patches by ~50% and area of stunted patches by ~60%.

2012 Onion field trials at River Point Farms

Various fields in which Dr. Bill Dean and staff at River Point Farms set up a range of research trials with Telone II soil fumigation, and banded/incorporated applications of fungicides at planting were visited during the 2012 season by du Toit and Sharma-Poudyal. The grower-cooperator also evaluated drench applications of Quadris immediately after planting, which resulted in severe phytotoxic effects to onion seedlings. The farm also continued to evaluate growth promoting treatments like Rezist, and combinations of treatments such as seed priming to promote rapid germination and emergence. Stunted patches of plants were rated in R044 on 23 May and R017 on 25 June. However, only the north half of plots in R017 could be rated because of poor growth in the south half from reasons other than *Rhizoctonia*. R044 and R017 were considered high risk for stunting according to the grower-cooperator, and proved to be so as stunted patches were observed early and were severe in sections of the fields. However, the disease distribution and uneven stands in the field meant that statistically robust data were only obtained for the fungicide trial in R044, as described below.

A pre-plant, banded, incorporated application of: 1) Quadris (12 fl oz/acre), 2) Quadris (12 fl oz/acre) + Rhizoburst (1280 fl oz/acre, 10-34-0 + 0-0-19 + humic acid), and 3) ReZist (1,280 fl oz/acre, Cu 1.75%, Mn 1.75%, and Zn 1.75%, with polyamines and natural plant extracts) were compared with non-treated control plots in a grower-cooperator field near Boardman, OR with four replicate plots/treatment in a RCBD. Fungicide applications were done as described for the ANW 238 trial. The number of beds/plot ranged from 8-12, each bed was 40 in. wide with two double-rows of the cultivar Tamara, and the length of each plot was ~0.25 miles.

Results: Quadris alone or in combination with Rhizoburst reduced the number of stunted patches, cumulative patch area, severity of stunted patches, and stunting index on 23 May and 6 June (Table 6). There was no significant difference in onion stunting parameters in plots treated with Quadris alone or Quadris + Rhizoburst. On 23 May, plots treated with Quadris had 52% fewer patches, 82% less patched area, 40% less severe stunting, and 84% reduced disease severity index compared to control plots (Table 6). Plots treated with Rezist did not differ significantly from the control plots.

Table 6. 2012 Onion fungicide trial near Boardman, OR (Field R044).

Fungicide treatment	No. of patches/A	Cumulative patch area (ft^2/A)	Stunted patch area (% of plot)	Severity of stunting (0 - 3 scale)[a]	Patch index (area x severity)[b]
		23 May 2012			
Non-treated control……..	64 a[c]	1,244 a	2.9 a	2.0 a	2,566 a
Rezist rate 1280 fl oz/A.....	76 a	1,282 a	2.9 a	2.0 a	2,937 a
Quadris rate 12 fl oz/A….....	31 b	222 b	0.7 b	1.2 b	398 b
Quadris rate 12 fl oz/A + Rhizoburst fl 1280 oz/A…..	22 b	292 b	0.5 b	1.3 b	366 b
LSD…….	16	338	0.7	0.3	815

		6 Jun 2012			
Non-treated control……..	90 a	1,654 a	3.8 a	2.0 a	3,655 a
Rezist rate 1280 fl oz/A.....	96 a	1,858 a	4.3 a	2.0 a	3,957 a
Quadris rate 12 fl oz/A….....	24 b	199 b	0.5 b	1.2 b	251 b
Quadris rate 12 fl oz/A + Rhizoburst fl 1280 oz/A…..	17 b	155 b	0.4 b	1.3 b	217 b
LSD……..	18	746	1.7	0.3	1,784

[a] Mean severity of stunting on a 1 to 3 scale, where average height of plants in a patch was: 1 = at least 2/3 the height of adjacent, healthy plants; 2 = 1/3 to 2/3 the height; and 3 = <1/3 the height of adjacent, healthy plants.

[b] Severity index = (severity rating of each patch) x (area of that patch), summed for all patches in a plot.

[c] For each rating date, numbers within a column followed by the same letter are not significantly different based on Fisher's protected least significant difference at $P = 0.05$.

Based on the large-scale, grower-cooperator field trials in 2011 and 2012, a pre-plant, broadcast incorporated application of Quadris effectively reduced onion stunting in the Columbia Basin.

2012 Onion plow trial (Field BH12)

Six replicate, 22' wide strips of plowed ground adjacent to non-plowed ground were set up across center-pivot irrigated Field BH12 near Benton City in October 2011 by the grower-cooperator. Plowing was done on 17 October. The entire field was then fumigated with Vapam. On 31 October 2011, Stevens winter wheat cultivar was planted in plowed strip as well as a 22' strip adjacent to each plowed strip. The soil in this field was heavier than most of the grower-cooperator fields, so the grower did not plant a winter wheat cover crop in the rest of the field. An onion crop of the cultivar Elbrus was planted in April 2012.

Results: Stunted patches did not develop, but aerial, infra-red photos in June-July as well as field observations illustrated that the fall plow treatment negatively impacted onion growth compared to non-plowed strips. This was opposite to what was expected from fall plowing to speed decomposition of 2011 spring wheat crop residues, with the objective of reducing soilborne inoculum of *R. solani* on those residues. However, soil in that field was less sandy than optimum for stunting from *R. solani*, and it has been established by S. Anstis and T. Wicks at SARDI, as well as based on growers' empirical observations in the Columbia Basin, that stunting caused by *Rhizoctonia* is primarily a problem in very sandy soils. Also, the grower planted a winter cover crop into the plowed and adjacent non-plowed strips after plowing in order to provide wind- and sand-blasting protection for spring-planted onion. This cover crop may have negated any beneficial effects of plowing on decomposing spring wheat crop residues. Ideally, plowing should be done in spring to the cover crop to speed up decomposition of residues, but that would remove the cover crop needed to protect onion seedlings, so this is not a practical option for growers to manage onion stunting. Therefore, further testing of plowing for speeding decomposition of cover crop residues was not pursued in additional grower-cooperator trials. Refer to details below of the plow trial in the OSU *Rhizoctonia* nursery in 2012 to compare with this grower trial.

2011-12 OSU Hermiston AREC *Rhizoctonia* nursery trials

Given the application of *R. solani* AG-8 inoculum across this nursery field in October 2011 with planting of the winter oat cover crop, infection of onion plants by the pathogen in spring 2012 was anticipated to occur more uniformly across the field, and not to be expressed as stunted patches. The 2011-12 winter oat cover crop was sprayed with Roundup on 12 March 2012. The potential impact of the pathogen on onion was measured as number of leaves/plant and plant height for 40 plants/plot, as well as chlorophyll content of leaves (5 measurements/leaf for each of 5 plants/plot) on 11 June 2012. In addition, 20 soil

cores were collected from each replicate plot of each trial in June to quantify soilborne *R. solani* associated with each treatment.

Plow trial: The day that Roundup was sprayed on the winter oat cover crop, 12 March 2012, four replicate plots (each 6.5' wide x 100' long) were plowed with a 3-bottom plow to a 12" depth (two passes of the plow side-by-side/plot). The plowed and non-plowed plots were then disked, rototilled, fertilized using a drop spreader (35:60:100 + 30 S + 3 Zn + 1.5 B at 400 lb/acre), rototilled again to incorporate the fertilizer, and irrigated for 2 hours using hand-lines. Onion seed of the cultivar Tamara was planted in each plowed and non-plowed plot on 14 March.

Results: There was no evidence of stunting on 26 April, when onion plants were at the 2-leaf stage. By 11 June, there was no significant effect of plowing on leaf number or chlorophyll content, but plowing did result in a significant increase in plant height ($P = 0.051$). The mean height of plants in non-plowed plots was 30.0 cm vs. 33.4 cm in plowed plots at the 6- to 7 true-leaf stage. This could reflect quicker release of nutrients from the winter oat cover crop residues in the plowed plots vs. non-plowed plots, but also effects of the plow treatment on the pathogen colonizing cover crop residues. Bulb yields were estimated in each plot in September 2012 by harvesting and sizing 50 bulbs/plot manually. However, poor stands occurred across the trial as a result of severe maggot damage in spring (an insecticide application was not made in spring 2013, but the winter oat cover crop residues attracted large numbers of maggot flies. This stand reduction from maggot damage potentially confounded *Rhizoctonia* disease measurements.

Green bridge trial: Four replicate strips were sprayed with Roundup at each of the following intervals prior to planting onion seed of Tamara: 4 weeks prior (16 February), 3 weeks prior (24 February), 2 weeks prior (1 March), 1 week prior (8 March), and 1 day prior (12 March). Onion seed was planted on 14 March after the field was disked, rototilled, fertilized, rototilled again to incorporate the fertilizer, and irrigated.

Results: Timing of the herbicide application had no significant effect on number of leaves/plant or chlorophyll content, but did affect plant height (Fig. 2). The longer the duration between herbicide application and planting onion seed, the taller the onion plants for green bridge intervals of 1 to 21 days before planting, but there was no significant difference in plant height for herbicide applications made 21 and 28 days before planting (Fig. 2). The results support those of the large-scale green bridge trial in Field ANW 444 (Table 4).

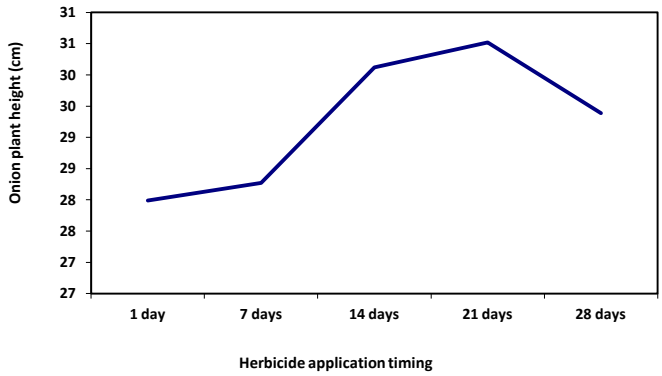

Fig. 2. OSU green bridge trial. Effect of timing spring herbicide application to a winter wheat cover crop on height of onion plants. Herbicide was applied to the cover crop at intervals of 1 to 28 days before onion seed of the cultivar Tamara was planted. Plant height was measured at the 6- to 7-true-leaf stage.

Set up of 2012-13 *Rhizoctonia* nursery: The winter oat cover crop was sprayed with Roundup on 13 March 2012 in the nursery field. On 16 March, 170 lb of *R. solani* AG-8 inoculum was mixed with 120

lb seed of the soft white spring wheat culticar Louise, and the mixture planted into the sprayed winter oat crop to increase *R. solani* inoculum in the section of the field that was then used for field trials in 2012-13. Soil and plant samples were collected from the field planted to a winter oat cover crop in 2011 and a spring wheat crop in 2012, as small patches of stunted plants were evident in parts of this ~1 acre field. The soil and plant samples were used for isolations/baiting to assess levels of *R. solani* AG-8. The wheat crop was harvested in fall, the stubble cut and removed, and herbicide applied. Winter oat was planted in fall 2012. This field was used for tillage and plow treatments in 2013 (see below).

2012 Onion yield loss evaluations

Field surveys were carried out to assess the effect of onion stunting caused by *Rhizoctonia* spp. on yield of three onion cultivars in grower-cooperator, center-pivot irrigated fields: the red cultivar Mercury was planted in four rows per 44 in. wide bed on 13 March in ANW 238 (same field as the 2012 fungicide trial described above); the yellow cultivar Tamara was seeded in two double-rows per 40 in. wide bed on 16 March in R044 (same field as the second 2012 fungicide trial described above); and the white cultivar Cometa was planted in two double-rows per 34 in. wide bed on 8 Apr in a grower-cooperator, center-pivot irrigated field near Pasco, WA. Patches of onion plants with different severity of stunting were selected in each field at the 5- to 7-true-leaf growth stages. Severity of stunting was rated on the 1 - 3 scale described above. Five patches were selected/field for each severity rating. Each patch was >5 ft. long and at least two beds wide. Manual harvest of the bulbs was done on 1 August for Mercury, 27 August for Tamara, and 21 August for Cometa from 5' of the two double rows/patch. Bulbs also were harvested from an equivalent area of healthy plants adjacent to each patch. Bulbs from each area were bagged separately and graded by size: colossal (>4.00" diameter), jumbo (3.00-4.00"), medium (2.25-3.00"), prepack (<2.25"), and culled (non-marketable). The total number of bulbs in each category was counted, and total bulb weight/size measured. All sizes except culled bulbs were considered marketable. The number and weight of bulbs in each category was calculated as a percentage of bulbs harvested, and the reduction in number and weight of bulbs in each size computed as a percentage of the number and weight in each size category harvested from healthy plants adjacent to the patch. The relationship between severity of stunting and percentage reduction in yield for each cultivar was calculated using regression analyses in SigmaPlot Version 12.

Results: The number of bulbs harvested in stunted patches did not differ significantly from the number of bulbs harvested from adjacent, healthy plants in the three fields evaluated, i.e., stunting caused by *Rhizoctonia* did not affect plant stand. However, bulb size was affected by onion stunting, with a greater impact on bulb size the more severe the stunting (Table 7). Colossal bulbs were present only in healthy areas sampled from the Mercury (1% of bulbs and 2% of total bulb weight) and Tamara (2% of bulbs and 6% of total bulb weight) fields, but not in healthy areas of the Cometa field nor any stunted patches for any cultivar (Table 7). In non-stunted areas of the Mercury and Tamara fields, a majority of bulbs were jumbo (65% of bulbs and 77% of total bulb weight for Mercury, and 85% of bulbs and 89% of total bulb weight for Tamara), followed by medium bulbs, with few or no prepack and culled bulbs. In healthy areas of the Cometa field, bulb size was smaller overall than the Mercury and Tamara fields (32 and 54% of Cometa bulbs were jumbo and medium, respectively, contributing 50 and 46% of total bulb weight, respectively). For all three cultivars, the distribution of bulb number and weight among size categories for bulbs harvested in stunted patches shifted to a greater number and weight of smaller bulbs the more severe the stunting (Table 7). Total weight of Mercury bulbs was reduced by 49, 54, and 77% in patches with severity ratings of 1, 2, and 3, respectively, compared to adjacent, healthy plants. Similarly, reduction in total marketable bulbs (colossal + jumbo + medium + prepack) was 49, 54, and 79% in patches with mean severity ratings of 1, 2, and 3, respectively. Correlation analyses revealed significant associations between severity of stunting in the Mercury field and percent reduction in jumbo bulbs ($r = 0.61$, $P = 0.012$ for number of bulbs, and $r = 0.60$, $P = 0.014$ for weight of bulbs), total bulbs ($r = 0.63$, $P = 0.009$ for number of bulbs, and $r = 0.70$, $P = 0.003$ for weight of bulbs), and total marketable

bulbs (r = 0.64, *P* = 0.007 for number of bulbs, and r = 0.69, *P* = 0.003 for total weight). Stunting resulted in similar reductions in bulb yield for Tamara and Cometa. Significant regression equations calculated for total bulb weight and marketable bulb weight for Mercury, Tamara, and Cometa enabled estimation of the potential yield loss associated with each severity of stunting for each of the cultivars evaluated (*data not shown*).

Table 7. Effect of severity of stunting caused by *Rhizoctonia* on the incidence and total weight of bulbs in each size category measured as a percentage of the number and total weight of bulbs in each size category harvested from non-stunted areas in a field of each of three onion cultivars.

		Number of onion bulbs in each size category (% of bulbs harvested)[y]					Total onion bulb weight by size category (% of bulbs harvested)[x]				
Cv.[z]	**Onion stunting severity (0-3)**	**Colo-ssal**	**Jumbo**	**Medium**	**Pre-pack**	**Culled**	**Colo-ssal**	**Jumbo**	**Medium**	**Pre-pack**	**Culled**
Cometa	0……	0[w]	32	54	12	2	0	50	46	4	0
	1……	0	10	59	25	6	0	23	66	10	1
	2……	0	3	56	30	11	0	8	74	15	3
	3……	0	1	35	36	28	0	5	62	27	6
Mercury	0……	1	65	31	3	0	2	77	20	1	0
	1……	0	26	46	18	10	0	47	45	6	2
	2……	0	9	61	24	6	0	20	68	11	1
Tamara	0……	2	85	11	2	0	6	89	5	0	0
	1……	0	55	43	2	0	0	69	29	2	0
	2……	0	20	62	17	1	0	37	55	7	1
	3……	0	3	64	32	1	0	8	77	14	1

[z] Cv. = Cultivar.
[y] Number of bulbs in each size category converted to a percentage of bulbs harvested from a plot (total = 100% for all size categories).
[x] Weight of onion bulbs in a particular size category calculated as a percentage of total weight of bulbs harvested from that patch.
[w] Each data point is the mean for five replicate patches for that severity rating.

In conclusion, onion stunting caused by Rhizoctonia spp. reduced bulb yields significantly for all three cultivars, and the greater the severity of stunting, the greater the decrease in total and marketable bulb weight as a result of smaller size bulbs. The reduction in number of total and marketable bulbs varied among cultivars, although cultivars were confounded with field sites and agronomic practices of each farm. Determining the impact of stunting severity ratings on bulb yield and size, and translating these to

disease measured in larger field trials should enable assessment of whether management practices evaluated are feasible economically (e.g., Quadris applications).

2012 pea field trials

Dr. Lyndon Porter worked with Watts Bros. (ConAgra) to set up two grower-cooperator pea field trials in 2012. However, neither crop developed stunted patches from *Rhizoctonia* that season. Also, none of the treatments demonstrated significant effects on plant growth (emergence, plant height, root disease index, or pea yield) compared to the control treatments. Details of the two trials are shown below.

SC-27 pea chemigation trial (Field M11): The biological product SC-27 (sold by Riverton Ag) contains 27 different biological organisms, and has been evaluated at several locations for control of *Rhizoctonia*, e.g., SC-27 apparently provided some benefit against this pathogen on potato in a trial at the OSU HAREC in 2011. SC-27 was applied by chemigation through the center pivot to an entire pea crop on 26 April. Five replicate tarps (each 24' x 40') were laid over the field during the application to create four control plots without SC-27. Porter sampled soil (12 six" deep soil cores/plot) from treated and non-treated areas prior to application of SC-27. Soil samples were dried overnight at 45°C and stored at 15°C to be tested for inoculum levels of *Rhizoctonia* if adequate disease developed in the trial. A request was made to apply SC-27 by chemigation in replicated 'pie wedges', but the grower cooperator was not able to do so. The pea cultivar Serge was then planted.

Results: The limited size of the tarped areas made it difficult to assess effects of Sc-27 on stunting of pea caused by *Rhizoctonia*. However, there was no significant difference in plant height, root disease index, or pea yield between areas of the field treated with SC-27 and the non-treated control plots (Table 8).

Table 8. Comparison of pea plants treated with SC-27 vs. non-treated control pea plants.

Treatment	Plant height (cm)	Root disease index	Yield (g)
SC-27	45.7 ± 4.9	3.3 ± 0.7	835 ± 113
Control	45.4 ± 5.4	3.4 ± 0.5	904 ± 151

[a] Plant height measured at flowering from six subsamples/replication with 5 plants/subsample.
[b] Root disease index at flowering on a scale of 0 - 5, with 5 = most severe root rot.
[c] Yield of pea plants from 5 feet of five adjacent rows of plants/replication/treatment.

Stamina (strobilurin fungicide) pea seed treatment (Field E6): On 3 May, pea seed of the cultivar Serge, treated with Apron (0.32 fl oz/100 lb seed) + Maxim (0.04 fl oz/100 lb) + Stamina (1.5 fl oz/100 lb) was planted in six replicate 44' wide strips across the length of the field (three replicate strips on either side of the pivot), alternated with 44' wide strips planted with pea seed treated with Apron + Maxim alone (grower's standard pea seed treatment). The seed treatments were applied by Pureline Seed in coordination with Dick Lowe.

Results: Planting pea seed treated with Apron + Maxim + Stamina did not have a significant effect on emergence, plant height, root disease index, or yield of pea in this trial compared to planting pea seed with the standard fungicide treatment of Apron + Maxim (Table 9). Unfortunately, this was a late planted processing pea crop, and a BASF Corp. field rep indicated Stamina has greatest efficacy against root rots under early season, cool soil conditions.

Table 9. Comparison of pea seed treatment with Captan + Allegiance + Cruiser + Cf Clear + Stamina (1.5 fl. oz.) vs. Captan + Allegiance + Cruiser + Cf Clear (control treatment).

Treatment	Emergence[a]	Plant height (cm)	Root disease index	Yield (g)
Stamina	36.7 ± 3.4	27.87 ± 4.22	0.71 ± 0.91	1042 ± 160
Control	38.1 ± 2.6	27.86 ± 4.19	0.96 ± 0.91	1145 ± 208

[a] Emergence 12 days after planting (15 May 2012) based on mean number of plants/10' row (216 rows from 72 locations).
[b] Plant height measured at the 12th to 13th node (4 subsamples/replication with 15 plants/subsample).
[c] Root disease index when plants were at the 12th to 13th node, on a 0 – 5 scale, with 5 = most severe root rot. Four subsamples were measured/replication with 15 plants/subsample.
[d] Pea yield (g) from 4 adjacent rows, each 5' long, from the center of each plot.

Predicting the risk of stunted patches by testing soils for *R. solani* AG8 and AG4
To assess quantitatively *Rhizoctonia* inoculum levels in fields, soil samples were collected in early spring from each of three fields on each of three farms: River Point Farms (29 February 2012), Sunheaven Farms (29 February 2012), and Carr Farms (3 March 2012). The fields on each farm represented those with a history of: i) no patching, ii) moderate patching, and iii) severe patching based on previous onion crops and aerial, infra-red images. Soil (~2 lb, collected to a 4"depth, since the greatest *Rhizoctonia* populations occur in the top 4" of soil, based on work by S. Anstis and T. Wicks in Australia) was sampled from each of three sections/field just before the cover crop was killed with herbicide application. The 27 soil samples (9 fields x 3 sections/field) were dried overnight at AgriSource Lab in Umatilla, OR at 45°C, and stored dry and cool. A 1 lb subsample of each of the 27 samples was sent on 24 April to the SARDI Lab for molecular assays for *R. solani* AG 8 and AG 4. A request was also made to quantify DNA levels of *R. solani* AG 3 (potato pathogen) and AG 2-1 (brassica pathogen), as potato and brassicas are grown in rotation with onion in some fields. The remaining soil for each sample was stored for testing in the PNW, including baiting and real-time PCR assays by Sharma Poudyal in Tim Paulitz' lab. The lab results were to be compared with visual assessments for patching in the onion crop in each field using infra-red aerial photos to see if sampling fields in early spring to test for the pathogen using a molecular assay might predict the disease risk for that season.

Results: The SARDI Lab results were received in summer 2012. Overall, DNA levels of *R. solani* AG 8 and AG 4 detected in the soils by real-time PCR assay did not show a strong correlation with the growers' perceived levels of risk of stunted patches in each field, nor with the incidence/severity of stunting observed in each field in May – July (*data not shown*). In fact, *R. solani* AG 8 DNA was only detected in 4 of the 27 samples, and only at levels considered of any significant risk in 3 of those 4 samples. However, the 3 samples were from the same field that had a severe perceived risk of stunting, and which developed severe stunted patches in 2012. This field also had the highest levels of AG 4 DNA (10-fold greater than the other fields). The highest levels of AG 2-1 DNA were from fields with moderate (2 fields) and severe (1 field) perceived risk. Also, AG 3 DNA levels did not correlate with the perceived risk of stunting or observed risk of stunting, with the highest DNA levels detected in 2 severe risk fields and 1 low risk field. In summary, it does not appear that the risk of stunting in a field can be predicted by random sampling of soil from fields for testing for DNA levels of R. solani prior to planting onion bulb crops. If soil samples collected within a month or so of planting did not give accurate prediction of risk, there is even less chance of soil samples collected the fall or summer prior to planting on onion bulb crop giving an accurate prediction of risk. Currently, the best prediction of risk of stunting remains the growers' experience and previous history of onion bulb crops in the fields of interest. Aerial, infra-red photos of onion bulb crops in late May through early July (depending on planting date and season) can help record the level of risk, and are increasingly a routine part of onion bulb growers' practices in the south Columbia Basin.

Molecular soil DNA assays to quantify *Rhizoctonia solani* AGs associated with stunted patches
In addition to the 27 soil samples described above, soil and plant samples were collected from inside and outside stunted patches of onion plants in the following fields during 2012 for baiting and quantifying *Rhizoctonia*: R017 (early June and early July), ANW 238 (early June and early July), and ANW 475 (early July), ANW 213 (early June), R7 (mid-June), LG7 (latter in the north Columbia Basin on dark, sandy soils where this disease has also become well established in onion crops). Soil samples were also

collected at 12” increments across a severe patch in each of R17 and ANW 238 to determine the distribution of *R. solani* across patches. Similarly, soil samples were collected from the 2012 green bridge trial in ANW 444, from onion rows and the sprayed cereal cover crop rows. A subsample of each sample was dried and shipped to the SARDI Lab in late summer 2012 for quantifying DNA of *R. solani* AG2-1, AG3, AG4, and AG8; and part of the soil was used for baiting and refrigerated for real-time PCR assays in 2013.

Results: The 115 soil samples sent to the SARDI Lab for quantifying DNA of *R. solani* AG8, AG4, AG2-1, and AG3 within and outside stunted patches in early June and July 2012 revealed that DNA of *R. solani* AG8 was present at a greater frequency in soil sampled within patches (57%) vs. DNA of *R. solani* AG4 (21%), AG3 (10%), and AG2-1 (7%) (Fig. 3). Also, *R. solani* AG8 was detected in almost three times as many soil samples from inside vs. outside patches (Fig. 3). This was true regardless of whether samples were collected in June or July, although the frequency of patches from which *R. solani* AG8 was detected in July was less than in June (Fig. 4). A similar but smaller trend was observed for *R. solani* AG3, AG2-1, and AG4 in June (Fig. 4). Of the four AG groups assayed, AG8 was most consistently associated with soil from within stunted patches of onion plants. The SARDI Lab categorizes the amount of DNA of *R. solani* AG8 at different risk levels: >120 pg DNA/g soil = severe risk, 50-120 pg DNA/g soil = medium risk, and <50 pg DNA/g soil = low risk. High and medium risk levels of *R. solani* AG8 were detected only from soil sampled inside patches, not outside patches (Fig. 5). *These results demonstrate that R. solani AG8 is the primary causal agent of stunted patches in onion crops of the four AGs evaluated.*

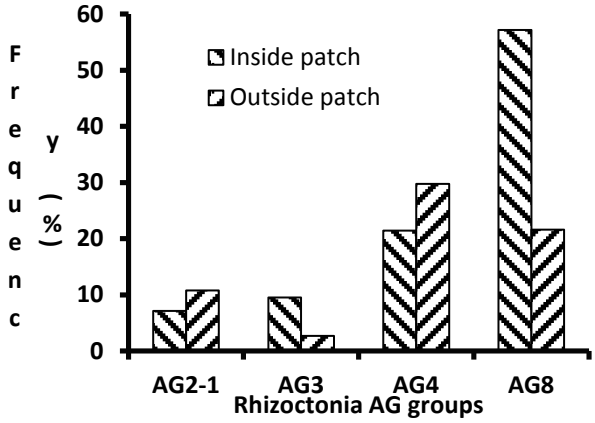

Fig. 3. Frequency of DNA detected of four *Rhizoctonia solani* anastomosis groups (AGs) inside vs. outside patches of stunted onion plants in onion bulb crops in the Columbia Basin in 2012.

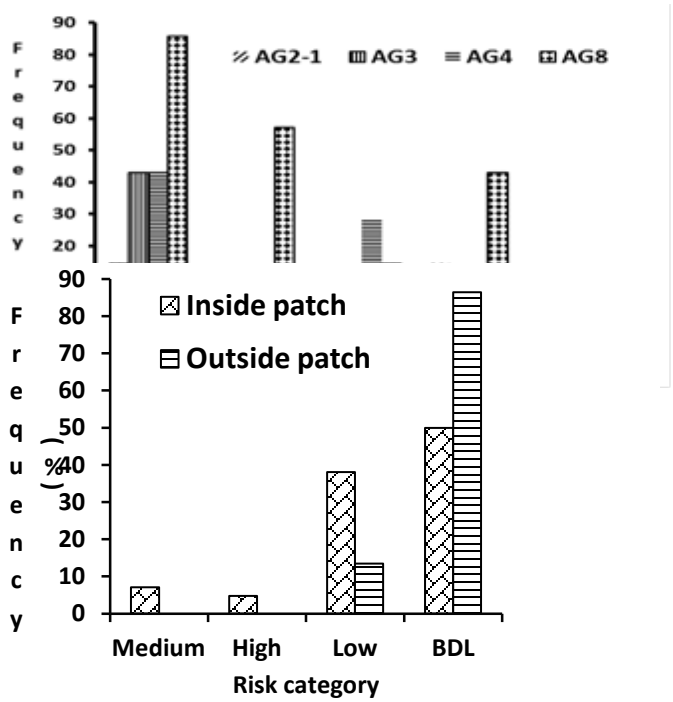

Fig 4. Frequency of DNA detected of four *Rhizoctonia solani* anastomosis

groups (AGs) inside (In) vs. outside (Out) patches of stunted onion plants in onion bulb crops in the Columbia Basin in June and July 2012.

For soil samples collected from onion rows and herbicide-treated cereal cover crop rows in plots of the green bridge trial in ANW 444, significantly less DNA of *R. solani* AG8 was detected in soil from plots sprayed with herbicide 17 and 27 days before planting vs. plots in which the herbicide was applied 3 days before onion planting. This corroborated the trend in severity of stunting, number of patches, and cumulative area of stunted plants for the three herbicide treatments. Furthermore, the amount of *R. solani* AG8 DNA detected was greater in soil from the cover crop rows vs. the onion rows. The amount of *R. solani* AG3 DNA detected did not differ between cover crop vs. onion rows, and DNA of *R. solani* AG4 was not detected in the soil samples. *The results provide further evidence of R. solani AG8 as the causal agent of stunted patches in onion bulb crops, the role of cereal cover crops as a host for R. solani AG8 that serves as a 'green bridge' for infection of onion seedlings, and the potential for using a longer duration between herbicide application to the cover crop and planting onion bulb crops as a means of reducing losses to this pathogen.*

2013 Onion and pea field trials

2013 Onion green bridge trial (Field ANW 338)
A 2013 field trial was set up in a grower-cooperator's onion bulb crop (ANW 338) near Paterson, WA to assess for a second year the effect on onion stunting of glyphosate spray interval to a winter wheat cover crop preceding planting of onion seed. Plots were arranged in a RCBD with 6 replications/treatment, and each plot was 12 beds wide x the diameter of the center-pivot irrigated field (~0.3 - 0.5 miles long). Onion seed was planted on 10 April 2013. Herbicide was sprayed by the grower-cooperator at each of three intervals prior to onion seeding: 1) 22 March = 19 days, 2) 8 April = 7 days, and 3) 9 April = 1 day prior to planting onion seed. Soil samples were collected from the cover crop rows and onion rows in each plot at the 3-leaf growth stage to quantify the level of *R. solani* AG8, as done in 2012. Soil was sampled 6" deep every 10 steps along the center row of each plot using a 1" diameter soil probe. Similarly, severity of onion stunting was assessed at the 4-leaf growth stage on 11 June 2013, with the rating method used in 2011 and 2012.

Results: Stunted patches of onion plants in ANW 338 were very scarce when the trial was rated on 11 June, and the disease did not progress through the season. The very limited numbers of patches meant there was inadequate disease pressure to assess the effects of the herbicide spray intervals on onion stunting. Therefore, soil samples collected from onion and wheat rows were not sent to the SARDI Lab in Australia for *Rhizoctonia* AG determination and quantification except for samples from the first replication of plots. The grower-cooperator has indicated a willingness to repeat this onion green bridge trial in 2014 because of the need to get valid assessment of the effects of herbicide spray interval for a second field season.

2013 Onion fungicide field trials
Onion fungicide trials were set up with a grower-cooperator near Irrigon, OR in two center-pivot irrigated fields (RPF 718 and R68) to evaluate the effects of Quadris and Fontelis on onion stunting. A pre-plant, banded, incorporated application of each fungicide was made 1 day prior to planting onion seed, in replicated strips along the diameter of each center-pivot irrigated field (each field was ~100-125 acres). Incidence and severity of onion stunting was to be assessed in June/early July, as done in the 2011 and 2012 field trials.

Results: Neither of the onion crops in RPF 718 and R 68 developed adequate patches of stunted plants for evaluating the effects of the Quadris and Fontelis treatments on onion stunting. In an attempt to get some disease ratings for these fungicide trials, plants in each of two strips (x 24 onion beds wide) that

had been treated with Fontelis in another field, RPF 744, as a banded, incorporated application just prior to planting, were rated for the number of stunted patches, size of each patch, and severity of stunting. Plants in two strips (each 24 beds wide) adjacent to the Fontelis-treated strips were rated similarly. There was no significant difference in incidence or severity of stunting between the control strips and the Fontelis-treated strips in this field. This supported results of the 2012 fungicide trial in ANW 238 in which Fontelis applied in the same manner did not cause a significant reduction in the incidence or severity of stunting (Table 5).

2013 OSU Hermiston AREC *Rhizoctonia* nursery trials

Green bridge and plow trials were set up for a second year in the *Rhizoctonia* nursery at the OSU Hermiston AREC, which had been inoculated three times since 2011 with three strains of *R. solani* AG8.

Green bridge trial: The following five herbicide application intervals to the winter oat cover crop prior to planting onion seed were set up in spring 2013, replicated four times in a RCBD (each plot 50' long x 4 double-rows of onion): 1) 8 March = 27 days, 2) 16 March = 19 days, 3) 22 March = 13 days, 4) 29 March = 6 days, 5) 2 April = 2 days before planting onion seed. Onion seed of Tamara was planted on 4 April.

Plow trial: The 2012 plow trial was repeated in 2013 to assess the potential effect of plowing on onion stunting. Soil was plowed or left non-plowed in each of 5 replicate plots one week before planting onion seed of Tamara. Soil in both plowed and non-plowed plots was then rototilled just before onion sowing to prepare the beds for planting. Each plot was 50' long x 4 double-rows of onion.

For both the green bridge and plow trials, Lorsban insecticide was applied immediately after planting to avoid the severe maggot injury that occurred in 2012. Onion plant height was measured for 30 plants/plot at the 3- (7 May) and 5-leaf (10 June) growth stages. Plant height was measured for 10 plants every 5 steps from 5 sites/plot, for a total of 50 seedlings/plot. In addition, chlorophyll content of onion plants in the plow trial was estimated at the 3-leaf growth stage using a Minolta SPAD-502 chlorophyll meter for the second true leaf of each seedling. The average of five chlorophyll measurements was recorded/leaf, with recordings for five plants selected randomly/plot. Soil samples were collected from each plot in the green bridge trial on 31 May (6" deep soil cores collected every 5 steps from 10 sites/plot) to assess the effect of herbicide application on *R. solani* AG8 soilborne inoculum level, as described for 2012.

Results: Plots in the green bridge and plow trials in the *Rhizoctonia* nursery were overgrown by weeds, particularly marestail. Although herbicides were applied to the trial by a field crew overseeing the trial for du Toit and Sharma-Poudyal, the weed pressure was so severe that the onion plants could not be seen in many of the plots. Hand-weeding was done for 2 days on 11-12 June to address this problem. Onion bulbs (25 bulbs from each of 4 sections/plot for a total of 100/plot) were harvested from the plots in each trial on 26 August, graded, sized, and weighed as described for the 2012 field trials. Unfortunately, the severity of stunting of the onion plants in these trials as a result of severe weed competition negated detecting any effects of the plow or green bridge treatments on onion growth, stunting, and yield in these two trials.

2013 Onion yield loss assessment from stunting caused by *Rhizoctonia*

Five fields, three at Sunheaven Farms (ANW 240, ANW 417, and ANW 774) and one at each of River Point Farms (RPF 756) and Carr Farms (Carr 225), were selected for onion yield loss assessment from stunting caused by *Rhizoctonia*. Five patches were flagged for each stunting severity rating of 1, 2, and 3 as detailed for the 2012 yield loss assessment. Each patch was flagged at the time of rating, and GPS coordinates recorded to locate each patch for bulb harvest. Flagging in ANW 240, ANW 417, and ANW 774 was done on 11 June, and RPF 756 and Carr 225 on 12 June. Onion bulbs were harvested on 19 July

2013 in ANW 240 in each of the flagged patches and an equivalent asymptomatic area adjacent to each patch, and the bulbs were graded, counted, and weighed as described for the 2012 yield loss assessment. Bulbs were harvested, graded, and weighed for the other four fields on 26-30 August.

Results: Total marketable bulb yield loss was 29, 43, and 53% for patches of stunted onion plants with severity ratings of 1, 2, and 3, respectively, compared to marketable bulb yield outside stunted patches in ANW 240. Yield data for the remaining four fields is being analyzed by Sharma Poudyal. Results of the 2013 yield loss assessments will be submitted in December 2013 for publication in Vol. 8 of Plant Disease Management Reports, and combined with 2012 data for a full-length manuscript.

2013 Pea field trials

Based on the lack of significant treatment effects in the 2011 and 2012 pea field trials, combined with the economic impracticality of other treatments that were to be evaluated in grower-cooperator pea crops (e.g., banded, incorporated applications of fungicides like Quadris, soil fumigation, etc., no structured grower-cooperator pea field trials were set up in 2013. However, du Toit was contacted by a grower in the central Columbia Basin in April to examine a pea seed crop near Basin City, WA that had numerous patches of extremely severely stunted pea plants. The field had been planted to a winter wheat cash crop in 2012, but the grower sprayed the wheat crop with herbicide on 15 March 2013, and then plowed the field on 18 March and planted a pea seed crop the same day. By mid-April, the grower noticed numerous patches of stunted plants. du Toit visited the field on 24 April, collected soil and plant samples, and verified the cause of the problem to be *Rhizoctonia*. The extremely short interval (3 days) between spraying the wheat crop with herbicide, incorporating the sprayed wheat crop, and planting the pea crop probably resulted in very high levels of *Rhizoctonia* inoculum present in the soil at the time the pea crop was germinating and emerging, leading to severe stunting. This situation reflected results of the 2012 green bridge trial, with the most severe patching occurring in plots sprayed with herbicide just 3 days prior to planting onion seed. The pea seed crop near Basin City provided an opportunity to measure the impact of *Rhizoctonia* on pea seed yield, to compare with the processing pea yield assessment in 2011 in Field K-11. On 7 May 2013, severity ratings were assigned to stunted patches in the pea seed crop, plant and soil samples collected, and 10 patches flagged. Severity of stunting was rated following the onion severity scale described above for each of four replicate strips of 40 rows of pea plants along the diameter of the field. In addition, the number of patches and patch area (estimated by the number of rows x length of row) of each patch were estimated visually. Ten large patches were flagged for pea seed yield comparison inside vs. outside each patch just prior to the grower harvesting the seed crop on 4 July. Pea plants were harvested that day from 1 m^2 within each patch and 1 m^2 of an equivalent asymptomatic area adjacent to each patch to compare pea seed yield and seed quality. The plants were dried in cloth bags at the WSU Prosser IAREC for 2 weeks, and the seed threshed using a plot thresher. Seed yield (g/plot) was measured, and seed quality assessed in August using the pea seed germination assay of the Association of Official Seed Analysts. Soil and plant samples collected from inside and outside each of five patches on 7 May were used to isolate *Rhizoctonia* spp. The isolates were subjected to DNA extraction and ITS rDNA sequencing for *Rhizoctonia* species and AG identification, as described below. Results are being analyzed.

2013 Greenhouse trials

2013 Screening of pea lines for reaction to *R. solani* AG-8: A total of 37 pea cultivars/lines were screened for resistance/susceptibility to *R. solani* AG8. Seeds of these lines were obtained from seed companies in the Pacific Northwest (Pureline Seeds) and from Rebecca McGee with the USA ARS in Pullman, WA. A seed of each line was planted in a plastic cone, with five replicate cones/soil treatment, and two soil treatments: 1) non-inoculated control soil, and 2) *R. solani* AG8-inoculated soil. Plant height, stem diameter, dry shoot mass, and dry root mass were measured. A root rot scoring (1 to 9) was

done for the inoculated plants. The repeat experiment is being completed in fall 2013. Data from these screening trials is still being analyzed.

2013 Onion germplasm screening for reaction to *R. solani* AG8: A greenhouse experiment was set up on 29 April 2013 to evaluate the resistance/susceptibility of onion lines/cultivars to *R. solani* AG8. A total of 37 onion lines was evaluated, with 10 seeds/line planted in soil in pots inoculated at 25 CFU *R. solani* AG8/g soil. Similarly, 10 seeds of each line were planted in non-inoculated soil. The experiment was laid out as a RCBD with 4 replications/treatment combination. Onion emergence (stand count) was recorded weekly. Onion plant height and shoot dry weight were evaluated at the 3-leaf growth stage. An inoculation rate of 25 CFU/g soil was used based on a previous PhD student's project on this disease, working with du Toit and Paulitz (Patzek et al. 2013. Plant Disease 97:1626-1635). However, stunting of onion seedlings was not observed in the inoculated plots. Therefore, the experiment was set up again on 24 June using an inoculation rate of 0.25% based on soil dry weight, i.e., a greater concentration than the first experiment. However, there was again no evidence of stunting of the inoculated plants. The isolate (Rh070927) used for this experiment had been re-cultured multiple times to increase inoculum on sterilized oat seed, and testing revealed that the isolate had lost pathogenicity and was growing much slower than the original culture. A new culture was initiated from the original stock of this isolate, and the protocol of inoculum production modified so that only fast-growing cultures of this isolate were used subsequently to produce inoculum for additional greenhouse experiments. The onion germplasm screening experiments are being repeated in fall-winter 2013-14 because of this complication with inoculum viability.

2013 Cover crop screening for reaction to *R. solani* AG8: Isolate Rh070927 of *R. solani* AG8 was also used to assess the reaction of 10 different types of cover crops at 0.25, 0.50, and 1.00% inoculation rates (soil dry weight basis), compared with growth of the cover crops in non-inoculated soil (Table 10). However, no visual differences were observed in growth of the cover crops between non-inoculated and inoculated soil treatments, presumably as a result of loss of pathogenicity of the isolate as noted above for the onion germplasm screening trial. Therefore, this experiment is being repeated in fall 2013 once viable batches of inoculum have been prepared.

Table 5. Cover crops screened in greenhouse trials for reaction to *Rhizoctonia solani* AG8.

No.	Cover crop	Latin binomial	Seed source
1	Annual ryegrass	*Lolium multiflorum*	Center Seed, OH
2	Spring wheat	*Triticum aestivum*	USDA-ARS, Pullman, WA
3	Winter triticale	*Triticosecale*	OSU Hermiston AREC, Hermiston, OR
4	Forage oat	*Avena sativa*	Center Seed, OH
5	Black oat	*Avena strigosa*	Alabama Crop Improvement Assoc., AL
6	Orchard grass	*Dactylis glomerata*	OSU Hermiston AREC, Hermiston, OR
7	Winter canola	*Brassica napus*	University of Idaho, Moscow, ID
8	Radish	*Raphanus sativus*	Center Seed, OH
10	Buckwehat	*Fagopyrum esculentum*	Center Seed, OH
11	Crimson clover	*Trifolium incarnatum*	Center Seed, OH

2013 Onion fungicide seed treatment evaluations: Onion seed of the cultivar Talon (Bejo Seeds, Inc.) was treated with the following fungicide seed treatments to assess the efficacy of the treatments against soilborne *R. solani* AG8 using a greenhouse trial similar to the 2011 seed treatment trial described above: 1) Farmore D300 (metalaxyl + fludioxonil + azoxystrobin), 2) Farmore D300 + Vibrance (sedaxane), 3) Farmore I500 (Farmore D300 + thiamethoxam + spinosad), 4) Farmore I500 + Vibrance, 5) Apron (metalaxyl) + Coronet (boscalid + pyraclostrobin), 6) Apron + Rovral (iprodione), and 7) Apron + Thiram (current standard onion seed treatment for growers in the Columbia Basin). Efficacy of these seed treatments against onion stunting is being determined in growth chamber trials in fall 2013.

2013 Efficacy of pre-plant, incorporated and drench applications of fungicides on stunting of onion caused by *R. solani* AG8: Onion seed of the cultivar Tamara was planted in soil inoculated or not inoculated with *R. solani* AG8, after treatment of the soil with each of a number of fungicides applied as pre-plant, incorporated applications or drench applications to determine: a) the potential efficacy of each fungicide with each of the two methods of application for management of onion stunting, and b) the potential of each fungicide and method of application to cause phytotoxicity to onion seedlings. This growth chamber trial was set up in fall 2013, and will be repeated in winter 2013-14. The trial is being carried out to assess the potential for phytotoxicity that was observed in a grower-cooperator's field with drench applications of Quadris compared to no phytotoxicity when this product was banded and incorporated prior to planting, and to evaluate other fungicides with potential for management of stunting using the two methods of application.

2012-13 Laboratory trials

***Rhizoctonia* spp. culture collection and specimen preservation**
Soil and plants collected from onion and pea patches in 2011-12 were used to isolate *Rhizoctonia* spp. Altogether, 600 isolates from onion and pea fields were obtained on water agar (WA), transferred to potato dextrose agar (PDA) plates, and purified. Isolates were then grown in a broth medium, and mycelium harvested and stored for DNA extraction. The isolates also were stored for long-term use as part of the greater *Rhizoctonia* culture collection of the USDA-ARS in Pullman, WA. DNA was extracted from the isolates, and a polymerase chain reaction (PCR) assay used to amplify the internal transcribed region (ITS) region of the ribosomal DNA (rDNA) of each isolates, with the amplified region sequenced by Elim Biopharmaceuticals, Inc. (Hayward, CA) to determine the *Rhizoctonia* species and anastomosis group (AG) of each isolate. The universal eukaryotic primers UN-UP18S42 (5'-CGTAACAAGGTTTCCGTAGGTGAAC-3') and UN-LO28S576B (5'-GTTTCTTTTCCTCCGCTTATTAATATG-3') were used to amplify the ITS1 + 5.8S + ITS2 region of rDNA.
Manual sequence editing was performed with Chromas Lite Version 2.1 (Technelysium Pty. Ltd.). After editing, sequence matching was carried out in GenBank using BLAST analysis to determine the fungal species and AG of each isolate.

Of 342 isolates from onion crop soil samples or onion plants, 219 were either *Rhizoctonia* spp. or *Ceratobasidium* spp. (latter is the teleomorph of fungi related to *Rhizoctonia*). Of these 219 isolates, 184 (84%) were *Rhizoctonia* spp. and the remaining 35 (16%) were *Ceratobasidium* spp. The predominant *Rhizoctonia* species and AGs were *R. oryzae*, *R. solani* AG3, *R. solani* AG4, *R. zeae*, *Ceratobasidium* AGA, and *R. solani* AG8, followed by others (Fig. 6).

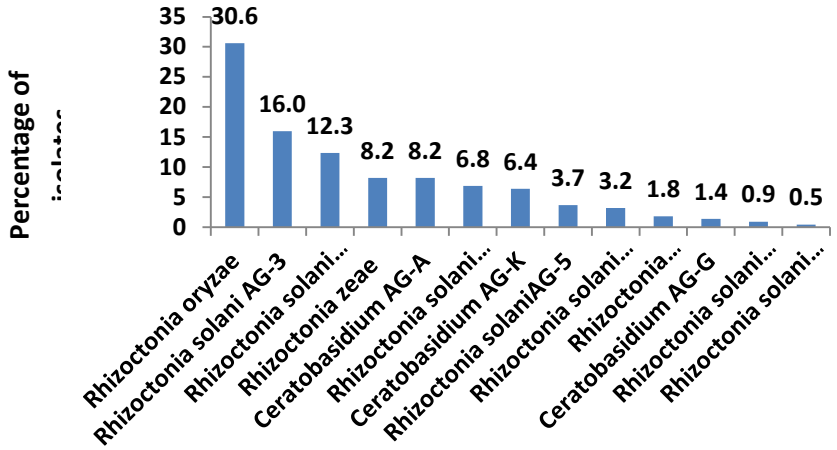

Fig. 6. Percentage of fungal isolates recovered from plant and soil sampled from onion crops in the Columbia Basin that were identified as *Rhizoctonia* and *Ceratobasidium* species and AGs by ITS DNA sequencing.

Of 203 fungal isolates obtained from pea crop soil samples and pea plants, 141 isolates (78%) were *Rhizoctonia* spp. and 39 (22%) were *Ceratobasidium* spp. The predominant species and AGs were *R. solani* AG4, *R. solani* AG2-1, *R. solani* AG-3, *Ceratobasidium* AG-K, *Ceratobasidium* AG-I, *R. solani* AG-8, and others (Fig. 7).

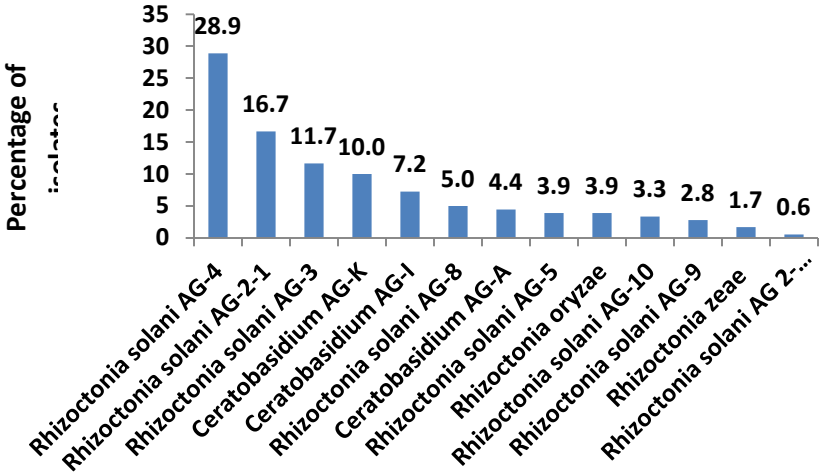

Fig. 7. Percentage of fungal isolates recovered from plant and soil sampled from pea crops in the Columbia Basin that were identified as *Rhizoctonia* and *Ceratobasidium* species and AGs by ITS DNA sequencing.

Sequencing of the ITS rDNA of 50 additional *Rhizoctonia* isolates collected during the 2013 field season from onion and pea crops is in progress.

Soil samples for quantification of *Rhizoctonia solani* AGs from symptomatic pea and onion crops
Quantitative assessment of *R. solani* AG-2-1, AG-3, AG-4, and AG-8 from 300 g dried soil sampled from each of 98 sites in pea and onion crops surveyed in 2013 was done at the SARDI Lab in Australia in August 2013. Soil samples were collected from inside and adjacent to patches of stunted plants in two pea crops and five onion crops in June and July 2013. The frequency of detection and DNA concentration of each AG will be compared between soil sampled inside vs. outside patches of stunted plants to determine the potential role of isolates of each AG as causal agents of stunting in pea and onion crops, as done in 2012.

Overall significant results, accomplishments, and conclusions
The numerous field, lab, and greenhouse experiments for this project have helped elucidate that *R. solani* AG8 appears to be the primary cause of stunting in onion and pea crops in the Columbia Basin, when these crops are planted on sandy soils in spring following winter cereal cover crops. However, the results also demonstrate the complexity of *Rhizoctonia* species and AGs present in soils and colonizing plants in crops in which this disease might occur. The relative role of these other AGs and species remains to be clarified in relation to the primary causal agent of stunting, *R. solani* AG8. Efforts to predict the risk of stunting in fields by testing soils with a quantitative molecular assay for *R. solani* AG8 proved that this is very difficult, if not impossible for a number of reasons. Most quantitative molecular assays only allow DNA to be extracted from very small samples of soil that can never adequately represent the large scale

of growers fields for which risk assessment is needed, particularly given the very uneven and sporadic distribution of the pathogen in soils at inoculum levels needed to cause stunting symptoms. The proprietary DNA extraction and quantification protocol of the SARDI Lab in Australia was the only assay that revealed differences in inoculum levels of various *R. solani* isolates within and outside patches of stunted onion plants. Unfortunately, soil samples have to be shipped to Australia to be tested with this protocol, which makes the assay uneconomical for growers.

The project identified two very effective means of reducing losses to stunting in onion and pea crops with the cereal cover cropping system that results in this disease. One management tool is a banded and incorporated application of the fungicide Quadris made just prior to planting onion seed. In multiple large-scale, grower-cooperator field trials over multiple seasons, this treatment reduced the incidence and severity of stunting by anywhere from 40 to 80%. Based on feedback received from stakeholders after results of these trials were presented at the WSU Onion Field Days in 2011, 2012, and 2013, as well as at the annual conventions of the Pacific Northwest Vegetable Association each year, this practice has been adopted by many onion bulb growers in the Columbia Basin in fields that they perceive as highest risk for stunting. The practice is not pertinent for certified organic onion production, however. A second very practical management tool identified during this project is timing herbicide application to the cereal cover crop at least 2 weeks prior to planting onion or pea seed, preferably 3 to 4 weeks prior. This results in the onion or pea seed being planted after the *Rhizoctonia* inoculum has reached a peak of colonization of the cover crop residues, and then declined. However, this practice may not work if the cover crop was planted late in the fall so that cover crop plants are too small to provide adequate protection of onion and pea seedlings against wind/sandblasting in spring if the cover crop is killed with herbicide at an early (small) stage of growth. However, growers' are now much more aware of this effect of delaying planting of onion and pea crops for at least 2 weeks after herbicide application to the cover crop, and can utilize this management tool based on individual field situations. There is also no additional cost to growers for this management tools as growers currently apply herbicide to their cover crops, so the only change might be in timing the herbicide application.

Some fungicide seed treatments (e.g., Coronet and Quadris) appear to have some efficacy against *R. solani* as the cause of onion stunting, but efficacy of these seed treatments appears to be rather limited, as the impact is detectable in inoculated greenhouse trials but seed treatments did not fare well in growers' fields that had significant levels of disease pressure. An integrated management program consisting of a fungicide seed treatment, a pre-plant, banded/incorporated application of Quadris, and applying herbicide to the cover crop at least 2 weeks prior to planting onion seed should help reduce losses to stunting significantly in onion bulb crops in the Columbia Basin. Unfortunately, the banded, incorporated application of Quadris does not appear to be justified economically in pea crops, but timing of herbicide application to the cover crop preceding pea crops is very justifiable economically in processing pea crops.

The yield loss assessments in grower-cooperator onion and pea crops quantified the degree to which these crops can be impacted by stunting caused by *Rhizoctonia*. The degree of yield loss may vary among cultivars and depending on severity of stunting across the field. Completion of the trials screening onion germplasm for resistance may help identify cultivars with greater tolerance or resistance to stunting, which could potentially be utilized by onion growers for fields they consider of higher risk for stunting. Similarly for the pea cultivar screening in progress, and the cover crop screening trial.

Soil fumigation with Telone II did not appear to have a beneficial effect at reducing losses to stunting in onion bulb crops. This is not surprising given that Telone II is a nematicide, not a fungicide. However, evaluation of this treatment was important as a number of onion growers in the Columbia Basin were under the impression this fumigant could control onion stunting. Telone II is an expensive and

environmentally-sensitive management tool that should not be used for applications for which the product is ineffective, such as attempting to manage stunting in onion crops from *Rhizoctonia*.

The 11-month period in the middle of this 3-year project, between the PhD student leaving WSU and a postdoctorate being hired, resulted in a majority of the greenhouse and lab aspects of the project being delayed for a year or more. Some final greenhouse and growth chamber experiments are still in progress, data remain to be analyzed, and manuscripts will be written and submitted for publication in peer-reviewed journals. However, additional funding has been procured to keep the postdoctorate on the project through May 2014, which should enable these lab and greenhouse trials to be completed. In addition, several grower-cooperators have expressed interest in in-kind support for setting up several large-scale trials in onion crops in 2014, such as repeating the green bridge cover crop trial, because of the insights they have gained from this project into managing this disease more effectively.

Lindsey du Toit was the overall lead on the project and the primary contact for onion grower-cooperators, including coordinating planning meetings with cooperators for various trials over the duration of the project. Tim Paulitz provided invaluable expertise on *Rhizoctonia* in cereal cropping systems for this project, and provided lab space in his program in Pullman for the PhD student, Maxwell Handiseni (who left the project in June 2011), and postdoctoral research associate, Dipak Sharma Poudyal (who started on the project in May 2012). du Toit and Paulitz co-supervised the PhD student and postdoctorate. du Toit and Paulitz designed a majority of the field, lab, and greenhouse experiments, and assisted the student and postdoctorate with data analyses and technical aspects of the research. Phil Hamm provided access to land, support staff, and resources at the OSU Hermison AREC where the *Rhizoctonia* nursery was set up. Hamm also assisted personally with some of the field trial disease ratings, and provided technical support (J. Eggers and others) for setting up and monitoring some of the grower-cooperator field trials because of the travel distance from Mount Vernon, WA (where du Toit is based) and Pullman, WA (where Paulitz and Sharma Poudyal are located). Lyndon Porter took the lead on the various pea trials in thr project, including establishing grower-cooperator trials, and overseeing the pea trials.

Key grower-cooperators provided onion and pea crops for the various field trials, including field preparation and planting of the crops, all equipment and personnel expenses for applying the various treatments, general crop maintenance, providing personnel to assist with disease ratings and harvest operations, etc. These included River Point Farms (primary contacts were Bill Dean and Jess Holcomb), Sunheaven Farms (Wes Locke), Carr Farms (Wally Huppert), Grigg & Sons (Lorin Grigg), Watts Brothers/ConAgra (Guy Madison), and Victory Farms (Nathan Metzger). Onion and pea seed for field and greenhouse trials was provided at no cost by Bejo Seeds, Inc., Nunhems USA, Seminis Vegetable Seeds, Pureline Seeds, and USA ARS personnel. Dow AgroSciences donated the soil fumigation treatments for the project. Syngenta Crop Protection did a majority of the fungicide seed treatments free-of-charge as in-kind support of the project.
This project only entails specialty crops (onion and pea).

GOALS AND OUTCOMES ACHIEVED

The overall goal of this project is to reduce losses caused by *Rhizoctonia* in onion bulb and pea crops in the Columbia Basin. A specific target was to reduce total stunted areas in onion and pea crops by at least 50% as a result of incorporating disease management practices demonstrated to effectively reduce losses caused by *Rhizoctonia* spp. Aerial photos of onion and pea crops in the Columbia Basin in 2011-2013 were obtained from grower-cooperators that had experienced losses to stunted patches, providing a benchmark for the degree of losses. Software was used by one of the companies that takes aerial, infrared photos for growers, to quantify area of patching in each photos. However, several confounding factors were discovered that limited the ability to utilize aerial infrared photos for determining if this project had achieved the 50% goal of reduced stunting within the 3-year timeframe of this project. The

two most influential factors confounding the ability to achieve this measurable outcome are that: 1) all onion and pea growers in the Columbia Basin use rotation intervals between onion or pea crops of at least 2 years, and preferably 3 to 5 years; and 2) many large-scale onion and pea growers in the Columbia Basin lease ground from different farms in the region, so they are not always producing onion or pea crops on their own ground, and may not have an understanding of the history or perceived risk of stunting in all of the fields in which they raise onion and pea crops in any particular year. This means there was no way of assessing the impact of specific practices implemented as a result of this project using aerial infrared photos of the same field taken over several years. Furthermore, it became apparent during the field evaluations of stunting that aerial infrared photos are 2-dimensional and, therefore, useful for measuring area of stunted plants in a field, but the impact of the disease on the crop is 3-dimensional, i.e., area of stunting and severity of stunting. The onion yield loss trials demonstrated how the economic impact of stunting is affected significantly by the severity of stunting, not just the cumulative area of stunting in an onion or pea field.

Some of the treatments evaluated in this project were being adopted by growers within the first 1 to 2 years of results being shared at field days and commodity conferences, but other practices being evaluated need refining for specific production systems or have not yet been completed (e.g., screening onion and pea germplasm for resistance or tolerance to stunting by *Rhizoctonia* is only at the very early stages of completion, and much remains to be done before this translates into a practice relevant to growers in the Columbia Basin). Also, as noted above, aerial infrared photos capture only 2-dimensions of the 3-dimensional impact of this disease. Nonetheless, continued comparison of aerial, infrared photos with ground-truthed evaluations in the fields will help assess how well the former can capture the impact of stunting on these crops and the effects of specific management practices implemented as a result of this project. Selected onion and pea growers in the Columbia Basin who have provided aerial images during this 3-year project (BENCHMARK) have offered to provide additional aerial photos of the fields as practices are implemented in the future. This will enable us to measure changes (reductions) in total patched areas in each field using software to measure reduction in area of stunting. Cooperating growers will also provide data on yields associated with the crops in aerial images as a correlative measure of the potential economic impact of practices implemented.

The yield loss assessments completed in onion and pea crops in 2012-2013 will enable more effective determination of the cost-effectiveness of specific management practices implemented for a range of cultivars, e.g., the cost of a fungicide application compared with the degree to which the application reduces the severity of stunting and area of stunted patches in a field can now be evaluated based on the onion yield loss results. Unfortunately, yield also is readily affected by other factors such as weather, cultivar, cropping history, fertility, and grower practices, making it difficult to achieve a very accurate indication of economic viability of some management practices. Given the longer-term nature of this disease and the rotation duration between susceptible crops in particular fields, we anticipate continuing to measure outcomes of this project (aerial infrared photos, yield measurements, etc.) after the grant period ends. This will be feasible because most of the stakeholders routinely have aerial images taken of their fields. Additional funding needed for this project after the grant ended in September 2013 was provided by stakeholders.

Of the seven activities/objectives listed for this project, the first five have been achieved to a large extent, namely to assess the impact of the following on management of stunting in onion and pea crops:

a. Soil fumigation with Telone II;
b. Seed treatments with thiram, azoxystrobin (Quadris), or boscalid+pyraclostrobin (Coronet) vs. Apron (control treatment for *Pythium* spp.);
c. Fungicide drench applications with azoxystrobin (Quadris) or thiophanate-methyl (Topsin M 70WP);

d. Timing Roundup application and cover crop incorporation 4 weeks, 3 weeks, 2 weeks, 1 week, or 1-2 days prior to planting onion or pea seed ('green bridge' duration);
e. Identify the primary *Rhizoctonia* species that infect onion and pea crops after winter cover crops.

The final two activities listed were delayed for almost a year when the PhD student left the project unexpectedly and it took a year to hire a postdoctoral research associate to resume some of the activities. During that period, Lindsey du Toit took primary responsibility for making sure the field trials were completed in cooperation with pea and onion growers. The two activities that are still in progress, and that are expected to be completely to a large extent by May 2014 include:
a. Evaluate onion and pea cultivars to identify more resistant or tolerant cultivars; and
b. Evaluate types of cover crops and cultivars to identify characteristics that minimize *Rhizoctonia* inoculum increase following incorporation of the cover crops.

Baseline data that was gathered included aerial infrared photos from the primary grower-cooperators of onion and pea crops in which field trials were set up during this project. These photos enabled the cumulative area of stunted patches to be measured for each field. However, none of these fields was planted to an onion or pea crop again during the duration of this funding (2011-2013) because of the importance of a 3-5 year rotation between onion crops or pea crops. This means it was not possible to assess the degree to which any management practices implemented as a result of this project might have reduced the stunted patched detected on aerial infrared photos. This is further confounded by the fact that many other factors can influence the severity of stunting in an onion bulb or pea crop, which cannot be estimated from aerial infrared photos. However, aerial photos provided by the key grower-cooperators on this project are been assessed in direct comparison with visual disease ratings and yield assessment in the fields. This information will continue to be analyzed in future seasons as more aerial images become available for fields in which management practices are implemented for stunting in onion and pea crops.

BENEFICIARIES

Onion bulb and pea growers in the Columbia Basin of central Washington and northcentral Oregon, who plant these crops on very sandy soils that necessitate using winter cover crops preceding the bulb or pea crops, have benefitted directly from this project. Results of the project have been shared at least twice a year in public format (field days and commodity meetings, in addition to articles in Onion World, etc.), and affected growers have commented anecdotally on their adoption of some of the recommended practices. Vegetable growers in other states/countries that also are affected by stunting from *Rhizoctonia* have benefitted from this project, e.g., onion growers in South Australia, where S. Anstis and T. Wicks work at SARDI on this disease. Results have been shared between personnel working on this project and the SARDI group working on this disease in onion crops. Crop consultants and field representatives for companies like Wilbur-Ellis have benefitted from this project by understanding the nature of the disease and several new management tools that were elucidated as a result of this project (green bridge effect, Quadris banded and incorporated just prior to planting).
Quantitative data generated by this study on potential yield losses caused by stunting in onion bulb crops of different cultivars (e.g., as detailed in Table 7 above and the related regression analyses reported for the 2012 onion yield loss assessment in Plant Disease Management Reports 7:V048 by Sharma-Poudyal et al., 2013) and in pea crops, and quantitative estimation of the degree to which specific management practices reduced the incidence and severity of stunting caused by *Rhizoctonia* (see Tables 1-6 above and Plant Disease Management Reports 7:V046 and V047) are of direct relevance to beneficiaries of this project (onion and pea growers). These results illustrate the economic impact of the disease and the economic cost/justification of the various management practices evaluated.

LESSONS LEARNED

The most effective management practices demonstrated in this project for onion stunting were evaluated primarily in large-scale, grower-cooperator trials. This probably accounts for the very positive outcome

of the ready adoption of these recommendations by growers in the Columbia Basin, based on anecdotal comments received at various field days and conferences at which results have been presented. On the other hand, the sporadic nature of the disease in growers' fields resulted in inconclusive results from far more of the large-scale field trials than expected, which was very frustrating considering the tremendous effort and expense for coordinating and completing such trials. This was exacerbated on some farms by additional treatments being placed over the treatments of interest, or severely inadequate replication and randomization of treatments that greatly weakened robustness of the statistical analyses. It was a difficult learning process to recognize which growers had the time, interest, and understanding of the importance of following the experimental design requested as closely as possible. Some trials were not set up as explained, and some growers placed additional treatments in the middle of the treatments requested, which confounded the ability to assess treatment effects.

A very difficult and unexpected aspect of this project was the 11-month period in the middle of this 3-year project when the PhD student left WSU and a postdoctorate was finally hired almost a year later. This absence of technical assistance resulted in a majority of the greenhouse and lab aspects of the project being delayed significantly for at least a year. Some greenhouse and growth chamber experiments are still in progress, data remain to be analyzed, and manuscripts written and submitted for publication in peer-reviewed journals. Additional funding has been procured to fund the postdoctorate on the project through May 2014, which should enable these trials to be completed. Several grower-cooperators have expressed interest in further in-kind support for large-scale trials in onion in 2014, such as repeating the green bridge cover crop trial, because of the degree to which they have benefitted from this project. The 11-month gap of assistance for this project highlighted the uncertainty and risk that can be associated with graduate students working on projects, and the importance of very careful screening of applicants for working on projects of this nature.

Another frustration was pea growers indicating they were not interested in evaluating treatments that might provide some valuable new insight into the disease, because the treatments could not be justified economically. This is one of the potential difficulties of relying on grower-cooperators for large-scale field trials, but is understandable given the scale of production in these fields and the value of the crops.

One unexpected outcome was the fact that the real-time PCR assays that had been developed prior to this project for quantifying *R. solani* AG8 in soils did not turn out to be nearly adequate. Problems with cross-reaction of the primers with isolates of other AGs, as well as the very limited amount of soil from which DNA can be extracted, rendered this assay invalid for this project. Fortunately, an alternative soil assay was discovered that turned out to be far more relevant and adequate, but which is proprietary and necessitates shipping soil samples to South Australia.
A lesson learned about falling short of meeting the expected measurable outcomes defined for this project is to get clarification from relevant stakeholders on the true potential for meeting the expected measurable outcomes, and re-defining those outcomes (if needed) in the context of relevant agricultural systems or practices, rather than on hypotheses alone. It may help to request key stakeholders review the proposal prior to submission, to assess the reality of the proposed work and methods of assessing the work.

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ADDITIONAL INFORMATION

In-kind donations were received from three grower-cooperators and a chemical company in the 2010-11 field season, including:

- River Point Farms donated all expenses for planting and maintain a 125 acre onion bulb crop in Field R708, approximately half of which was used for the primary onion bulb trial (estimated value of >$250,000). River Point Farms also allowed disease data to be collected in R022 where additional treatments had been laid out, as described above. This farm also provided access to aerial infrared photos of their onion bulb crops.
- Conagra Farms/Watts Brothers covered all costs to set up a processing pea trial in Field K-11 near Paterson, WA.
- Sunheaven Farms set up, applied treatments, maintained, and harvested an onion fungicide trial in Field ANW 364 near Paterson, WA, as described above, and provided aerial infrared photos of the field for further disease assessment.
- Dow Agrochemicals donated the costs and application of Telone for the soil fumigation treatments in Field R708.

In-kind donations received in the 2011-12 season included:

- River Point Farms donated all expenses for planting and maintaining two 125-acre onion bulb crops, approximately 1/10th of each of which was used for the fungicide onion trials (estimated value of >$50,000). River Point Farms also permitted collection of soil samples, disease ratings, yield assessments, and evaluation of infra-red, aerial images of onion bulb crops in 2012, as well as other RPF fields with additional treatments. The farm also provided some technical support for doing disease ratings and collecting bulb harvest data.
- Conagra Farms/Watts Brothers covered all costs to set up two processing pea trials near Paterson, WA, as described above.
- Sunheaven Farms set up the fields, applied treatments (fungicide, green bridge, and plow), maintained, and harvested each of three onion field trials described above (ANW 238, ANW 444, and BH12). Expenses associated with these trials were estimated at >$50,000 of in-kind support. The farm also provided aerial infrared photos of these fields.
- DuPont donated Fontelis for evaluation in field trials at Sunheaven Farms (ANW 238) and in several fields at River Point Farms.
- Dow contributed $10,000 in cash towards fumigation treatments.

In-kind donations and financial support in the 2012-13 season included:

- River Point Farms donated all expenses for planting and maintaining two 125-acre onion bulb crops, approximately 1/10th of each of which was used for fungicide trials (estimated value of >$50,000). River Point Farms again permitted collection of soil samples, disease ratings, yield assessments, and evaluation of infra-red, aerial images of onion bulb crops in 2012, as well as other RPF fields with additional treatments.
- Victory Farms permitted collection of pea yield data and disease ratings in a pea seed crop near Basin City that developed very severe stunting.
- Sunheaven Farms set up a field trial, applied treatments, and maintained the green bridge trial in ANW 338. Expenses associated with the trial were estimated at >$50,000 of in-kind support. The farm also provided aerial infrared photos of this and other 2013 onion fields to look at cumulative stunting viewed aerially.
- DuPont donated Fontelis for evaluation in field trials at River Point Farms and in greenhouse fungicide trials.

Over the three years of the project, onion seed, pea seed, and cover crop seed were donated by growers for the field trials, and by various seed companies for the greenhouse and growth chamber trials. Fungicides for growth chamber and greenhouse trials were donated by Syngenta Crop Protection and other chemical companies. Syngenta Crop Protection applied fungicide seed treatments at no charge for the greenhouse seed treatment trial.

<u>Field days:</u>

du Toit, L.J., Poudyal, D.S., Paulitz, T., Porter, L., Hamm, P., and Eggers, J. 2013. Rhizoctonia seedling blight in onion crops in the Columbia Basin. Pp. 10-11 in: 2013 WSU Onion Cultivar Demonstration and Field Day handouts. Washington State University, Pullman, WA.

du Toit, L.J., Poudyal, D.S., Paulitz, T., Porter, L., Hamm, P., and Eggers, J. 2012. Rhizoctonia seedling blight of onion crops in the Columbia Basin. Pp. 8-9 in: 2012 WSU Onion Cultivar Demonstration and Field Day handouts. Washington State University, Pullman, WA.

du Toit, L.J., Poudyal, D.S., Paulitz, T., Porter, L., and Hamm, P. 2011. Rhizoctonia seedling blight of onion crops in the Columbia Basin. 2011 WSU Onion Cultivar Demonstration and Field Day. Washington State University, Pullman, WA.

Conferences:
Sharma-Poudyal, D., Paulitz, T., Porter, L., Eggers, J., Hamm, P.B., and du Toit, L.J. 2013. *Rhizoctonia* spp. dynamics and optimal timing of glyphosate application to cereal cover crops to manage onion stunting in Washington and Oregon. Phytopathology 103:S221-O. Poster presentation. APS Annual Meeting, 10-14 Aug. 2013, Austin, TX. (1,2,3,4,5,6)
http://www.apsnet.org/meetings/Documents/2013_Meeting_Abstracts/aps2013abO221.htm

Poudyal, D., du Toit, L. J., Paulitz, T., Porter, L., Eggers, J., and Hamm, P. 2012. Onion stunting caused by *Rhizoctonia*: Management and economic importance in the Columbia Basin of Oregon and Washington. Pages 68-77, in: Proceedings of the National Allium Research Conference, 12-14 Dec. 2012, Las Cruces, NM. http://aces.nmsu.edu/narc2012/index.html

Publications
Sharma-Poudyal, D, Paulitz, T., Porter, L., Eggers, J., Hamm, P., and du Toit, L.J. 2013. Effect of timing of glyphosate application to a winter cover crop on stunting of spring-sown onions caused by *Rhizoctonia* spp. in the Columbia Basin of Washington, 2012. Plant Disease Management Reports 7:V046.

Sharma-Poudyal, D., Paulitz, T., Porter, L., Eggers, J., Hamm, P., and du Toit, L.J. 2013. Efficacy of fungicides to manage onion stunting caused by *Rhizoctonia* spp. in the Columbia Basin of Oregon and Washington, 2011-2012. Plant Disease Management Reports 7:V047.

Sharma-Poudyal, D., Paulitz, T., Porter, L., Eggers, J., Hamm, P., and du Toit, L.J. 2013. Yield responses of three onion cultivars to stunting caused by *Rhizoctonia* spp. in the Columbia Basin of Oregon and Washington, 2012. Plant Disease Management Reports 7:V048.

Sharma-Poudyal, D., Paulitz, T., Porter, L., Eggers, J., Hamm, P., and du Toit, L.J. 2014. Yield responses of onion cultivars to stunting caused by *Rhizoctonia* spp. in the Columbia Basin of Oregon and Washington, 2013. Plant Disease Management Reports 8:*in progress (to be submitted Dec. 2013)*.

Additional full-length journal articles are being prepared by du Toit, Paulitz, Sharma Poudyal, Porter, and Hamm as final results are produced for various components of this project that were not quite completed at the time this report was prepared. This includes manuscripts on each of the following: 1) use of Quadris and fungicide seed treatments to manage stunting in onion bulb crops, 2) yield loss assessment combined with infra-red aerial photography to assess the impact of onion stunting, 3) 'green bridge' herbicide application timing to cereal cover crops for managing stunting in onion bulb crops (after completion of another grower-cooperator green bridge trial in 2014 with Sunheaven Farms), 4) *Rhizoctonia* spp. and AGs associated with stunting in onion crops in the Columbia Basin, 5) *Rhizoctonia* spp. and AGs associated with stunting in pea crops (including pathogenicity testing of isolates of the

various species AGs being completed in winter 2013-14), 6) screening onion cultivars for reactions to *R. solani* AG 8, and 7) screening pea cultivars for resistance to *R. solani* AG 8.

Website

Pacific Northwest Vegetable Extension Group – Photo Gallery with associated resources on onion stunting at:
http://mtvernon.wsu.edu/path_team/onion.htm#rhizoctoniastunting

PROJECT #14

Project Title: The Washington State Guide to Sustainable Winery Practices

Partner Organization: Washington Wine Industry Foundation

PROJECT SUMMARY

The number of wineries in Washington has rapidly grown to over 650 (number at onset of project) and this number is expected to triple in 10 years. Production of wine in Washington wineries represents substantial consumption of water, fuel, electricity, glass and other natural resources. This use of resources not only represents considerable monetary cost to wineries themselves, it affects the quality of our environment and community infrastructures.

Availability of educational resources providing wineries with information about improving sustainability at all levels (economic, social, and environmental) has not kept pace with the rapidly growing wine industry and the number of wineries in our state. Compounding the issue is the wide-spread geographic distribution of wineries and lack of empirical data documenting the effects of adopting more sustainable approaches to wine production. Additionally, most Washington wineries are small, family owned businesses without the resources to hire technical consultants or staff to conduct assessments and develop sustainability improvement plans.

Washington is the second largest producer of premium wine in the U.S. It contributes to the state's economy through job growth, trade, taxes, revenues and tourism. It is expected the grape and wine industry in Washington will contribute $10 billion per year to the state economy by 2020 and $15 billion to the national economy. Achieving long-term sustainability for this important sector of the economy is critical.

Winerywise provides an access-on-demand online educational resource for wineries to assess their consumption of resources and identify management decisions for cutting energy and fuel use; improving water conservation and wastewater recycling; utilizing eco-friendly material handling, recycling, and environmentally preferred purchasing; reducing solid wastes; optimizing local supply chains; promoting physical, social, and economic well-being of employees; and promoting neighbor and community communication.

PROJECT APPROACH

During the project period, content was finalized for Winerywise chapters covering nine important sustainability issues/opportunities: energy efficiency; water management; education and research; waste management; staffing, safety and HR; material handling; preferred purchasing; community outreach; site development. A user-friendly website www.winderwise.org was developed to create on-demand access to Winerywise assessment and checklist educational tools. Additionally a Facebook page was established.

Content was developed for a two-hour "How to Winerywise" session to introduce Winerywise and instruct wineries about how the web-based tool could be used to monitor, assess, and increase sustainability by improving practices in nine key areas, including waste management, water management and energy efficiency. An instructional team was assembled representing sustainability and resource management consultants and professionals.

"How to Winerywise™" Session Agenda

Session presenters
Judy Thoet, Wine Industry Consultant and Winerywise™ committee member
Jim Harbertson, WSU Irrigated Agriculture Research & Extension Center

5 min Welcome, introduction of self, housekeeping items & survey reminder
5-15 min Background of Winerywise (Why, Who, What), and where it is today. Will mention WIPS briefly & the UW/SHIP site being developed.
15-15 min Why should your winery be interested in sustainability? What is Extension doing to promote winery sustainability?
25-55 min Live tour/Demo of the Winerywise Web Site using 'Terra Dolce Winery' as the test case.
55-75 min Discussion of WIPs and sharing of their sustainability projects and introduction of Kennedy Jenks winery engineers who will briefly discuss what they're doing with the WIPs
75-100 min TREE group presentation
100-110 min Introduction of LIVE & CRC representatives – they give a brief explanation of their winery sustainability certifying agencies/objectives.
110-120 min Q&A and Concluding Remarks. Session survey distributed and collected from attendees.

A postcard announcement about the launch of Winerywise was distributed by mail to 1751 industry stakeholders, media and educators.

Sessions were offered at four locations in Washington:

- Grandview
- Walla Walla
- Woodinville
- Kennewick

There were nearly 70 winery representatives that attended these sessions in July 2012 and February 2013.

A group of volunteer 'Wineries in Practice (WIP)' was established representing small, mid and larger wineries. The following steps were taken by the WIPs to implement and measure improvements in one or more practices in their winery.

1. WIPs identified a practice(s) for improvement that could be tracked and measurable at before and after points.
2. Baseline data for the practice was collected and/or measured.
3. Improvements were implemented.
4. Data collected or measured to measure impact of improvement for the period January 16, 2012 through January 15, 2013.
5. WIPs reported results about cost/benefits/savings as a result of adopting more sustainable practices to grant leads.

Information gathered from WIPs was used in education and outreach sessions to indicate the types, changes in consumption of resources, and dollar savings a winery may experience through adopting more sustainable practices.

The collective results of data from the WIPs was presented in "Making Winery Sustainability Work" at three locations in the state and presented to 72 winery representatives in July 2013.

"Making Winery Sustainability Work" – Topic Summary

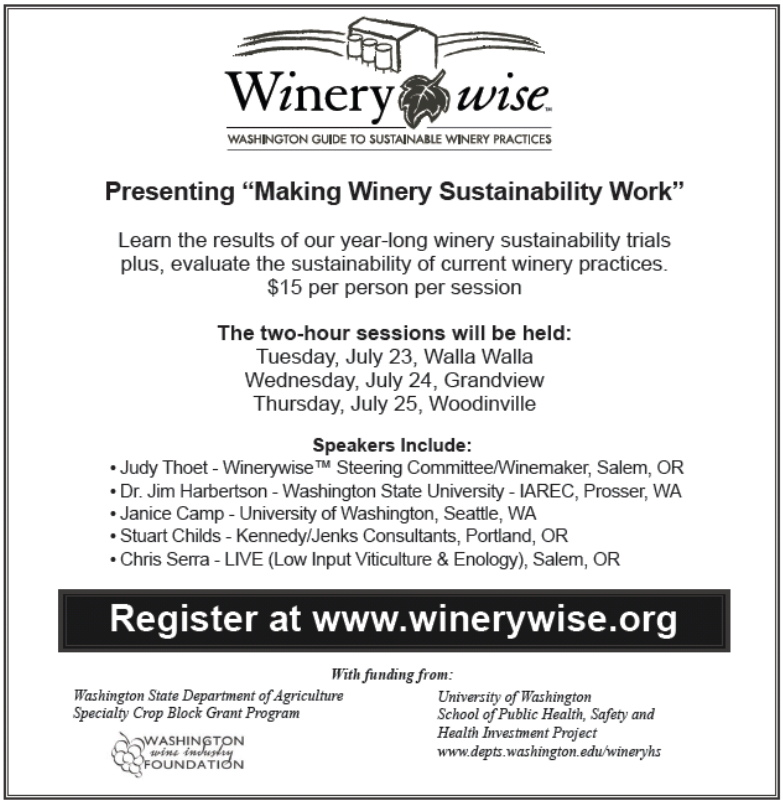
*Judy Thoet/Winerywise –**Where is Winerywise today?***
Judy Thoet spent a short amount of time looking at the updated Winerywise site and how it works as an interactive guide of business and winery management for those in the industry. Judy also discussed current the current status of multiple Winerywise projects.

Dr. Jim Harbertson/Associate Professor and Extension Enologist, WSU – ***Examining the Sustainability of Winery Practices.***
Did you realize that over 70% of the grapes grown in Washington State are processed at less than 10 wineries? While large wineries frequently have volume efficiencies, many of the smaller wineries are unaware of the process to be sustainable. Dr. Harbertson showed which metrics are some of the most important for smaller wineries to examine for the greatest gain in sustainability. This part of the session presented the tools necessary to find success as a small winery.

Stuart Childs & Susanne Zeichel/Kennedy Jenks – ***The Success of Sustainability****.*
After Dr. Harbertson explained the theory of creating sustainability in a winery, Stuart Childs and Susanne Zeichel from Kennedy Jenks showed how the theories work in real life. Winerywise had the opportunity to work with these two winery process engineers from Kennedy Jenks on the Wineries In Practice (WIP) project in 2012. During the presentation wineries learned about the success stories of implementing sustainability in Washington wineries. The engineers talked about the process one winery went through to reduce the volume of their process wastewater to increase their wine production without maxing out their wastewater treatment system.

Janice Camp, Senior Lecturer, Environmental and Occupational Health Sciences, UW – WA ***Winery Safety & Health web site.*** Janice Camp introduced the winery focused and information-filled web site that has all the facts and forms you need for a winery employee health and safety program. This website acknowledges Washington State as one of the largest producers of premium wines and the need to ensure winery employees stay healthy and safe. During this part of the session Janice discussed the Washington Labor & Industry requirements for employee safety processes and programs, and the 'one stop shopping' safety and health forms that are available at the site.

Chris Serra/LIVE – ***How to Become a Sustainably Certified WA Winery****.*
Chris Serra, Executive Director of LIVE (Low Input Viticulture and Enology discussed the process that two Washington wineries went through to become sustainably certified and explained how to apply that process to a winery. Chris provided examples of changes or modifications the wineries made for their certification, including any costs or cost savings experienced as part of the certification process.



Winery wise

WASHINGTON GUIDE TO SUSTAINABLE WINERY PRACTICES

Presenting "Making Winery Sustainability Work"

Learn the results of our year-long winery sustainability trials
plus, evaluate the sustainability of current winery practices.
$15 per person per session

The two-hour sessions will be held:
Tuesday, July 23, Walla Walla
Wednesday, July 24, Grandview
Thursday, July 25, Woodinville

Speakers Include:
- Judy Thoet - Winerywise™ Steering Committee/Winemaker, Salem, OR
- Dr. Jim Harbertson - Washington State University - IAREC, Prosser, WA
- Janice Camp - University of Washington, Seattle, WA
- Stuart Childs - Kennedy/Jenks Consultants, Portland, OR
- Chris Serra - LIVE (Low Input Viticulture & Enology), Salem, OR

Register at www.winerywise.org

With funding from:

Washington State Department of Agriculture
Specialty Crop Block Grant Program

WASHINGTON wine industry FOUNDATION

University of Washington
School of Public Health, Safety and Health Investment Project
www.depts.washington.edu/wineryhs

Winerywise: Your Guide to Sustainable Winemaking, a four page brochure was distributed to 780 wineries in Washington introducing Winerywise.

During the project period, an unanticipated opportunity to collaborate with the University of Washington Department of Environmental and Occupational Health Sciences arose. Winerywise safety and health components were shared and merged with Washington State Department of Labor and Industries and University of Washington Safety and Health website targeting both L&I staff and wineries.

Additionally, a partnership evolved with the Washington Department of Ecology Tree Team (Technical Resources for Engineering Efficiency). TREE reached out to Winerywise for assistance and a forum for informing wineries about new requirements for wastewater treatment. TREE and Winerywise Steering Committee members contributed to the development of the Washington Department of Ecology report 'Water Supply, Wastewater, and Stormwater Management Options for Washington Wineries', Publication 12-10-017. A TREE team member participated in Winerywise outreach sessions to introduce this report.

The initial steering committee for Winerywise was the sole reason the Winerywise website is as comprehensive and as complete as it is. This team truly cared about the product they were producing and took personal interest and pride in the end result. The group met nearly monthly for the entire length of the grant and spent dozens and dozens of hours reading, editing, commenting, sharing, and testing. The team was a unique mix of wineries, environmental professionals and consultants, with each bringing valuable knowledge to the table to successfully create the Winerywise tools.

GOALS AND OUTCOMES ACHIEVED

Goal:
Winerywise will make available best practices that will not only help protect Washington's natural resources, but also demonstrate cost savings associated with these practices to encourage statewide participation.

Measurable Outcome:
Each chapter was drafted by industry and then submitted to a contracted third-party consultant specializing in that field (i.e. energy efficiency, waste management, etc.), for review, editing and input. The content was then evaluated and reviewed by the industry stakeholder group and the content given to a graphic and web designer to design and format a webpage that was uploaded and tested by the Winerywise Steering Committee. A comprehensive, fully-functional and accessible online website is now complete.

Activities Completed:

- Expert consultants, including specialists in water, energy and waste, winemaking and winery operation, sustainable practices, and LEED accredited architects were hired to review and approve chapters, self-assessments and checklists, and serve as presenters for introducing and informing the winery community about Winerywise and winery sustainability improvement practices.
- Industry stakeholders/project committee reviewed, edited and confirmed final content for use in development of the Winerywise website.
- Professional website developer and designed was engaged to create the Winerywise website and install approved content.
- Website tested by volunteer wineries.
- Winerywise introduced to winery community through direct mailing, email, Facebook, printed media and education seminars.

Future Outcomes:
A "Wineries In Practice" group of volunteer wineries was identified (small, medium and large) and these volunteers measured changes in energy and water consumption over the course of a year to establish measurable outcomes in the following areas:

- energy use (electric, fuel, natural gas)
- water consumption
- waste management including water, glass and packaging
- environmentally preferred purchasing (buying locally)

The data from the "Wineries In Practice" group of volunteer wineries, who implemented Winerywise best practices, were collected to compare consumption and costs including percentage reduction in:

- water usage over one year
- energy usage over one year
- average weight per case of wine
- volume of landfill waste

While WWIF developed an outreach and marketing plan that targeted Washington wineries via mailings, emails, and educational sessions using WIP data (that demonstrated proven environmental and economic impacts), it is now clear that participation by wineries (to use self-assessments and/or action plans) will take longer as the value of the website spreads.

Progress toward future outcomes:
The volunteer WIPs that participated to provide data about reduced resource consumption, waste reduction and cost savings as a result of adopting more sustainable practices has already been analyzed and summarized in presentations to winery stakeholders. This information is now available for future learning opportunities. The WIPs are also industry leaders and continue to share their findings within their circle of wineries.

All goals were met with the exception of the number of wineries we expected to have conducted Winerywise self-assessments and implemented action plans. Our goal was to have 175 wineries (or 25% of the state's wineries) participating by the end of the grant period. At this time, based on the website feedback system, only three Washington wineries have completed the self-assessment. Even though data collected from WIPs substantiates significant resource consumption and cost savings from adopting sustainable practices, the actual performance of self-assessments and implementation of new practices has been extremely slow. Feedback from stakeholders indicates it is believed the self-assessments and action plan development involve too great of a time commitment and overall, the nine chapters seem too daunting for a small winery to take on all at once.

There will need to be a more concerted effort to help wineries walk through the chapters one by one in a smaller and more intimate setting where they feel comfortable asking questions and seeking advice. WWIF intends to seek further grant assistance for an on-site trainer that will travel to the individual wineries to help them navigate the self-assessments and then complete the action plans.

We are, and more importantly, the industry is pleased with the product developed with funding from this grant and believes it will be used extensively to encourage Washington wineries to evaluate operational practices and adopt methods to reduce energy consumption, decrease waste production and improve long term winery sustainability. The information gathered from WIPs substantiates potential benefits from adopting more sustainable practices.

Winerywise Wineries In Practice (WIP)

Winery	Selected Practice	Details	Results (one year data)
WIP1	Material Handling	Initiated a holistic composting and recycling program. The composting included all materials from employee lunchrooms, the concert area and the Visitor Center (food, switching to compostable dinnerware, etc). The winery and visitor center began to recycle all possible materials.	The reduction in materials going to the landfill is 5.25 tons monthly, with a cost savings of >$400 monthly. The winery is currently recycling up to 95% of waste materials.
WIP2	Energy Efficiency	Motors - Retrofitted their air compressor with a VFD (variable frequency drive) component to reduce energy consumption	Cost savings of $4,130 annually

WIP2	Energy Efficiency	Lighting Retrofit - switched all lights to being sensor controlled. Where feasible, lights were switched to a lower wattage and/or LED	Cost savings of $8,486 annually
WIP2	Energy Efficiency	Insulated all hot water piping	Cost savings of $23,514 annually
WIP3	Water Management	Performed a Facility Water Balance (FWB) to determine where to save water going into wastewater stream. Began to reuse tank sanitizing solutions, recycled bottling line sterilizing water, purchased a new filter for their Cross Flow filter which reduced water consumption, and switched to steam barrel cleaning.	Water consumption on some of the described changes decreased as much as 60%. (self-owned well water). Allowed the winery to increase production without an expansion to their wastewater treatment system. (also self-owned)
WIP4	Water Management	Performed a Facility Water Balance (FWB) to determine where to save water going into wastewater stream. Barrel washing using a rotating head impingement cleaner used 6.5 gal/bbl with hot water electricity usage of 1.4231 kwh/bbl. It was suggested that Hedges switch to a steam barrel cleaning system.	The steam barrel cleaning technique resulted in only .1875 gal/bbl water usage, and an electrical usage for hot water of only .064159 kwh/bbl. This resulted in an annual water usage savings of 28,406 gallons (self-owned well water), and an annual power savings of $366 from hot water heating.
WIP5	Waste Management	Developed a winery recycling program	The holistic winery recycling program resulted in 58% reduction in waste to landfill and 12.6 tons of materials are recycled monthly.
WIP5	Water Management	Installed a cross flow wine filtration system and stopped using diatomaceous earth filtration systems.	Installation of the cross flow filtration system reduced the Total Suspended Solids (TSS) in wastewater streams by 47%.

WIP6	Environmentally Preferred Purchasing	Change to light weight bottles - reduced overall weight of bottles by approximately 25%	The reduction in glass weight allowed Pacific Rim finished case goods shipments to increase from 20 pallets to 23 pallets per truck (56 cases per pallet). This resulted in an annual cost savings of $36,000 in shipping costs.
WIP6	Water Management	Water usage reduction was achieved through staff education on water conservation, switching to smaller diameter water hoses, updated tank washing protocols, and installation of shutoff valves on all hoses.	Water usage went from 3.76 gallons/case of finished wine to 2.67 gallons per case of finished wine, or a water reduction of 29%.
WIP6	Energy Efficiency	Lighting Upgrade - installed motion sensors on all lighting in both offices and winery. Also replaced metal halide lighting with energy efficient fluorescents.	By installing motion sensors and energy efficient lighting the winery was able to reduce it's total annual kWh usage by 21.4%.

BENEFICIARIES

Washington State will benefit from the work completed in this project as will wineries from throughout the Pacific Northwest, the US and the world as many of the findings are applicable to any winery. The fact that it was created and based on findings in Washington State will not only enable our wineries a "leg up" on the competition but also enable them to attain a greater level of sustainability.
The most impactful data is first and foremost that which was accumulated and then shared by the WIPs based on the content of the information in the Winerywise chapters.

LESSONS LEARNED

In the end, everyone involved in Winerywise is extremely pleased with the resulting product. However, it is noted a lack of understanding of complicated technological issues arising when developing online interactive website tools created a situation where the website development did not keep up with the work or the steering committee's expectations. The project was delayed and required an extension. While anticipated and certainly hoped for, the camaraderie, teamwork and focus exhibited by the stakeholder Steering Committee was nothing short of stellar. Having a clearly identified plan with a timeline and staff that kept the project pushing forward made for a powerful team.

The unmet project goal for reaching a target of 175 participating wineries serves as a reminder that the largest percentage of Washington wineries are young, small, family-operated businesses lacking resources, including human resources and time resources. The demands of operating a small winery often make it difficult to initiate another project which appears likely to consume more of those valued resources. The Winerywise structure of nine chapters with checklists, self-assessments, and action plan development appears, at the onset, to be too large of a project for many small wineries to undertake. Although the Winerywise product is excellent, hindsight suggests that creation of a product formatted

with smaller, simpler pieces would be less daunting and may be more easily adopted in piecemeal fashion at the onset and then working up to a full website.

These comments are being taken into consideration as the Washington Wine Industry Foundation moves forward with development and production of winery safety products under a Washington State Department of Labor and Industries SHIP grant.

CONTACT PERSON

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WA Wine Industry Foundation
509-782-1108
Vicky@washingtonwinefoundation.org

ADDITIONAL INFORMATION

Salaries/wages

The Steering Committee consisted of nine stakeholders and over a dozen participated as Wineries In Practice.

We estimated that the nine Steering Committee members participated in between 20 and 36 planning meetings with an average meeting length of 90 minutes. These stakeholders shared their time, travel and technical expertise to make Winerywise truly industry-driven.

In addition, the Wineries in Practice had multiple projects and multiple staff members working on each project during the last year of the project. This group too provided time and technical expertise to implement and track Winerywise sustainability practices for instructive purposes useful to all wineries in the state.

The two stakeholder groups combined represented an estimated in-kind match of well over $75,000.

Supplies

The Washington Association of Wine Grape Growers provided and in-kind contribution in year one valued at $5,000 for development of website code which housed Winerywise content.

Contractual

Kennedy Jenks Consultants contributed technical guidance, assistance and in-kind data analysis for the "Wineries In Practice" projects plus they participated in each of the three outreach and training sessions for a total of at least $15,750.

The following appeared in the July issues of *Good Fruit Grower*, *Vineyard & Winery Management*, *Wine Business Monthly*, and *Wines & Vines*.

Winery wise

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PROJECT #15

Project Title: Increasing SC Producer Competitiveness through Value-Added Processing

Partner Organization: Washington State Department of Agriculture

PROJECT SUMMARY

The initial purpose of this project was to increase the markets for specialty crops and provide growers with more profitable markets and extend their sales season. This project was conceived to assist small to medium sized specialty crop growers in developing value-added, processed products and to directly market these products. A number of small and mid-sized farmers struggle because they are not large enough to have the efficiencies of scale to supply major retailers and processors. They have a disadvantage when compared to large producers so their main options have been to sell fresh products to packing houses, processors and other commodity buyers and but have little to no control of the price paid for their commodity. An alternative is to develop marketing strategies to sell the same products directly to consumers, institutions or retailers, or to develop value-added, processed products that they can market themselves beyond the fresh harvest season.

Many specialty crop farmers in Washington have suffered from low pricing and periodic oversupplies in commodity markets over the past several years. One proven option for specialty crop farmers is to develop value-added products with shelf life for year round sales that they can market directly to generate higher profits. The purpose of this project was to conduct multiple series of small workshops designed to address all of the steps necessary to bring specialty crop based value-added products from concept to market. The workshops were conducted over four consecutive weeks in diverse geographic areas within Washington State. The workshops included both guest speakers and roundtable discussions on how to develop, produce and market a value-added product. Ultimately, this project was intended to develop additional revenue streams for products coming from the farm and diversify the revenue sources to improve the farms' competitiveness and economic vitality.

This project was timely because of the weakened economy and ongoing consolidation within the agriculture industry has resulted in low commodity prices. Historically, recessions have spawned new start-up enterprises as individuals and companies look for new opportunities. This project was designed to help small and mid-sized specialty crop growers identify and take advantage of emerging trends, especially those available through direct marketing and value-added processing.

Increasing the food processing capacity within the state has been a priority of state and local agencies for many years. Efforts have included the recruitment of large food processors, such as, the Pasco Food Processing Center and ongoing efforts by several local economic development organizations. There are also on-going efforts to encourage value-added processing for smaller producers, like the United States Department of Agriculture's (USDA) Value-Added Grant Program, the Northwest Agriculture Business Center (NABC) in Mount Vernon, and the Blue Mountain Station project in Dayton. This project has complemented existing efforts by reaching out into regional areas of the state that were previously underserved. In addition, the intensive nature of the workshops conducted for this project lead to the establishment of successful new enterprises at a time when many smaller farms are struggling with profitability.

There were no previously funded SCBG projects with the same focus.

PROJECT APPROACH

In a short span of under two years, this project successfully conducted many activities and effectively completed its objectives. The first step was to design and distribute a survey to pinpoint the needs,

desires and preferences of the stakeholders. This survey was widely distributed through numerous ListServs and received 112 responses from across the state. The survey question that addressed respondents' interest in pursuing a value-added enterprise showed 45% were interested in starting a new venture, 33% were interested in expanding an existing business, and 22% said that they may want to move in this direction pending more information. Those responding to the survey indicated that 45% currently produce row crops, 44% berries and tree fruits, 46% said that they were farming with diversified production, including livestock, poultry and eggs, while 33% are processing their own products, and 5 indicated that they are co-packers.

The initial survey provided the basis for developing the workshop curriculum. Responses to a question on potential topics to be covered showed that 73% wanted information on regulations, rules and food safety. There were 71% that requested that product marketing be covered, 64% wanted information about labeling, 58% desired assistance with market research, 57% technical product development, and 55% business planning. One half of respondents expressed a desire to indentify resources leading to knowledge and expertise in the field of value-added processing.

Finally, the survey helped to identify specific geographic regions within the state that expressed the most interest in attending workshops, when potential participants would most likely be available, and additional logistical planning issues such as days and times most desired. In all, the survey proved to be an essential planning tool in developing a pertinent grant program that would resonate with the targeted audience.

Following the survey stage, an Advisory Committee was created early in the development of this project which helped to narrow and sculpt the contents and delivery of the workshop curriculum. This Advisory Committee was made up of all the key partners identified in the grant proposal, as well as pertinent stakeholders. Members included representation from USDA, Washington State University, NABC, WSDA Food Safety Program, WSDA Organic Program, Northwest Food Processors Association (NWFPA), and value-added producers. In all, there were 20 members solicited for the Advisory Committee and 12 of these attended the meeting which was held in Olympia at the WSDA offices. A very productive dialog ensued with valuable input from all factions. The intent for establishing the Advisory Committee resulted in a productive path for finalizing the course curriculum and identifying partners and resources.

During the grant period there was a total of 7 workshop series completed. Each workshop series was conducted over 4 consecutive weeks from 9:00 am until 3:30 pm. The workshop sessions were held in Puyallup, Pierce County; Spokane, Spokane County; Wenatchee, Chelan County; Mt. Vernon, Skagit County; Chimacum, Jefferson County; Hazel Dell (Vancouver), Clark County; and, Woodinville, King County. There were a total of 101 participants with a breakdown of 76 women and 25 men. 45 participants indicated that they were farmers, 9 chefs, 20 were processors, and 27 described themselves as 'other', which included educators, community organizers and economic development professionals.

Following each workshop series, an evaluation survey was conducted. These surveys, supported by email and personal contacts, indicated great satisfaction with the class content, the speakers and generally reported a very positive outcome for the series. Specific post-workshop survey results are summarized here:

Number of participants responding = 56%
Overall effectiveness (great or good) = 98%
Level of knowledge & quality of resources = 99%
Workshop logistics (great or good) = 97%
Would recommend to others: Yes=89% Probably=11%

Improved understanding of VA prospective - Significantly = 76%
Somewhat to much = 22%
Value of Speakers (significant to some) = 95%
Developed potential partner relations - Much = 30%
Some = 40%
Maybe = 30%

Gained tools for evaluating new enterprise - Very much = 70%
Somewhat = 26%

Learned next steps for successful VA business = 94%
Plans to develop new VA product Immediately (6 – 12 months) = 48%
Within 1 year to 18 months = 37%

As a result of feedback from each workshop series, suggestions for improvement were made for subsequent workshop session. After the first sessions in Puyallup where each student received a personal thumb drive containing all of the class resources a significant improvement was introduced. In lieu of distributing pre-loaded thumb drives, all of the class resources were shared through the web based system – "Dropbox". This innovation benefitted the students with instant access to updates and additions to the resource materials, while reducing expense and physical resources. While this technology did present some challenges for a few students, overall, it provided a far superior means to share the class assets and ensure that all information was kept current.

Another class function that evolved over time was the introduction of a class project to develop a virtual value-added specialty crop product. This exercise promoted 'group think' and class participation in a roundtable format where we attempted to take our virtual product from concept to market. While the idea of this process was valuable and engaged all of the students in considering and discussing each of the required steps, there wasn't adequate time in the packed agenda to fully implement this exercise. Short of adding at least one additional session to the workshops some compromise in content is necessary.

In addition to the 7 workshops series, a number of presentations were made at various venues to promote the concepts of value-added products as a means of season extension and for diversifying revenue streams. These included WSU Cultivating Success classes, Seattle Tilth Master Preservers' class, the Washington State Farmers Market Association annual Conference, the Power of Regional Food Economy Conference in Spokane, and the Mother Earth News Fair in Puyallup. A video on Value Added Products was created at the end of the project period that will assist WSDA with continuing to promote options for food product developments and state regulatory categories.

A final follow-up survey was conducted to evaluate long term impacts of this grant. Regretfully, because of time constraints a longer range view of outcomes will not be possible. Despite this shortcoming, and while only one year has elapsed since the first workshop series, six months since workshops 2 and 3, 3 months since workshops 4 and 5, and only 6 weeks since the completion of workshops 6 and 7, the survey has yielded very positive results. These outcomes are summarized here:

Number of respondents = 45
Number of new products being marketed = 5
Number of new products in development = 9
Number of products in final planning stage = 13
Number of new products proposed within one year = 11
Number of respondents not planning to process VA = 9

Number reporting workshop impact on decision to proceed
Provided adequate tools and resources = 24 (60%)
Provided necessary confidence to act = 16 (40%)

Seven individuals, or 17%, reported that as a result of what they learned in the workshops they have determined not to pursue a value-added enterprise. This is viewed as a positive response based upon the savings these folks were able to make in time and money (and grief) after learning about all of the challenges faced in creating a new value-added business.

The follow-up survey reported the following results regarding facilities for processing value-added products:

Number using existing facilities = 5
Number that have built their own new facility = 10
Number that are renting an existing facility = 8
Number that are using a new shared-use = 2
Number using an existing shared use = 5
Number using a co-packer = 2
Number that are using a Cottage Food Permit = 2

Finally, there were 25 unique new products or product lines being processed as reported by workshop participants.

Given the short timeframe since the conclusion of the workshops, it is not possible to project the economic impact, nor number of jobs created as a result of this grant. However, based on anecdotal evidence, both from the surveys and from one-on-one conversations with participants, one must conclude that there has been a significant increase in the production and sale of specialty crop value-added products. These new and expanded enterprises have definitely resulted in improving the profitability of numerous small and mid-sized producers, despite the fact that it's too soon to accurately quantify the results.

From the very outset the value of the project partners was realized and greatly valued. Without the support and input from several of these partners the effectiveness and range of the grant would have been significantly curtailed. At the beginning, the preliminary outreach survey would not have been successful without the assistance of the WSU Small Farm Team, Cascade Harvest Coalition, Tilth Producers of Washington, the Department of Farmland Preservation, and others that helped disseminate the survey. The participation of key partners on the Advisory Committee, namely, WSU Extension, WSDA Food Safety, WSDA Organic Program, Northwest Food Processors' Association, USDA Rural Development, Northwest Agriculture Business Center, as well as successful processors, added critical value to development of the curriculum and content of the workshops.

Outreach to promote the workshops was significantly assisted by the partners through their respective ListServ's and postings on their websites and in their newsletters.

The role that Cascade Harvest Coalition played as fiscal sponsor allowed for a simplified and transparent method of collecting fees to cover meals, snacks and beverages for participants which the grant funding could not provide. This resulted in the ability to develop a positive and productive group dynamic through shared meals and break times. It further leads to an enhanced cohesiveness and improved use of time during the duration of the workshops. The efficiency of this arrangement was crucial to the success of this project.

The quality, depth and breadth of the guest speakers were another essential element that supported the ultimate success of the workshop series. Representatives from USDA Rural Development & Farm Services Agency, local offices of Small Business Development Centers, and Northwest Farm Credit Services all were instrumental in providing insights into business planning and financing options. WSU Extension also provided resources for these topics, as well as, in many instances, they facilitated access to classroom space and AV equipment for conducting the workshops.

The participation of WSDA Food Safety in presenting on the topic of regulations and licensing was essential in laying the foundation for students to pursue their proposed projects and in assisting with the development of the video on Value Added Products.

The workshop agenda was dependent on input from a number of professionals in the insurance industry, food technology, and marketing fields. These contracted speakers were highly valued by the workshop participants and they provided essential content to the agenda.

GOALS AND OUTCOMES ACHIEVED

Goal: Assist growers to diversify their revenue streams and improve their farms' competitiveness.

Target: 90 participants will attend the training; ten growers will start or expand their direct marketing and value-added processing and/or apply to USDA's Value-Added Grant Program as a result.

The proposed target of 90 participants was exceeded by more than 12 % with a total 101 students participating in a total of 7 workshop series rather than just 6 series originally planned. As indicated in a follow-up survey, and supported by email and phone conversations, the goal of 10 growers starting or expanding their direct marketing and value-added processing enterprises was also greatly exceeded. Responses indicate that at least 37 new or expanded businesses will result from the grant activities within the next year. This represents a 370% result compared to the target! While several workshop participants have indicated a desire and plan to apply for USDA VAPG grants in the future, it is too soon to measure this outcome.

Performance Measure: WSDA will maintain a mailing list of participants and conduct follow-up surveys one and two years after the end of the project to measure success. Included in this survey will also be the number of new jobs created and new revenue to the farm.

As a result of budget constraints within the agency, this performance measure will not likely be performed due to lack of staff time and personnel. On the other hand, due to the excellent early feedback and successful nature of many of the workshop participants, it is safe to project that a significant number of new jobs will, or have already been created, and a great deal of new revenue has already been generated and will continue to expand as more new enterprises come on line.

In addition, at the end of each workshop series, participants will be surveyed to assess what they learned, the effectiveness and value of the training, and how to improve it.

Each workshop series was followed by a survey to evaluate effectiveness. The results consistently showed all topics were covered adequately to the satisfaction of 95 % or greater of all the participants. Feedback specifically indicated the effectiveness and value of the learning experience and usefulness of the resources and tools that were shared throughout each class.

The only measurable outcomes that are long term would be the continued success of new and expanded VA enterprises. Based on participant feedback it is clear that many of the students will progress with establishing successful enterprises resulting in new VA products, improving their revenue streams and extending their market season. Already, numerous new and expanded enterprises have emerged as a result of these workshops, and many more are in the process of developing or finalizing their plans to do likewise.

The fact that this project can report such overwhelming success speaks to a positive comparison of the activities and established goals with the actual accomplishments. As far as activities are concerned, a total of 7 workshop series were completed as compared with the 6 that were proposed. There were a total of 101 participants compared to only 90 in the grant proposal. There were reportedly 37 new or expanded business ventures compared to only 10 projected. In addition, there is evidence to expect even greater future success as suggested by reported planning activities by workshop participants and construction of new infrastructure.

There was no baseline data prior to this grant project. It is expected that all of the farmers have gained knowledge and access to resources that will allow them to improve their business operations and marketing outlets which will benefit their profitability. It is further expected that the project has benefited existing processors who may partner with growers, or develop new product ideas using specialty crops.

BENEFICIARIES

It is not only those that participated in the project directly, but as these individuals prove successful, it is reasonable to expect that other growers will follow suit. Already several of the workshop participants have reported their sharing resources, ideas, and tools with other farmers. In addition, by working with a variety of partners who also seek to increase the number of value-added processors and agriculture related jobs in the state, this project will be supporting collectively increased economic activity, economic vitality of the farms, and job creation. If only 10 new value-added businesses are started with three employees each, this would represent 30 additional jobs. By most economic development metrics, a job creation project is considered successful if one job is created for every $50,000 invested. On that basis, creation of as few as five jobs would make this project successful. Evidence to date points to these numbers being greatly exceeded.

Therefore, specialty crop farmers, value-added processors, the regulatory agencies, local rural communities, local economies and consumers are all clearly beneficiaries of the success of this project. The growers benefit from new revenue streams and season extension, the processors gain additional product lines and greater sales volumes, and the regulatory agencies benefit from an informed and educated workforce. Rural communities gain new job opportunities and local economies benefit greatly from expanded revenue and the multiplier effect of new and expanding local businesses. In the end, consumers not only benefit from a broader selection of product choice and access to an extended season for purchases, but the quality and nutritional options are greatly expanded leading to more fulfillment and a healthier future. A true ‘win-win’ situation has resulted from the successful completion of this project.

The quantitative data is more of a long range measure of results. Since completion of this project is still so recent one cannot state definitive numbers that can identify the precise economic impact at this time. Anecdotally, the number of new and expanded businesses along with those in the process of planning and/or building new processing facilities would indicate a very positive result for economic impact even though it’s too soon to present quantitative data. The data obtained to date from a post workshop survey clearly indicate numerous new and expanded businesses have resulted from this project with inherent and significant positive economic impact.

LESSONS LEARNED

The biggest lesson learned was the amount of work and time that goes into creating and presenting an effective series of workshops. Deciding the venue, the time of day and day of week is very important in order to gain the broadest possible audience. Without the benefit of the initial survey and the insights provided by the Advisory Committee, these decisions would have been just a shot in the dark. One

important lesson that was realized prior to beginning the project, but was reinforced by the outcome was that these types of learning opportunities must be made available outside of the growing season. Due to delays in planning the first 3 series were scheduled too late in the spring resulting in only one of the three initial workshops having adequate registrants to proceed.

Outreach turned out to be a larger task than anticipated. Given the independent nature of the target audience it was realized early on that despite expressed interest, multiple attempts to get perspective students to enroll were necessary for ultimate success. This process, while rewarding in the end, required more time than realized in advance.

The group dynamic for this style of workshop is critical. Too many participants results in an unwieldy group discussion particularly when a few people tend to dominate the conversation. This presents challenges for the facilitator to keep on topic and to provide an opportunity for everyone to be heard. Too few participants results in a restrictive and limiting group discussion. The idea of including a roundtable element was important for the success of this project, particularly in light of the objective of developing partnerships. The role of the facilitator is key to the success and flow of a meaningful roundtable discussion.

Scheduling was another challenge and the take-away here was that the organizer needs to stay flexible and willing and able to adjust the agenda when the unexpected inevitably occurs.

The limitations of technology or comprehension of how to best use it also presented itself throughout the classes. The use of Dropbox to disseminate and share information, while a powerful tool, turned out to be a challenge to negotiate for several students. The lack of internet access at some venues was another problem that presented challenges.

One additional lesson was the value of Eventbrite to achieve outreach and solicit registrations. This proved to be a valuable tool in managing workshop registrants and establishing initial contact lists. The use of Survey Monkey also proved invaluable to conduct, record and manage evaluations.

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ADDITIONAL INFORMATION

See Report 12-25-B-1102 Attachment E

The only unexpected outcome was the exceeding of most of the goals and measures for this project. It was gratifying to find that this course was so effective in promoting the implementation and expansion of so many businesses resulting in new revenue for so many farmers. There were several inquires by stakeholders that were unable to attend the workshop sessions for an on-line version of the course. Since the development of such an option was not budgeted in the original grant, it was not reasonable to accommodate this request. Further, it was judged that the interactive nature of the workshop format with roundtable discussions was an essential feature that could not be replicated in an on-line presentation. Since value-added processing is sometimes most feasible in partnership with other producers or appropriately-scaled processors due to infrastructure costs, the networking element of face-to-face workshops was viewed as an important feature for success.

The only goal or activity that was not fully implemented was the development of Food Safety Fact Sheets. A great deal of effort was expended in the development of these tools, however, in the end

some compromises were necessitated by inadequate time and human resources. Still, the ultimate product delivered should serve as a useful resource to new applicants for Food Processor Licenses. The only lesson to be shared here is that high quality work requires excellent organizational skills coupled with willing partners and the investment of a good deal of dedicated time. Perseverance and flexibility have proven to be crucial elements to conducting a successful grant project yielding consistently positive results.

PROJECT #16

Project Title: Skagit Delta Agricultural Irrigation Supply & Management Project

Partner Organization: Western WA Agricultural Association

PROJECT SUMMARY

The Skagit River is one of the great rivers of the West, and the lower Skagit delta area is often referred to as "The Agricultural Heartland of Western Washington." The rich soils, flat topography, and moderate maritime influenced climate of the Skagit delta provide some of the most optimal farming conditions in the world. Over 80 different commercially significant crops are grown locally. Agriculture defines the Skagit Delta, and it is the No. 1 industry in Skagit County. The farmers of land in the Skagit delta have formed a unique level of cooperation where land is seasonally leased, swapped, exchanged, and bartered for the cultivation of a variety of crops, many of which depend on irrigation. Principal crops including potatoes, broccoli, cauliflower, cucumbers, cabbage, carrots, kohlrabi, vegetable seed, and cut flowers and bulbs depend on irrigation for their successful growth and harvest.

While the Skagit delta is legendary worldwide for its agricultural productivity, the American Farmland Trust has identified it as "one of the five most threatened agricultural areas in the nation." Yet, critical agricultural irrigation water availability, conveyance, and mobility needs exist that are affecting the long term security of production of specialty crops in the Skagit agricultural delta area. Additionally, confusion over state water rights requirements and complexity of regulatory programs are challenging the certainty of access to historically available and utilized irrigation water on the delta.
The farming community earlier completed a Skagit Basin Comprehensive Irrigation District Management Plan (2006) and a subsequent Skagit Delta Agricultural Water Management Pilot (2008). These documents presented a comprehensive analysis of actual water use by agricultural irrigators, a review and evaluation of current water rights and water allocation authorities, and a thorough evaluation of drainage and irrigation district water management and service delivery operations. The reports evaluated a variety of options and forwarded several recommendations intended to improve agricultural water availability, management and delivery to Skagit delta agricultural users. The agricultural community had also negotiated and obtained a reservation of water for irrigation purposes in the lower Skagit River Delta area in the 2006 Amendments to the Skagit Instream Rule.

The Skagit Conservation District (SCD), Washington State University Extension (WSU-E) and the Western Washington Agricultural Association (WWAA) partnered on this project to provide the management, engineering and technical assistance to the districts and landowners.
Through this project the agricultural community and drainage and irrigation districts serving this area were able to proceed with implementing the key recommendations of the Skagit CIDMP documents. These activities included providing direct professional and technical assistance to the landowners/irrigators, and the drainage and irrigation districts, to assist them in implementing improved water management and service delivery functions in the Skagit delta area.
The project elements:

- Regulatory and permit compliance technical assistance to the districts in developing and processing new water right applications, change applications, transfers, etc. needed for irrigation purposes;

- Assistance with developing and implementing required administrative programs for drainage and irrigation districts' water contracting to agricultural irrigation users;

- Design and engineering assistance to the drainage and irrigation districts for improving existing or installing new infrastructure and conveyance improvements; and,

- Technical and design assistance in the development of water conservation measures and water use efficiency projects for landowner/agricultural irrigators.

PROJECT APPROACH

The WWAA took the lead on regulatory and permit compliance issues, working with the districts in developing and processing new water right applications, change applications, transfers, etc. needed for irrigation purposes. The WWAA also provided assistance to the districts in developing and implementing required administrative programs for drainage and irrigation districts' water contracting to agricultural irrigation users. To accomplish this work there were many meetings with the districts, organizations, local government and agencies, residents and other stakeholders to discuss the proposals and activities. Many district commissioners were directly engaged in the project activities, involving more than 80 meetings, and contributing over 440 hours of their time.

There were no lobbying efforts as a part of this project. No WSDA Specialty Crop Grants funds were used for lobbying purposes.

The project activity you may be referencing regards Skagit County Consolidated Dike District # 22 efforts to reorganize as a dike, drainage and irrigation improvement district. This is a business function that the districts can engage which is already codified in state law. The law provides that the districts must request such an election be held by the county before implementing irrigation improvement functions within the district service area.

The grant did support the development of the request by the district to the county to schedule an election for the reorganization. Review of the necessary legal documents for completeness and accuracy was also completed. The county conducted the election. There were no advertisements or endorsements in support of the proposal prepared or distributed as a part of the election process. An informational flyer which explained the purpose of the election was prepared which was sent to the property owners in the district. A copy of this document was submitted with the project final Performance Report.

We do not believe that any of these activities could be considered lobbying.

- **Water Rights Acquisition and Coordination** – Skagit County Drainage and Irrigation Improvement District No. 15 (DID15) developed and submitted a water right application to provide a supplemental source of water for irrigation purposes within the district's service area. A temporary/preliminary water right for DID15 was issued by the Washington Department of Ecology (WDOE). Skagit County Consolidated Diking Improvement District No. 22 (CDD22) completed the county elections process to become a consolidated dike, drainage <u>and irrigation</u> improvement district. CDD22 obtained assignments of private water right applications to district, and prepared and submitted a consolidated district water right application to the WDOE to improve security of water availability for the district's service area. The water right application for CDD22 is still pending with WDOE. Pursued potential Interlocal Agreements (ILA) between the Skagit Public Utility District (PUD) and CDD22 and DID15 to insure uninterrupted water availability during summer irrigation season when low instream flows may prevent diversion of water from the Skagit River under the districts' new water right permits. A draft agreement was developed, but no further action has been taken by the districts and PUD to complete an ILA arrangement. Legal assistance was an essential element of the project support activities. Two law firms provided review and counsel, and assisted the districts in preparation of documents including a draft ILA, water right applications, and elections materials. Very important was a complete legal analysis (prepared earlier under the

CIDMP) that clarified the authority of drainage and irrigation districts to exclusively manage water in their service area and direct contract for irrigator water use.

- **Implementing District Water Management Programs** – Five key districts, with significant irrigation activity, were identified in the grant for implementing district-wide irrigation water management programs. Three of the five districts developed and formally implemented Water Management Programs. Each district has adopted a program operating manual to provide guidance and assistance to the districts in managing, conveying and contracting for the use of the waters developed by the drainage system for the benefit of the district and the landowners served by the district.

    - DID15, DID17 and CDD22 prepared and adopted management programs for their respective districts. They have been implementing these programs during the past irrigation seasons. This involves accepting and processing annual seasonal applications from irrigators, publishing public notice, approving the applications for district irrigation water use, and monitoring the use during the irrigation season. We also developed an e-mapping approach for tracking and recording the seasonal irrigation water use for the districts.
    - Outreach to DID19 and DID22 to develop and implement district-wide irrigation water management programs was not successful. A draft Water Management Manual was prepared for DID19. However, the DID19 district commissioners declined to approve the program. DID22 commissioners were not interested, at this time, in developing the program.

- **Development of Irrigation Water Projects** – DID15 and CDD22 both moved forward with development of projects and acquisition of permits for their water supply projects.

    - DID15 Skagit Irrigation Water Supply Project – The district intends to construct diversion from the Skagit River to provide a supplemental irrigation supply for agricultural purposes that will enhance seasonal groundwater water levels for subsurface irrigation benefits and provide for an additional water source for surface irrigation of crops throughout the district area. With this new system of pumps and pipes at least an additional 1,500 acres would be available for irrigated crop production. The irrigation supply project design and permit acquisition was accomplished as a part of the grant project. The project would have been in construction by now, however, difficulties in finalizing of the floating pump and screen design contributed to permit acquisition problems and a substantial delay in project progress.

    - CDD22 focused efforts on reorganizing the district to include irrigation improvement district authority to provide additional assurance that the necessary supply and mobility of water is available when and where it is needed by growers during the irrigation season. An “irrigation improvement district” is uniquely empowered to control and provide waters developed by the drainage system for irrigation purposes, and can make improvements to drainage infrastructure for the transfer of water to key areas for crop irrigation purposes. The district acquired assignment of private water right applications to the district, and then made a single consolidated application to the WDOE for a water right. The district also completed an engineering assessment of the current water diversion facilities.

Professional Engineering Assistance to Districts -
The Skagit County Conservation District (SCD) provided essential professional engineering assistance and design work to the districts for improving existing or installing new irrigation water infrastructure and conveyance improvements.

- DID15 Skagit River Irrigation Supply Project Design – The SCD spent over the three year period considerable time and effort to develop the project design. Challenges included moving the preferredproposed diversion to a different location due to private property access difficulties. Also, the intake fish screen design proved to be very difficult achieve due to rigorous NMFS/NOAA criteria for fish protection. Additional consultation was sought through the Washington Conservation Commission and Walla Walla Conservation District to help achieve the final fish screen design for the project. The final design incorporates an intake/diversion facility that will consist of twin floating "Riverscreen" self-cleaning fish screens with flexible 12" pipes connecting to portable electric pumps. (The "Riverscreen" fish screens are a new commercially available product that has been certified as meeting NMFS/NOAA fish protection criteria for screen size and velocity.) The two pumps will connect to individual 12" flexible pipes that will merge through a "Y" connection to a permanent 15"pipe through the river dike to connection with the existing open ditch system. The 15" PVC low pressure transmission pipe, is approximately 1700' long from the dike to connection and discharge of the irrigation water into the ditch system for conveyance to the irrigated farm fields.

- **CDD22 Irrigation System Design –** The SCD inventoried and evaluated the existing infrastructure system in CDD22. This is a unique system of multiple pumps located and operated on the river dikes owned by the district. One pump is permanently located on the South Fork Skagit River Fir Island dike. There are also three portable trailer mounted pumps, capable of being moved from location to location along the Fir Island dikes that are used seasonally to divert water to various ditch networks within Fir Island depending on where irrigated crops are planted seasonally. Prepared an 'as-built' set of engineering plans detailing the plans and specification sheets for the existing diversion pumps and conveyance lines serving the drainage/irrigation ditch system.

Technical and Design Assistance to Specialty Crop Irrigators -
The Washington State University – Extension (WSU-E) partnered on this project to provide the technical and design assistance in the development of water conservation measures and water use efficiency for landowner/agricultural irrigators.

- WSU-E provided technical assistance services during the course of three irrigation seasons to 12 farmers, evaluating more than 20 big gun systems. WSU provided recommendations to the farmers on how to modify or adjust their irrigation systems operations for improved water conservation and more irrigation application efficiency. A yearly detailed "Irrigation Evaluation Results" report of activities was prepared.

- WSU-E also developed, as a part of this effort, a "Big Gun" certificate that is awarded annually at the western Washington Potato Workshop to the Skagit farmer whose irrigation efficiency for the season scores the highest.

- The grant also provided support for an unexpected opportunity to participate in an international dialogue on research and irrigation efficiency focusing on potatoes. Potatoes are the largest specialty crop commodity in the Skagit Delta agricultural area. WSU-E was able to attend a tour in Peru to observe and learn about their techniques for irrigation and cultivation of specialty potato crops. The visit involved time at the international potato center in Lima, Peru. The purpose of the trip was to better connect with the scientists at the center who are responsible for studying the latest irrigation technologies and maintaining the gene bank of all the potato varieties in the world. They discussed the development of more efficient irrigation system designs as well as learned about research on new potato genetic material that will consume less water resources in our northern maritime climate.

Benefits to Commodities Other Than Specialty Crops -

Specialty crops define Skagit Delta agriculture. Over 80 different commercially significant crops, representing a farm gate value of about $260 million annually, are grown here. Principal crops including potatoes, broccoli, cauliflower, cucumbers, cabbage, carrots, kohlrabi, vegetable seed, and cut flowers and bulbs depend on irrigation for their successful growth and harvest. Eighty-six percent of irrigated crops in the Skagit Delta agricultural area are specialty crops. Growers of specialty crops in the Skagit Delta agricultural area were the primary beneficiaries of this project which helped improve the protection, management and certainty of delivery, of water for their irrigation needs. The project's substantial in-kind match (from other sources) served to provide a financial separation from the grant funding for the remaining fourteen percent of crops that likely also benefitted from the overall project.

GOALS AND OUTCOMES ACHIEVED

The Skagit Delta Agricultural Water Supply and Management Project facilitated and contributed to substantial progress towards long-term irrigation security and water availability for specialty crop growers in the Skagit River delta area.

- The first district water management programs are in place improving local access and delivery of irrigation water for crop production.
- New water rights are being acquired providing for additional capacity for irrigating more Skagit Delta specialty crops.
- Critical new agricultural irrigation infrastructure is being developed to increase mobility of irrigation water and conveyance to seasonal crop locations.

Outcome 1

Goal: Improved assurance of adequate irrigation supply for Skagit delta specialty crop producers. Target: Two districts will have acquired state-issued water rights for the 2011 irrigation season and five districts will have water management programs and user-contracting procedures implemented by September 30, 2012. Benchmark: No districts currently have official water rights or management programs. Performance Measure: District success in accomplishing these targets will be monitored and reported.

- DID15 has obtained an irrigation water right from the WDOE authorizing new additional seasonal irrigation water for use within the district's service area.
- CDD22 went through the elections process and formed as an irrigation improvement district. Also applied for a water right which is pending before the WDOE.
- DID15, DID17 and CDD22 developed, adopted and have implemented irrigation water use authorization programs.
- Completed preliminary discussions with the Skagit PUD and developed a draft Interlocal Agreement that would provide a contingency source of supplemental irrigation water supply for DID15 and CDD22 that would insure uninterrupted water availability when low instream flows may prevent diversion of water from the Skagit River under the districts' new water right permits.

Outcome 2

Goal: Improved predictability of irrigation supply and delivery to Skagit delta specialty crop producers. Target: At least three district water conveyance/delivery system projects will be designed and engineered by end of project. Benchmark: No conveyance/delivery system projects exist. Performance Measure: Enhanced system operation and capacity for irrigation water conveyance by districts to water user locations will be measured and reported.

- DID15 completed final design for a pump and pipeline facility to convey the water to the district system augmenting currently available district system water supply. All local and state permits have been secured for the project. Construction is pending funding.

- CDD22 evaluated their system operation and efficiency, and current facilities were determined to be adequate. The system was documented with engineer prepared "as-built" plans and specifications.

Outcome 3

Goal: Improved conservation and efficient use of irrigation water for Skagit delta specialty crop producers. Target: At least ten water conservation- use efficiency technical assistance consultations will be provided to landowners/agricultural irrigators resulting in an increase of their irrigation water use- efficiency and conservation. Benchmark: No consultation program exists; benchmark for each landowner/irrigator will be determined at consultation. Performance Measure: Number of consultations will be tracked; change in efficiency will be measured.

- Twelve growers, involving over 20 field irrigation systems, were provided water conservation and use efficiency evaluations. Direct technical assistance follow-up consultations were provided. Recommendations that were developed – and then implemented by the growers - resulted in significant on-the-ground improvements of irrigation water use efficiency and conservation. Additionally, a "Big Gun" irrigation efficiency certificate award program was developed.

BENEFICIARIES

The marque project initiative that has taken shape under this grant is the ***Skagit River Irrigation Water Supply Project*** for Skagit County Drainage and Irrigation Improvement District No. 15. This project will deliver a supplemental outside source of irrigation water supply to the central agricultural area of the Skagit Delta, and is a first of its kind for the Skagit Delta agricultural community. Primary specialty crops grown within the district's boundaries that will benefit from this enhanced irrigation supply are potatoes, flower bulbs, vegetable seed, various other vegetables, and berries. Approximately 1,500 additional acres of specialty crops, with an estimated added farm gate value of $1.2 million will be able to be grown annually with this additional irrigation capability.

The DID15 irrigation project design and operation is also very protective of the environment. First, the unique engineering design and of the irrigation water diversion from the Skagit River insures no harm to fish including listed Chinook salmon and Bull Trout species. Second, the in-water components and pumps are portable so that the intake floating fish screens and the pumps can be set up for the summer irrigation season and then removed and stored off-site during the off season when winter high river and flood flows are occurring. Third, the facility O&M plan provides for operational controls to assure that no water diversions occur that would impact low instream flows in the river. Also, the project has an important research component. As the first of its kind project to add a supplemental source of water to

the drainage/irrigation conveyance system the district will monitor and evaluate several aspects of the project on-the-ground performance and efficiency of delivery to the irrigation water users.

While this project has provided substantive benefits to many specialty crop growers and other farmers in the Skagit Delta agricultural area we recognize that we must remain vigilant and attentive to matters of agricultural water security and availability. For example, the legal landscape affecting our ability to acquire water rights recently changed once again, and unexpectedly. Only a few days after the expiration of this grant the Washington Supreme Court issued a decision that has a direct adverse effect on the future of agricultural irrigation supply within the Skagit River Basin. The Court invalidated the 2006 Skagit Instream Flow Rule Amendments adopted by the Department of Ecology which provided a reservation of future water supply from the Skagit River for agricultural purposes. The agricultural community lost a share of water that had been negotiated with the state and reserved for future irrigation need for Skagit Delta farmland owners. We will now have to rethink and revise our long-term strategies for securing new and adequate sources of irrigation water as needed for farmers on the Skagit Delta.

LESSONS LEARNED

We underachieved in a few areas of the grant project. This is also reflected in the under-expenditure of grant funds awarded for the work. Generally, the conclusion is that the work plan was more ambitious than what was actually practical to achieve.

Three districts developed and implemented water management programs. Two of the five districts we had expected to move forward with development of water management programs decided not to participate. We feel that we misread their readiness to proceed. This resulted in less technical assistance time and service demands from the WWAA.

We also originally focused on a GIS ArcView based approach for e-mapping and recording of seasonal irrigation water use in the districts, but discovered and ultimately used a much simpler and less expensive application using Google Earth as the platform.

One water right for a district was obtained from the WDOE. Another is still pending. Developing the water right applications was more complex than anticipated. And, the review and processing time we estimated for approval by WDOE was too optimistic.

We had anticipated three irrigation water projects, one for each year of the grant, requiring engineering assistance from the SCD. The Skagit CD completed two engineering assignments for irrigation projects under the grant. With the lack of participation from one of the key districts we could not proceed with any design or engineering work on a third water project.

While an important element of the support activities to the grant project, we overestimated the amount of legal services required to pursue water right applications, draft legal agreements, and assist with permitting questions and issues.

We did not, in the grant, recognize a need for contingencies or budget for services to prepare requested specialized environmental documents, provide surveying, and custom equipment design applications for the grant project initiatives. Fortunately, these unanticipated expenses for additional contractor services were able to absorbed into the grant budget.

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ADDITIONAL INFORMATION

See Report 12-25-B-1102 Attachment G for Additional Information

The following table provides a summary of the project expenditures including the total level of cash and in-kind matching donations utilized for the project.

COST CATEGORY	Grant Funds	Cash Match	In-Kind Match	Total Expenditures
WWAA Salaries & Benefits*	$99,426*		$14,580	$99,721
District Commissioners			$10,050	$10,050
SCD Salary & Benefits	$14,386	$1,373		$15,759
WSU Salary & Benefits	$32,161	$9,668		$41,829
Travel & Training	$6,530			$6,311
Supplies & Equipment	$13,868			$13,490
Legal Services	$11,732			$11,732
Other Contractual	$4,945			$4,945
Total Project Expenditures	**$183,048**	**$11,040**	**$24,630**	**$218,718**
Project Budget	**$228,800**	**$15,400**	**$30,150**	**$274,350**

* A portion of WWAA Salaries and Benefits originally budgeted as in-kind match was determined eligible as a direct expense under grant funding.

PROJECT #17

Project Title: A Stable Workforce for Specialty Crops in Washington

Partner Organization: Washington Farm Labor Association

PROJECT SUMMARY

The NASS estimates that greater than 50 per cent of seasonal farm workers in specialty crops are not authorized to work in the U.S. In the coming years labor shortages will intensify.

WAFLA used grant funds to identify the most important barriers – both employer and worker – that are preventing specialty crop producers from attracting a legal and stable workforce, and educate employers regarding strategies and programs to overcome these barriers that exist at present.

Motivation: WAFLA's motivation is the labor shortage. Every year specialty crop producer's number one worry is whether workers will come. The farmers have put much time and effort into the crop by harvest time.

Timeliness: Labor shortages in specialty crops occurred sporadically, up until 2005, when growers began experiencing shortages that were reflective of a dysfunctional workforce. In 2006, the state Employment Security Department began surveying for labor shortages. Although labor shortages subsided somewhat during the recession, they are back.

This project was not built on any previously funded specialty crop grants.

PROJECT APPROACH

The activities listed here are explained in more detail in Question 7, which asked, "describe the activities that were completed."

Brief Summary of Activities performed and Tasks achieved:

Activities: Learning, surveying, teaching, researching, writing, presenting.

WAFLA spoke with farmers and presented the various options to obtain legal workers and surveyed growers to see which options would be able to provide workers in the numbers required.

Based on the informal surveys, WAFLA next designed a suite of trainings, the purpose of which was to present employers with the options to create a legal and stable workforce.

WAFLA researched the history of this problem; which resulted in the writing and presentation of a research paper. The paper was sent to partners and researchers, and WAFLA has made plans to present it to the industry at industry conferences. WAFLA's research was shared with various government entities as well.

Our original grant proposal called for extensive participation by Washington State University. When this changed, WAFLA relied on other associations, principally the Washington Farm Bureau and Horticultural Association, to provide WAFLA access to their members.

WAFLA provided its research findings to the state labor, markets, and economic analysis division of the Employment Security Department. WAFLA provided input for ESD's annual agricultural workforce report.

WAFLA's research is being made available to graduate students at Washington State University who are doing further research.

Although every farmer benefits from a legal and stable workforce, the most benefit is derived from the employers who use the most labor, or more precisely, to employers where labor is the largest percentage of the total cost of production. As WAFLA's research indicates, specialty crop producers are the principal beneficiaries because the highest percentage of their total cost of production is from labor.

Amendment No. 1 of grant agreement number K512 included conducting research, writing and distribution of a research report as part of the project activities. Grant funds were used to conduct research and to write the research report but expenses for distribution were not charged to the grant. Washington Farm Labor Association believed and still believes the distribution of the report to inform Federal and State elected officials of our research findings is a component of the grant.

Washington Farm Labor Association has not yet delivered the grant research paper to any State or Federally elected official or any State or Federal office and, if the USDA believes doing so would constitute lobbying, Washington Farm Labor Association will not distribute it to any such official or office.

GOALS AND OUTCOMES ACHIEVED

WAFLA had two goals:

1. Identify the most important barriers-both employer and worker-that are preventing specialty crop producers from attracting a legal and stable workforce.
2. To educate growers about how they can achieve a stable workforce under current laws and regulations.

WAFLA performed the following activities:

Survey: WAFLA surveyed employers to determine their needs. In a conference at the annual Horticultural show in December 2011, WAFLA presented four different ways to source workers – H-2A, farm labor contractors, ESD WorkSource, and prison labor. Participants overwhelmingly reported that only H-2A and farm labor contractors could provide workers in the quantities that are necessary for the specialty crop industry.

Growers told WAFLA that farm labor contractors do not work well in a mono crop environment, i.e., one in which everyone needs workers at the same time.

Educate: WAFLA conducted 18 educational activities related to a legal and stable workforce. Early on, there was tremendous pressure from employers to provide training in completing the I-9.

Present: Five meetings were conducted during the course of the grant term, and WAFLA is scheduled to present at several grower meetings this winter, including Blueberries, Hort, Cherry Institute, and several others.

Research: All available studies and reports were researched to understand the reason behind the agricultural labor problem and possible solutions. WAFLA's report is greater than 30 pages and full of information to help growers and other researchers proceed.

Measurable Outcomes:

WAFLA concluded that Washington farmers are willing to do business using the guest worker program. This is demonstrated by the astronomical growth of the H-2A program in Washington from 2006 through present as reported in the research paper. WAFLA's conclusion is consistent with USDA and Farm Bureau in citing large costs. All researchers agree that the most prudent course for the federal government to prevent future illegal immigration is to make it easier for employers to use the legal option.

Another grant goal was to help growers, by providing 13 training modules, to understand what it takes to attract the same workers each year. WAFLA exceeded its measurable outcome by providing 23 trainings with this grant.

The next goal was to increase the total number of employers who attend these grant training modules to 400-500 which would be at least a 210% increase in the number of employers trained compared to the 2009 Farm Bureau sessions, which had a total attendance of 190. WAFLA exceeded this goal with a measurable outcome of 703 total attendees at the grant funded trainings.

The training was broadly divided into two categories:

- Category One: Grower complies with legal workforce regulations. The vehicle to comply with these laws is either the DHS Form I-9, or the E-Verify program. WAFLA spent considerable resources educating growers in these programs.
- Category Two: Strategies to increase the legal workforce. WAFLA identified four strategies (H-2A program, hire a labor contractor, work with ESD to provide refugee workers, and use of prison labor). Of these, only the H-2A program or labor contractors could reasonably provide workers in sufficient quantity (and quality) to make an impact.

Below is a list of the training conducted and the numbers of attendees:

Events	**Training**	**Presentations**	**Research**	**Date**	**# of Attendees**
Workforce Summit-Plan for 2012 Workforce (2 events)	2			8/16/2011 8/17/2011	59
Governor Chris Gregoire's workforce meeting		1		10/19/2011	
Washington Farm Bureau Annual Meeting		1		11/12/11 - 11/15/11	
Washington State Horticultural Associations' Annual Meeting		1		12/5/11 - 12/7/11	39
Workforce Summit 2012	1			12/7/2011	225
Solving the Labor Shortgage with H-2A (2 part webinar series)	2			2/1/2012 & 2/8/12	17
Meeting with Masaru Yamada			1	2/4/2012	
Meeting with Tamar Jacoby			1	2/28/2012	
PNW Christmas Tree Growers		1		1/24/2012	60
Okanogan HORT Show (Ask Dan if this was for WSDA grant)		1		1/31/2012	90
Guestworker Visa: Legal Avenue for Undocumented Worker?	1			3/20/2012	48
Yakima, Harassment Training English	1			4/11/2012	36

Yakima, Harassment Training Spanish	1			4/11/2012	12
Pasco, Harassment Training, English	1			4/18/2012	32
Moses Lake, Harassment Training, English	1			4/25/2012	8
Moses Lake, Harassment Training, Spanish					2
Wenatchee, Harassment Training, English	1			5/2/2012	20
Wenatchee, Harassment Training, Spanish	1			5/2/2012	17
Mt. Vernon, Harassment Training, English	1			5/9/2012	22
Mt. Vernon, Harassment Training, Spanish	1			5/9/2012	12
Olympia, Harassment Training, English	1			5/23/2012	4
Workforce Summit 2013	1			2/20/2013	80
TOTALS	**18**	**5**	**2**		**703**

Long Term Measurable Outcomes:
The long term goal is to educate policy leaders of the benefits of a legal and stable workforce. This includes elected officials, as well as opponents of legal immigration.

WAFLA's research paper will be part of the long term education of elected officials. WAFLA contacted each of the Washington Congressional caucuses to discuss this issue in August 2013, and is in the process of making appointments to present the research to them now.

Comparison of Projected goals with actual accomplishments;
The goal of making growers aware of the law and educating them to the options available to achieve a legal and stable workforce was met.

WAFLA's first target was to increase the number of employers who attend such trainings to 400-500 growers at 13 regional meetings, which would be a 210% increase in the number of employers trained as compared to the 2009 Farm Bureau sessions (approximately, 160 in attendance). Once all the trainings were provided WAFLA had provided 18 trainings and 5 meeting presentations. Once the attendance of these events was added up, WAFLA achieved a total attendance of 703 employers.

WAFLA's second target was to improve the quality of the training. This was measured by having the survey ask, "If you attended the 2009 Farm Bureau H-2A training sessions, do you think the quality of today's training was an improvement?". 83 % of respondents answered "Yes", while 17% responded "No improvement detected."

In section 4 "Expected Measurable Outcomes" of our grant, the goal was to "Educate growers about how they can achieve a stable workforce under current laws and regulations." Attachment E, under the Project Purpose/Objective subheading there is a list of training modules Washington Farm Labor Association would be using for this grant. The last on the list is "Training and Motivating Supervisors." The Harassment Training is the training for this module

Sexual harassment in agricultural labor is an issue that has been reported throughout the United States for a number of years. Charges are rarely filed by agricultural worker victims due to language barriers, fear of repercussion, and/or a lack of knowledge of U.S. anti-discrimination laws, to name a few reasons. Workers will quit their job or finish working through the season but will not return to that employer the following year making it difficult for specialty crop growers to maintain a stable workforce so the harassment trainings definitely fall within the scope of this project.

The harassment training Washington Farm Labor Association provided was designed for upper management and for field supervisors. The upper management training focused on delegating authority vs. responsibility, developing systems to keep senior management aware of any harassment happening regardless of receiving a complaint, cultural differences, and what can be done to prevent retaliation from field supervisors. It also focused on prevention, proper investigative and reporting procedures, and appropriate discipline. Other anti- harassment laws were also covered but sexual harassment was a major topic.

The field supervisor training focused on defining what a field supervisor's role is as a leader and what their responsibility to their employer is. It also focused on defining what constitutes sexual harassment and explaining the anti-sexual harassment laws. It covered cultural differences, retaliation and how to report incidences they know of or hear of. Other anti- harassment laws were also covered but sexual harassment was a major topic.

BENEFICIARIES

There are two groups of beneficiaries:

Growers. Specialty crop growers are the primary beneficiaries. This group is now aware of the steps that must be taken to comply with the law, and the options available to obtain a legal and stable workforce.

Policy Makers. Policy makers and other leaders are the secondary beneficiaries. This group requires further education to enable it to support less restrictive guest worker programs that benefit employers, domestic workers, and foreign workers.

The quantitative data comes from WAFLA's survey. The data that concerns the beneficiaries is:

- Typical percentage of migrant/seasonal workers who are not documented in a given year.
- Direct cost to use a guest worker program.
- Other indirect cost (i.e. regulatory compliance cost) to use a guest worker program.

LESSONS LEARNED

Growers demonstrated a desire to solve the problem.

Our surveys, training, and research are very convincing that the problem will be solved.

There were no unexpected outcomes, other than those that have already been identified.

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ADDITIONAL INFORMATION

All in-kind matching donations came from WAFLA. Almost all were utilized for salaries and benefits with a small portion donated for giveaways and other supplies.

WSDA Grant No. K512	In-Kind Match
Salaries	
Directory Provided Training IN-KIND MATCH	4798.31
Benefits (Payroll Deductions, 15% of Salary)	
Director Payroll Deduction IN-KIND MATCH	1004.79
Supplies	
WAFLA IN-KIND MATCH (Giveaways, other supplies)	138.13
Contractual	
WAFLA Marketing Coordinator IN-KIND MATCH	2740.73
IN-KIND MATCH	**8681.96**

The grant provided WAFLA the resources to complete a 35 page research paper. The Bibliography to the paper lists publications and websites.

WAFLA was asked by growers to scale this down to a more presentable format. So WAFLA created a 16 page "Washington H-2A Annual Report" and a four page "Worker Testimonial Profiles" which were produced without grant funds. These are submitted as separate attachments.

PROJECT #18

Project Title: *USA Pears Road Show*

Partner Organization: Pear Bureau Northwest

PROJECT SUMMARY

This activity was conducted as a joint project for the Oregon and Washington State Departments of Agriculture and to address WSDA's Specialty Crop Block Grant Program priority of enhancing international trade. The purpose of this project was to augment market development and access, as well as provide consumer education regarding the multiple varieties of USA Pears available, origin, ripening, nutritional benefits, and usage in recipes. Getting consumers more familiar with other pear varieties, such as Red Anjou, Starkrimson, Bosc, and Concorde is one of the top goals the Pear Bureau has for the Mexican market. This activity provided the opportunity for much deeper contact with consumers than a typical in-store promotion, and overall this activity helped create the necessary excitement or theater that is lacking in the marketing programs for most fresh produce items to sufficiently engage consumers. Furthermore, this activity enhanced the current promotional program of in-store promotions, PR, consumer advertising, and consumer communication activities that the Pear Bureau conducts each season in Mexico. The Pear Road Show helped the Pear Bureau make a deeper impact with its core consumers and created greater consumer attachment to the USA Pear brand.

Since March 2009, exports to Mexico were impacted by the 20% retaliatory tariff placed on pears due to the U.S.'s cancelation of the Mexican Pilot Trucking Program. This retaliatory tariff has resulted in an estimated loss of $30 million since its inception (since the completion of the USA Pear Road Show promotions, the trucking program dispute was resolved, and the tariff on pears was removed at the end of October 2011). The Road Show was intended to help motivate consumers to buy NW pears and the retailers and importers to stock larger volumes of NW Pears, in spite of the higher cost due to the tariff which resulted in higher retail costs for consumers.

This is also a key time for the Pear Bureau to deliver a message that resonates with Mexican consumers. Mexico ranks first in terms of obesity levels for children. There are 32 million adults and 10 million children and teenagers that are overweight and obese, with 5 million adults expected to become diabetic within the next 5 years. The Pear Bureau's consumer activities, including the Road Show, emphasize the importance of a nutritious diet, exercise, and a healthy lifestyle. All of these issues are becoming increasingly important to Mexican consumers, demonstrating the growth opportunities for USA Pears in this market.

The USA Pear Road Show built upon the success of a similar promotion, the U.S. Fresh Fruit Road Show, which was conducted in Mexico from 2006-2009 as a joint activity funded under the USDA's MAP-GBI program and the Healthy Fruits for Healthy Families promotion, another joint activity funded under a 2009 WSDA SCBGP grant. The concept proved to still have a strong resonance among consumers as well as retailers.

PROJECT APROACH

The Pear Bureau conducted a total of 80 promotional days in five major cities throughout Mexico: Mexico City, Guadalajara, Monterrey, Cuernavaca, and Queretaro. The retailers that participated are among the leading retail chains in Mexico: Soriana, Comercial Mexicana, Mega, Wal-Mart, Bodega Aurrera, Merkabastos, Chedraui and Smart.

The activities conducted during Road Show promotional days included sampling, recipe demonstrations, consultations with nutritionists, games for kids, opportunities to win USA Pear incentive items,

distribution of informational materials, and appearances by a USA Pear character mascot. All of these activities educated consumers about USA Pear varieties, ripening, and provide usage ideas. From February to May 2011, the Pear Bureau covered 58 stores, 13 events, 4 schools, 4 sport clubs, and 1 museum, reaching 44,835 contacts.

By interacting with consumers before entering the store, the Pear Bureau was able to positively influence their decisions to buy more USA Pears and purchase new varieties. The Pear Road Show also served as an incentive for retailers to increase the volumes and varietal range, improve the location of the pear display, and put USA Pears on ad during the promotional period.

Road Show promotions also took place in conjunction with 2 concerts by a pop music band, Savvy, that the Pear Bureau sponsored – these events provided the opportunity to interact with the teenage demographic that is typically difficult to connect with. No grant funds were used for entertainment costs. All costs associated with the concerts were covered by the Pear Bureau.

GOALS AND OUTCOMES ACHIEVED

The Pear Bureau's goals in the Mexican market are to increase volume, varietal mix, and maximize returns to the growers. The USA Pear Road Show augmented the Pear Bureau's core promotional activities and delivered positive results, with performance measure results surpassing all goals set prior to beginning the activity.

Expected Measurable Outcomes

A. Northwest Pear sales during the promotional period
   a. Target: Benchmark + 10%
   b. Result: Benchmark + 60% (Road Show results)
B. Variety exports to Mexico during promotional period
   a. Target: Benchmark + 15%
   b. Result: Benchmark + 3.71% (Road Show Final Report)
C. Increase in sales with each retailer during promotional period
   a. Target: Benchmark + 50%
   b. Result: Benchmark +110% in average (Road Show results)
D. Average price per box to Mexico
   a. Target: $17.25
   b. Result: $18.51 (Global Trade Atlas, Feb – May 2011)
E. % of those consumers who reported that information will influence their purchase behavior positively to buy more pears
   a. Target: 32%
   b. Result: 83% (Road Show results)
F. % of consumers who eat at least 3 servings of fresh fruit and vegetables a day
   a. Target: 37%
   b. Result: 42% (Road Show results)
G. % of consumers who became more educated about Northwest pears
   a. Target: 38%
   b. Result: 86% (Road Show results)
H. % of consumers who consider health and nutrition important purchase decision motivators
   a. Target: 40%
   b. Result: 100% (Study of Habits and Usage of USA Pears, August 2011)

BENEFICIARIES
The over 1,500 pear growers in Oregon and Washington benefited from the USA Pear Road Show promotion, as demonstrated by the average price per box of $18.51 during February – May, which was well above the set goal.

	Value (USD)	Volume (MT)
February 2011	4,865,993	5,566
March 2011	5,868,534	6,222
April 2011	3,690,566	3,828
May 2011	3,764,174	4,033
TOTAL	**18,189,267**	**19,649**

Source: Global Trade Atlas

The promotion's positive results strengthened relationships with both retailers and consumers as a result of the promotions, which will contribute to future growth opportunities for USA Pears in the Mexican market.

LESSONS LEARNED
Overall, the USA Pear Road Show was a very successful promotion and delivered positive results for growers, as well as retailers and consumers. Mexico is the USA Pear industry's number one export market, and the Road Show was a unique and exciting way to connect with consumers, providing them with complete information regarding the characteristics, benefits, nutritional values and usage of Northwest pears. The end result is a more informed and motivated consumer that includes pears as part of a daily diet.

In planning and executing any promotion, especially internationally, it is important to keep in mind external factors that are outside of the control of the project. Therefore, the planning must allow for a degree of flexibility in order to adjust to the market conditions. In this project, the fluctuating exchange rate played a role, contributing to a decrease in the number of promotion days that was originally planned in order to stay under budget. The Mexican Peso – U.S. Dollar exchange rate decreased from 12.5-13 pesos/USD at the time the proposal was submitted until the end of 2010 to around 11.5 in April (an 11.5% depreciation of the US Dollar against the Mexican Peso).

Only one out of eight Expected Measurable Outcome targets was *not* achieved: the goal of increasing variety exports during the promotional period did not meet the target of 15% over 2009 exports. There are a variety of reasons that this target was not met: 1) the import tariff of 20% was in effect until June 8, when it decreased to 10%; 2) a lower crop compared to the previous year resulted in higher prices. In 2011, the average price per box was $28.21, which was over 5% higher than 2010 price of $26.77 per box; 3) increased competition with Argentinean varieties, which increased 210% from 34,089 boxes in 2010 to 105,796 boxes in 2011.

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ADDITIONAL INFORMATION
See **Report 12-25-B-1102 Attachment B** for the following:
1. Road Show Sales Data

2. Road Show Final Report
3. Study of Habits and Image for USA Pears

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PROJECT #19

Project Title: Puget Sound Food Network

Partner Organization: Northwest Agriculture Business Center (NABC)

PROJECT SUMMARY

There are a number of barriers that prevent farms from accessing new market opportunities presented by the growing number of consumers desiring to source local farm products. The barriers include lack of knowledge about how to access market opportunities, lack of effective and efficient communication between buyers and sellers, and the absence of processing, packaging and storage facilities. Based on market research, consumers now perceive locally produced and distributed food as "clean" and of high quality. Farmers have a distinct advantage in today's marketplace and PSFN is designed to help farmers meet demand for their products. NABC is collaborating with other agriculture organizations through projects like the Puget Sound Food Network (PSFN), to bring farm to market like never before.

Efforts to aid specialty crop producers with marketing efforts locally are extremely timely- in fact consumer marketing research has shown that Eat Local trends are more relevant to today's shoppers than ever. What lacks is the professional and technical assistance and infrastructure to support all scales of farming into commercial and institutional markets. In order for Washington's specialty crop producers to be profitable they need help connecting with the RIGHT buyers for diversified sales. NABC knows from experience that commercial and institutional buyers are now responding to consumer demand, they just needed help finding producers and products they could work with. PSFN provided that connection between buyers and sellers acting as "the glue" to help bind those relationships and work through perceived obstacles.

PROJECT APROACH

The SCBGP funding that NABC received has made it possible to further develop the PSFN project and has exceeded goals not only to create a network of people, businesses, products and facilities, and provide a route to market for local agricultural products, but it has also helped open up new and emerging market channels for small and mid-size producers that were not on the radar at the time the grant application was submitted. PSFN has expanded its efforts in big ways through contracts with the City of Seattle/King County CPPW Farm to Table and the Summer Feeding Program's Produce Bag Program, Seattle and Skagit Wholesale Markets, and delivered on participation incentives to their steadily growing network of dues paying members, continued improving client services and regular promotion of available products and producers through PSFN's weekly fresh sheet, known as Live Market.

NABC has strengthened regional partnerships with Cascade Harvest Coalition, Ag Resources of San Juan Island, Whidbey Island Grown and Sustainable Connections by co-sponsoring trade events, chef tours, and sharing announcements through their social networking outlets. Unfortunately, there were no opportunities to work with Clallam Grown or Kitsap Co Ag Alliance.

PSFN launched and marketed an aggressive membership campaign - PSFN staff attended 13 conferences and trade shows and attended 71 planning and partnership meetings (from barns to boardrooms).Through PSFN Account Management, PSFN has helped producers facilitate new and repeat sales within the Puget Sound region. PSFN hosted five member county specific spring training sessions, including Skagit, King, Whatcom, Island and Snohomish. These meetings proved very important for staff to understand the goals, needs and expectations of our members before the height of the season.

NABC actively sought advertising/sponsors for the PSFN. Currently there are two main sponsors: Meritage and Cedar Grove Composting. NABC hopes to continue growing their list of corporate sponsors.
In addition to the work plan activities**,** PSFN held four seasonal wholesale markets, two in Seattle and two in Mt. Vernon. Reported sales exceeded $40,000 over two years – this is margin-free income going directly into the hands of small farmers for wholesale volume sales to commercial and institutional food services. The markets proved helpful for producers and buyers to meet in one place and aggregate large orders- saving time and money while maintaining direct relationships. This wholesale market concept has since caught on in other parts of Washington and Oregon. NABC will be evolving this market concept, assuming there is adequate funding for PSFN in 2012 and beyond.

PSFN was delighted to collaborate again with the City of Seattle/King County on the Kids and Teens Eat Free Summer Food Service Program, privately funded by a $225,000 Wal-Mart Foundation grant. NABC received $28,000 to administer the program and identify a farm partner. During the months of July and August 2011, the City provided free meals and snacks to children and youth aged 1 to 18 years. Food was aggregated at Seattle Public Schools Central Kitchen and distributed to 90 approved King County sites where at least half of the children and teens were eligible for free or reduced-price school lunches. In addition to meals and snacks, young recipients were given free access to locally grown fresh produce to take home to their families each week. PSFN's role was to coordinate the supplemental produce bag program- locally produced fresh fruits and vegetables- to be distributed to meal sites. PSFN interviewed over 7 farm candidates, chose 1 based on criteria provided by the City, and then coordinated deliveries with that farm to grow, wash, and deliver 8,000 bags of produce (1,000 per week) to Seattle Public Schools Central Kitchen over eight weeks in July and August. PSFN member, Maltby Produce of Snohomish County, was selected to execute the PSFN Produce Bag Program in this groundbreaking year. The bags featured a sampling of colorful and delicious produce such as beets, radishes, carrots, beans (and bean seeds!), cherry tomatoes and apples - all grown on their 200-acre farm in Maltby, Washington. PSFN, through NABC, was responsible for all communications, reporting, and payments. Maltby Produce earned $18,000 over a 2-month period. The City of Seattle has expressed an interest in continuing this program in future years if funding is available, and that's hopeful news for area producers.

PSFN was also chosen to provide market facilitation services as part of a Center for Disease Control-funded Farm to Table project led by Seattle Human Services Dept of Aging and Disability that saw an increased level of activity in 2011 due to seasonal availability of fresh fruits and vegetables. PSFN is working with farmers and daycare and senior meal site partners to compile local produce weekly fresh sheets, and help one of our farms create a customized "Kid-Care" CSA Box. The Union Gospel Mission was given a farm contact list so they could solicit for pick up at farms. Many repeat orders occurred during August, and orders of many new summer products available locally. Since last fall, the number of daycare and senior care meal sites ordering produce directly from local farms has grown from 8 sites to 40. It has been a tremendously popular program that PSFN hopes to continue with additional funding.

PSFN has increased its social networking presence through weekly Live Market fresh sheets sent weekly every Monday since January 2010 to every member of PSFN. PSFN also maintains a regular blog and presence on its Facebook page and announcements on Twitter.

NABC has successfully completed the project work plan. For producers, the long winter did make it more difficult to produce wholesale volumes in June, but they rebounded and definitely rose to the occasion despite the weather. PSFN's project partners, such as Cascade Harvest Coalition, Ag Resources of San Juan Island, Whidbey Island Grown, and Sustainable Connection, have been instrumental in supporting implementation efforts, especially by providing consumer resources like publications and

education, and convening meetings and outreach events. PSFN has in turn supported and promoted these partners' events, outreach, and publications.

Since inception, NABC has built a process by which they validate new members and allocate their account managers based on what they produce as well as their farm location. The project manager validated all new memberships and allocated non-specialty crop producers to NABC staff members as points of contact (these supportive staff were not paid by SCBG funds). PSFN staff, who were fully or partially funded by SCBGP, managed specialty crop farmer membership accounts and market facilitation services first -hand. This ensured that the funding received through SCBG went only to support specialty crop producers. NABC maintains a membership record of all of its members and sorts them by producer type, buyer or logistical provider. Account Management for their members is the key to building rapport and effectively supporting specialty crop producers with their ongoing marketing support.

GOALS AND OUTCOMES ACHIEVED

The Expected Measurable Outcome for this project had two targets:

1) By the end of 2011, specialty crop users will report a 25% increase in their sales as a result of using PSFN. A 25% increase in sales was reached by all specialty crop users, and in many instances exceeded.
2) By the end of 2011, PSFN will have a total of 20 buyers and 80 sellers registered as users. PSFN now has 221 current members total, including: 66 Buyers, 69 Producers/Sellers, 5 Buyers/Infrastructure (primarily wholesale distributors or other aggregators), 1 Infrastructure (delivery services), 47 Individual consumers (non-business supporters), 33 Community Partners (non-profit agencies who do not purchase food). While the target of 80 sellers was not reached, the number of sellers did increase by 54% during the project period, from 45 to 69. The target for the number of buyers was clearly exceeded, with an increase of almost 350%, from 15 to 66.

NABC conducted end of year surveys in December, 2010 and again in November, 2011 targeting membership. The results measured Expected Measurable Outcomes and will also help NABC with its strategic planning in 2012 and beyond. PSFN uses online analytics to help improve business practices to stay relevant but also provide the best resources for members and community partners. NABC has worked with its members to coordinate many sales transactions and logistics, and have created a structure and a system by which to accomplish this on a weekly basis.

There are still many obstacles preventing small and mid-sized producers to diversify their customer base beyond niche markets like farmers markets and high-end restaurants. NABC has only just begun their groundbreaking work and will need to persevere on behalf of specialty crop producers so that they can be more profitable and preserve farming heritage for years to come.

BENEFICIARIES

Beneficiaries included specialty crop producers in Western Washington who were ready and willing to expand their sales into local, commercial and institutional markets specifically. Based on the differences between the year-end surveys from 2010 and 2011, PSFN was most effective in 2011. Out of 7 types of PSFN marketing assistance offered to members in 2011, members ranked the following as most helpful or significant to growing their farm sales in 2011 (ranked in order with 1 being the highest).

1) Made at least 1 new business connection and increased sales as a result of general outreach conducted by PSFN/NABC staff or social networks.
2) Participated as a buyer or seller at either *Seattle or Skagit Wholesale Market*

3) Considered or participated in PSFN's Seattle-based institutional projects *Farm to Table* (serving underserved senior citizens and preschool aged children) or *Summer Feeding Program.*
4) Listed products in *Live Market* fresh sheet or made purchase from fresh sheet lead
5) Met with my Account Manager and discussed sales goals/followed up with him/her at least once throughout the year, made some progress
6) Purchased or sold a product as a result of PSFN online marketing tool.
7) Considered or participated in Real Food Challenge (work with student led-groups working to improve food procurement on college campuses)

Other statistics:

- 10% of PSFN member producers reported $3,000 and $18,000 additional revenue generated as a result of PSFN's direct marketing and sales assistance
- 50% of members made at least one new business connection
- 5% of members were able to hire or maintain at least 1-3 employees
- No one reported losing business because of PSFN
- 50% of members are interested in using an online tool for business transactions and sales.
- 10% of those uninterested in using an online marketing tool for local food transactions are satisfied with Facebook as their primary online marketing tool.

LESSONS LEARNED

The project began with a strong emphasis on technology solutions, but NABC learned within the first three months of the project, that facilitating relationships first was key to increasing sales between buyers and sellers. While they believe that technology has a place in the redesigning of a more fair and equitable food system for smaller scale producers to be profitable, technology should be designed to compliment business relationships- not replace them. PSFN will continue building on the personal relationships and search for technologies that compliment the efforts they have already started.

The public health partnership opportunities with hospitals, schools and smaller institutions such as daycare centers, and congregate and home delivered meal sites were unexpected but very much welcomed. Farmers were able to service some of the smaller institutions - like daycare centers and senior centers - if they weren't quite ready to work with school districts. These projects not only opened up new sales opportunities for farmers, but fed people in underserved communities who otherwise did not have access to fresh food- much less locally produced fruits and vegetables. These projects pulled multiple levers that made farmers very proud to be a part of.

CONTACT PERSON

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ADDITIONAL INFORMATION

$132,794 was received in matching funds.
PSFN Blog: http://psfn.org/blog/ (many photos available)
PSFN 2011 Membership Survey:
https://docs.google.com/a/psfn.org/spreadsheet/viewform?formkey=dHhyTjhEOWRldEk2czNWWVJVZnpnbFE6MQ
PSFN Newsletter Archive: http://www.psfn.org/newsletter-archive/
PSFN Press: http://www.psfn.org/press/
PSFN Events: http://www.psfn.org/events/
PSFN Facebook page: http://www.facebook.com/pugetsoundfoodnetwork (many photos archived)
PSFN Twitter feed: http://twitter.com/psfn

PROJECT #20

Project Title: Focus on Farming - Agriculture Conference

Partner Organization: Focus on Farming Fund (Formerly 21 Acres)

PROJECT SUMMARY

The Annual Focus on Farming Conference, known for its timely and content-rich workshops, is where new and experienced farmers from Washington State and sometimes beyond go to find pertinent information for their farms' success. The objective of the conference is to supply producers with the most up-to-date information and skills for their farms to be economically viable; it also keeps support agencies aware of what issues are affecting producers. The issues that the six conference tracks address ranged from water rights to integrated pest management to marketing grass fed beef and tools for food safety on the farm. In 2010, 2011 and 2012 specialty crop production was the focus of at least three of the conference tracks (twelve workshops). This was accomplished by hiring the best speakers available both from our local agricultural community as well as from across the nation.

Focus on Farming has evolved over the years, it started as a local small group of farmers advising the county as to how they could assist the farm community in becoming a more economically viable industry. As the business model of agriculture has evolved the need for education became more apparent. What attendees were wanting was not currently available to them. As large farms transition to specialty crops they found themselves in new territory and seeking information. The opportunity to comingle conventional farmer with organic farmers, large farmers with small farmers, beginning farmers with centennial farm families provided an invaluable exchange of information and networking.

Topics within the specialty crop category are the most requested by attendees. Specialty crops cover the vast majority of what is grown in the region.

This project was not built on a previously funded SCBGP project.

PROJECT APPROACH

The grant covered the specialty crop portion of the 2010, 2011 and 2012 conference expenses. In 2010 there were 19 speakers that spoke to either about direct production of specialty crops or the business of farming. In 2011 there were 20 speakers and in 2012 there were 21 for specialty crops and business. Speakers were sought out locally as well as across the country to provide the agricultural community with the timeliest information available. Conference attendees were surveyed at the conference as well as after the conference. They were asked if they changed practices, added practices to their farming operations as well as what classes they would like to see the following year. All deliverables of the grant were met. In addition to speaker fees, portions of the venue, advertising, printing and graphic design were funded with the SCBG.

The facilitator remained Linda Neunzig throughout the grant cycle. Snohomish County and the Snohomish County Executive's office hosted all of the meetings, coordinated all of the graphics, keynote address', location, meals and keynote address'. The Snohomish Conservation District Coordinated track speakers and provided staff at the registration desk. WSU Snohomish County Extension Coordinated numerous tracks, Washington State Nursery and Landscape Association was the fiscal sponsor providing bookkeeping services as well as coordination the nursery track each year. Various farmers also volunteered time for the monthly planning meetings and helped coordinate the tracks.

The below figures are conference sponsorship and registration income figures as well as the overall conference expenses, not included are tradeshow/vendor space income or expenses covered by Snohomish County. Income including grant funds are all applied to the conference expenses including rental of the venue, speakers, advertising, food costs and conference bags.

Sponsorships – 2010 - $21,500, 2011 – $13,500, 2012 – $15,000 Total sponsorship – $50,000
Registration – 2010 - $12,770, 2011 – $14,175, 2012 – $14,790 Total registration – $41,735
In-Kind match from Snohomish County for salaries, benefits, travel Total $63,702

Conference expenses for 2010 - $62,819.90
Conference expenses for 2011 - $58,838.85
Conference expenses for 2012 - $58,714.76

Focus on Farming has a website, facebook page and twitter account at the following links that provide up to date information on upcoming conference events.

www.focusonfarming.org

https://www.facebook.com/focusonfarming

The program income from the specialty crop block grant track was then put back into the track because it was not all covered by grant funds as expenses exceeded grant funding.

GOALS AND OUTCOMES ACHIEVED

The planning committee met monthly to develop the workshops and find expert speakers using the information gathered in the previous year's survey's to best meet the needs of specialty crop producers attending the conference. The venue was secured each year well in advance of the event, 3,370 save the date cards were mailed to residents each year, advertisements were created and placed in the Capital Press and Grow Northwest publications, design and printing of the program, sponsorships acquired, vendors acquired, local meal sourced, industry literature requested for attendees, facebook, twitter and websites kept up to date with the current activities related to Focus on Farming. An end of conference survey was placed in each folder, attendees were asked to fill out a short survey after each workshop session as well as an online survey 5 months later to gauge changes made as a result of the conference. The WSU survey asked attendees the following question with answers below:

Which of the following changes have you made on your operation since attending a Focus on Farming Conference?

Began farming or ranching	5.1%
Obtained a farm or ranch loan	1.4%
Added a new product	15.3%
Added a new marketing method	20.4%
Increased production	22.7%
Increased acreage	11.6%
Diversified the farm or ranch	15.3%
Changed production methods	10.6%
Hired additional workers	8.8%

The following table is a comparison of the activities and goals established for the project with the actual accomplishments.

WORKPLAN **Task/Activity**	**Responsible Party**	**Timeline**
Focus on Farming conference	Linda Neunzig	November 2010, 2011, 2012 - Completed
Follow up survey	Committee members	November 2010, 2011, 2012 - Completed
Obtain registration numbers for grant reporting	Curt Moulton	November 2010, 2011, 2012 - Completed
Compile survey results from individual sessions	Linda Neunzig	November 2010, 2011, 2012- Completed
Send out Survey Monkey link via e-mail	Curt Moulton	November 2010, 2011, 2012 - Completed
Compile and evaluate survey results, compare against the previous year's data	Linda Neunzig Curt Moulton	December 2010, 2011, 2012 - Completed
Conference committee planning meetings: select a theme for the year, select keynote speakers	Committee members	2nd Friday of every month all year long, biweekly the month of October 2010, 2011, 2012 – Completed
Seek sponsorships	Ryan Carpenter	Ongoing - Completed
Budget – create and maintain	Linda Neunzig	Ongoing - Completed
Advertising, printed materials, program	Linda Neunzig	Ongoing- Completed

The expected measurable outcomes for this project were:

Goal – Increase the number of producers attending workshops on specialty crop production – specialty crop classes were extremely well attended to the point that some had standing room only and were overflowing into the halls. A large variety of specialty crop classes were provided each year which provided enough opportunities for everyone attend numerous classes each day. Surveys were taken after each class.

Benchmark – 2009 total attendance was 530. Estimate that approximately 75% (or 400) of these attendees were specialty crop producers – Attendance for each conference has increased since the grant started. 2012 attendance was over 600. Due to the high number of specialty crop classes offered as well as keynote address' that included specialty crops the attendance estimated to be closer to 90 – 95%.

Target - Increase attendance of producers attending workshops on specialty crop production by 50 each year – the was attained by increasing the number of specialty crop workshop classes available as well as keynote address' that pertained to specialty crops.

Performance Measure – A survey will be filled out at the end of each workshop session as well as an online survey after the conference. Attendee numbers will be tracked through registration. Five months after the conference attendees will be surveyed to see what changes if any were implemented in their farming operations. – a copy of each of the survey results for each year is attached. In addition to the grant specified survey we did an extensive e-mail/phone survey of all attendees of the past five Focus on Farming conferences to gather information on long term changes to farming operations as well as what type and scale of farming the attendee's of the conference participate in. This survey was done in partnership with WSU's Social & Economic Sciences Research Center in Pullman.

No money for the SCBG was used for fundraising. Funds were raised by volunteers. The monies that were collected were used for areas within the conference program that were not related to specialty crops or were used in addition to SCBG if the SCBG were insufficient to cover the expenses. The conference has many other farming tracks where SCBG funds do not apply and were not used.

BENEFICIARIES

The varied specialty crop producers in the Puget Sound region have benefitted by the increased opportunity to engage with expert speakers from around the country under a multitude of specialty crop production topics. They learned about new crops, new growing methods, and new ways of marketing, business planning and consumer trends all of which will assist producers. The result being more new farmers, current farmers increasing the amount and diversity of production and increasing the profitability of the farm.

The question was asked during the follow up WSU survey with responses below:

Has your farm or ranch income increased, stayed the same, or decreased as a result of changes you made on your operation because of information you received at the Focus on Farming Conferences?

Increased - 24.8 %
Stayed the same – 72.4%
Decreased – 2.8%

In the Survey Monkey done five months after the conference the following question and results are:

Because of Focus on Farming 8, I will:						
	answered question					**44**
	skipped question					**7**
	Yes	**Possibly**	**Probably not**	**No**	**Rating Average**	**Rating Count**
Try something new in my business	**53.5% (23)**	39.5% (17)	4.7% (2)	2.3% (1)	1.56	43
Diversify my current crop	20.0% (7)	**42.9% (15)**	17.1% (6)	20.0% (7)	2.37	35
Consider expanding	**36.1% (13)**	**36.1% (13)**	13.9% (5)	13.9% (5)	2.06	36
Make no changes	3.3% (1)	10.0% (3)	30.0% (9)	**56.7% (17)**	3.40	30

LESSONS LEARNED

The demand for a conference of this size and scope continues to be a draw for new and beginning farmers, however it is always a challenge to meet the needs of all attendees. One of the advantages of the conference is the comingling of all types of farmers both large and small, organic and conventional. The cross pollination between the farmers is invaluable, while it still remains challenging to bring new information to existing producers that will have enough relevant content to entice the seasoned farmer to leave the farm for a day of learning. Specialty crops workshops are by far one of the best attended. Without the grant we never would have thought to do a track devoted just to specialty crops but we will definitely continue with it even though the grant is complete. The nursery track continues to be a valuable asset to the nursery industry with good attendance. Over the years the way in which we reach out to potential conference attendees has changed with the addition of facebook and twitter while many farmers continue to want the tradition post card in the mail. Keeping up with the latest marketing trends

has been an ever popular workshop allowing direct marketing to the consumer in a manner they are most familiar with.

There were no unexpected outcomes or results that were an effect of implementing this project. Everything was achieved that was proposed in the grant application/contract.

CONTACT PERSON

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ADDITIONAL INFORMATION

The below figures are conference sponsorship and registration income figures as well as the overall conference expenses, not included are tradeshow/vendor space income or expenses covered by Snohomish County. Income including grant funds are all applied to the conference expenses including rental of the venue, speakers, advertising, food costs and conference bags.

Sponsorships – 2010 - $21,500, 2011 – $13,500, 2012 – $15,000	Total sponsorship –	$50,000
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www.focusonfarming.org

https://www.facebook.com/focusonfarming

PROJECT #21

Project Title: Economic Impact of the Washington State Tree Fruit Industry

Partner Organization: Washington State Horticultural Association (WSHA)

PROJECT SUMMARY

The purpose of this project was to quantify the impacts of the Washington State tree fruit industry. While the concept of value from agricultural production is not new, it is frequently overlooked or misunderstood in today's industrially dominated world. People interested in economic sustainability, economic stability or economic development often want to be able to estimate the impact of changes, or proposed changes, in these economies. According to a 2004 study, the tree fruit industry annually cultivated nearly $6 billion in revenues and over 140,000 jobs for the Pacific Northwest economy. As this region, and the entire nation, has struggled through a recession and the potential for increased taxes/regulations, it became critical to quantify a) the changes that may have transpired in those contributions, and b) the strength that agriculture continues to bring to local, regional, state, and multi-state economies.

This project was also needed for the purpose of demonstrating the size and spatial distribution of the economic effects of the tree fruit industry in Washington – both overall and for seven key tree fruit counties: Benton, Chelan, Douglas, Grant, Franklin, Okanogan, and Yakima. The analytical goals were to estimate the impact of the tree fruit industry on the economies of all of these jurisdictions in both absolute and relative terms, and to portray the inter-industry relationships in these jurisdictions. Additionally, this study was to present industry economic trends over the past 10-15 years. Study data would be available to develop a state-wide communications and outreach program.

PROJECT APPROACH

The project resulted in an economic study indicating the impact of tree fruit production in the studied counties which comprise the bulk of the state's production. A number of sources were utilized to achieve the spectrum of data needed. The primary source was the United States Department of Agriculture; both state and national offices. Export data was provided by the Department of Commerce and the WISER Center in Massachusetts. Data on the size of the state and regional economies came from the U.S. Bureau of Economic Analysis, while data on the distribution of the labor force came from the Washington State Department of Employment Security. Input/output modeling was utilized. There were no unusual developments, but a clear picture of the economic impact was presented.

The primary project partner was Dr. Patrick Jones with the Institute for Public Policy and Economic Analysis at Eastern Washington University. The IPPEA conducted the study including data gathering, complication, and input-output modeling, and then prepared and presented the final report.

Other project partners included several of Washington's tree fruit industry associations who generated industry data and contributed cash match for the project. Such partners included the Yakima Valley Growers-Shippers Association, the Washington Growers Clearing House Association, the Marketing Associations, the Wenatchee Valley Traffic Association, and the Washington State Fruit Commission

An Advisory Team, consisting of lead personnel from the above tree fruit organizations, also provided a very useful review of data prior to the final report submission, which resulted in the correction of erroneous data and the inclusion of a better source of information, which added to the validity and credibility of the report.

GOALS AND OUTCOMES ACHIEVED

The project goal was to study the most currently available data from the available sources to determine the economic impact of Washington's tree fruit industry. The data set the boundaries, including output measured in the value of crops sold; any value-added component; employment from the production sector; and taxes paid at state and local levels. This information was then utilized to arrive at the reported conclusions. Eastern Washington University's Institute for Public Policy and Economic Analysis used econometric methodologies to study the available data and then presented it in a useful report that tells the story of the industry's contributions. The study is available on the Eastern Washington University website and the study conclusions were presented at the 2012 Washington State Horticultural Association Annual Meeting on Monday, December 3, 2012 in Yakima, Washington.

The Expected Measurable Outcome of quantifying the true economic impact of the tree fruit industry in Washington and in the seven major tree fruit producing counties was accomplished. The metrics of output (sales), employment, value-added, and taxes (state and local) were used to demonstrate economic impact. The study provided an analytical snapshot of the full effects of the industry in the most recent calendar years for which detailed data are available -2007 through 2009. The analysis used an input-output framework, specifically, the state and county models and data sets provided by the Minnesota IMPLAN Group. Value-added served as the basis of national accounting, such as gross domestic product (GDP), and was the preferred measure of economic effect in the study. By definition, it is less than output (sales) and greater than labor income. Job results contain both full- and part-time jobs. In addition, the study presents the estimated total taxes raised by the industry to the state and county jurisdictions. Finally, for each county and for the state, a list of industries most affected by tree fruit production is presented.

Considerable time was spent isolating the effect of tree fruit from all fruit farming to arrive at series for final sales, job and total wages that reflect only activities in Washington state orchards. Due to the high variability in tree fruit markets for the three study years, Washington State results were presented as an average. For the three years, initial value added contributed to the Washington economy by the industry amounted to $1.1 billion, on average. This led to a total effect of nearly $1.95B in value added per year, on average, to the state economy. The total effect of the industry implies a share of about 0.6% of the state GDP in the years 2007 through 2009

The study provides economic impact data separately for each major tree fruit producing county in Washington. In addition, although not one of the original counties targeted, Walla Walla County results were included in the study as this county has experienced significant increases in tree fruit production over the past few years.

Tables and graphs contained in the study include those for direct and indirect purchases of business sectors impacted by activities; total household income of owners and employees; local business sectors impacted by household expenditures; an estimate of the average annual employment supported by the tree fruit industry in the respective key counties; and the tree fruit industry impact on the eight major tree fruit producing counties. The impact of Washington State's tree fruit industry on the United States was not calculated as part of the study; however, the size of Washington's production of apples, cherries and pears relative to U.S. production was included.

BENEFICIARIES

Producers/growers now have a clear snapshot of the value of their efforts and the extent to which a multiplier is in play to augment the value of that production. There is now a clearer picture of the worth of tree fruit agriculture to both state and local taxing districts. The general public will also benefit by seeing the extent to which production agriculture impacts their livelihood through the effect of the

multiplier. In short, growers and their employees earn wages that are spent on rent, groceries, fuel, clothes, etc. and this report tends to show how others are truly 'in' the tree fruit business!

LESSONS LEARNED

This project had a clear and precise directive: to take existing data and subject it to econometric analysis to determine the extent of economic impact. It nicely accomplished that goal as it relates to a sector of the industry – grower/producers – that had not previously been separately studied.

The biggest lesson learned was the extreme importance of being engaged in the review of data. The employment data that was originally furnished by a nationally recognized provider was not accurate. This was discovered only when the preliminary report was presented to the Advisory Team once the project was nearing completion. This resulted in the need to alter the data set, conduct additional work, and delay the final presentation of the report to industry by a year. However, these delays and additional work were well worth the effort.

CONTACT PERSON

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ADDITIONAL INFORMATION

See **Report 12-25-B-1102 Attachment D** for the Economic Impact of the Washington Tree Fruit Industry (Report).

In-kind match of $18,560 was fully utilized for addressing technical issues and oversight. Since industry information was available independently, the other organizational partners were not asked to provide a cash match. They did provide oversight and review of the report when it reached draft status. WSHA made a $1000 cash match to cover cost associated with grant.

PROJECT #22

Project Title: A Baseline Analysis of Washington State Fresh Market Apple Food Safety Programs and Practices Relating to Microbial Pathogens

Partner Organization: Center for Produce Safety (CPS)

PROJECT SUMMARY

As the leading tree fruit supplier in the U.S., Washington and its research entities and associations such as the Northwest Horticultural Council (NHC) and the Washington Tree Fruit Research Commission (WTFRC) are particularly focused on ensuring the produce grown, packed, stored, and distributed remains safe from microbial contamination. While there is some research on the effectiveness of various practices used to mitigate microbial pathogens on apples, these studies are primarily related to the production of apple juice and not specifically to the occurrence of pathogens on the fruit itself or in packing houses that pack fresh market apples (Yuste, 2003; Reinders, 2001; Dingman, 2000). To this end, in 2010 the NHC and the WTFRC collaborated with the Center for Produce Safety to sponsor work that would "fill the gaps in our basic understanding in specific areas of food safety practices for fruit…production, harvest and post-harvest handling" (CPS, 2010).

In early 2011, Intertox began work on the Center for Produce Safety and Washington State Department of Agriculture-funded research project entitled, "A Baseline Analysis of Washington State Fresh Market Apple Food Safety Programs and Practices Relating to Microbial Pathogens." The goal was to document the current food safety programs and mitigation practices that the fresh market apple packing companies in the state of Washington are using to address potential microbial pathogens. To achieve this goal, Intertox partnered with the NHC and the WTFRC for research support and access to the packing houses.

PROJECT APPROACH

At the beginning of the project, Intertox met with the Pacific Northwest Food Safety Executive Committee and visited individual packing houses to understand the potential apple microbial issues, practices used, and current data availability. In December 2010 Intertox met with apple packing house companies at the Washington State Horticultural Association's annual meeting to provide an overview of the project and to request individual company support and participation. Packing house support, as well as support from the NHC and the WTFRC, was critical since much of the research depended on obtaining and evaluating confidential packing house data. Specifically, the research centered on compiling data on current food safety practices, pathogen occurrence, and mitigation practices and analyzing it for variations and trends in order to provide the fresh market apple industry in Washington with valuable information on how their practices affect product safety.

The study methodology used to achieve the project goal included the development and delivery of a survey instrument, data collection, creation of a database, and data analysis. The survey was developed and distributed in early 2011 with the support of the NHC and the WTFRC and was fielded in order to obtain packing house information on the food safety programs, efforts contributing to the mitigation of microbial pathogens, and types and frequency of microbial testing currently in place. The survey was also used to solicit packing houses' willingness to provide historical microbial testing data for the project in order to collate and utilize private datasets. After obtaining individual packing house permission to access and use their testing data, Intertox hired Intertox Decision Sciences (IDS) to collect the data, purge confidential company details, and build a Microsoft Excel (2010)-based microbial test database. Intertox then evaluated the data in order to establish baseline microbial pathogen levels, food safety programs, and current mitigation practices and their ability to reduce microbial pathogens. The research findings were presented to the Pacific Northwest Food Safety Executive Committee in

December 2011 and to attendees at the annual Washington State Horticultural Association's meeting also in December 2011.

GOALS AND OUTCOMES ACHIEVED

The research and technical objectives of the project were as follows:

1. Meet with The Pacific Northwest Food Safety Expert Committee to gain an understanding of the potential apple microbial issues, practices used and current data availability.
2. Solicit industry support for scope and participation in the project during the Washington State's Horticultural Association's annual meeting in December 2010.
3. Develop a questionnaire for distribution to packing houses to obtain information on the food safety programs and efforts contributing to the mitigation of microbial pathogens currently in place.
4. Collect industry data.
5. Prepare database and evaluate data quality.
6. Prepare a baseline report of microbial pathogens, food safety programs and current mitigation practices and their ability to reduce microbial pathogens.

All of the above objectives were achieved. Intertox had multiple meetings with members of the tree fruit industry thus the industry was much very much engaged in the process and the results. At the final meeting, Intertox met with the Executive Committee of the Pacific Northwest Food Safety Committee and communicated the study results to industry representatives. This industry advisory group confirmed that research expectations were met and proposed that additional research be completed on remaining tree fruit.

Thirty-two companies, representing 55% of all apple packing companies (conventional and organic) in Washington, completed surveys. The project goal was to obtain responses from a minimum of 25% of the packing houses. Thirty-four percent of the survey respondents categorized their operations as small (<1.25 million boxes), 50% as medium (1.26 – 3.75 million boxes), and 16% as large (>3.76 million boxes).

Summary of Survey Findings:

- 94% of survey respondents reported that they test the water used in the packing line regularly for microbial load. Of those companies that test their water, 93% tested their source water. Other testing locations include the wash/rinse bar (57%), dump tank (70%), and flumes (40%). The organisms most often tested for are fecal coliform (53%) and generic *E. coli* (70%). Fifty percent reported testing for organisms other than fecal coliform and generic *E. coli* such as total coliform, *Listeria*, and *Salmonella*.
- Seventy-eight percent of the survey respondents reported using environmental testing to check microbial levels at their packing facility. All of these companies tested their equipment. Other common testing areas were drains (64%) and walls (60%). Of the companies that reported their testing frequency, the majority said they did so quarterly (15) while four companies test annually, three test semi-annually, two test 3-4 times per year, and two conduct monthly testing.
- Of the 32 survey respondents, nine reported they conduct microbiological testing of their apples before shipping to customers. The reasons for testing include buyer requirements (5), audit requirement (1), food safety program verification (4), and foreign market requirements (1). Seventy-eight percent of companies that test their apples took samples at the end of the packing line. Other points in the packing process where apples were tested were after washing but before packing and before sizing.

In preparing the research plan, Intertox, the NHC, and the WTFRC established a goal of obtaining five years of microbial test data from 10 packing houses in order to ensure the data was representative of the

industry. Once the survey closed, Intertox had commitments from 17 companies to provide their microbial data. The distribution of the 17 packing houses is 31%, 25%, and 38% of the total small, medium, and large companies, respectively.

Summary of Microbial Test Data Findings:

- Water tests were reported for the period of 2005 through 2010 – 60% of all water test results were for total coliform, 23% for fecal coliform, and 16% for generic *E. coli*. Eighty-four percent of the tests for fecal coliform in water resulted in less than 2 MPN/100 mL, and 6% were between 2 and 15 MPN/100 mL. At least 4% of all tests for fecal coliform in water were greater than 500 MPN/100 mL and at least 6% were greater than 100 MPN/100 mL. Of the water samples that were tested for generic *E. coli*, 72% had levels less than 2 MPN/100 mL. Colilert® water test results were most often negative for both total coliform and *E. coli* (86%), with 13% positive for total coliform but negative for *E. coli*, and only 1% positive for both total coliform and generic *E. coli*.
- Companies tested environmental surfaces in their packing houses for generic *E. coli* (39%) and *Listeria* spp. (30%) more than they did for *Salmonella* (17%) or total coliform (14%).
- From 2009 to 2010, with the exception of *Salmonella* testing, testing for all target organisms increased substantially: total coliform increased by 83%, generic *E. coli* by 81%, *Listeria* by 74%, and *Salmonella* by 25%. From 2005 to 2010, the number of sampling locations increased as well. Positive results were reported for total coliform (8%), generic *E. coli (0.5%)*, and *Listeria* spp. (0.6%). *E. coli* O157:H7 and *Salmonella* were not detected in the environmental tests.
- Between 2005 and 2010 when products were tested, they were more frequently tested for *Salmonella* (41%), *Listeria* (29%), and *E. coli* O157:H7 (20%) than for generic *E. coli* (9%) and *Listeria monocytogenes* (1%). In 2008 the number of tests conducted for *Salmonella* and *E. coli* O157:H7 peaked and then rapidly declined. By 2010, the number of tests for both pathogens had fallen below 2006 levels. *Listeria* testing remained relatively flat between 2007 and 2009. By 2010, however, *Listeria* testing had also declined below 2006 levels. The limited number of generic *E. coli* tests ranged from five to 14 per year over the five year period. Of the product tests conducted between 2005 and 2010, slightly less than one percent was positive. There were 118 tests for the human pathogens *Listeria monocytogenes* (4 tests) and *E. coli* O157:H7 (114 tests), resulting in one positive *E. coli* O157:H7 and one positive *Listeria monocytogenes* result.

While the number of companies providing test data represents 29% of the total market (31% of small companies, 25% of medium companies and 35% of large companies), unfortunately too few total environmental and product tests data points were available to establish baseline levels and frequency of generic microbial contamination. At best, the resulting data is informative but does not allow for a clear understanding of the baseline levels and frequencies of microbial contamination. Given that routine environmental testing programs have only recently been implemented in a number of the packing houses, the addition of 2011 data and the inclusion of additional packing houses could produce enough data points for establishing a baseline for environmental contamination and frequency. However, this may not be the case for product testing. Over the six year period from 2005 to 2010, environmental testing has generally increased while product testing has decreased after peaking in 2008. This may reflect a shift in focus of food safety programs toward prevention with sampling programs redirected to identify potential contamination of food contact surfaces instead testing the end product for contamination. Further research planned in 2012 will include efforts to collect additional environmental and product test data in order to complete the baseline analysis.

While the microbiological testing results that were obtained during this project resulted in very few positives, it is unclear whether the data indicate a measure of success for the food safety programs of

the participating packing houses. Although the research is not at a point of establishing a correlation between microbial control and mitigation practices and results, the research was effective in establishing baseline mitigation practices. With 55% of all packing houses responding to the microbial survey representing small, medium, and large companies, the survey results are reflective of the total market.
Information collected during the survey provides insight into the types of microbial contaminants screened for by packing houses and how they are controlled, monitored, or tested.

Outcome 1: Establish baseline levels of microbial contaminants on Washington fresh market apples. Intertox was able to collate and utilize public and private data sets to help establish baseline levels. However, it was determined that the results were not statistically valid.

Outcome 2: "Determine the frequency of generic microbial contamination on Washington fresh market apples in packinghouses, and during storage and shipping." Frequency results were provided for water, environmental and final product microbial tests. However, it is believed that there needed to be additional data (future years or additional companies) to insure validity.

Outcome 3: Identify and determine the effectiveness of mitigation steps that could be used to manage generic microbial contamination risks for Washington fresh market apples." Although the research is not at a point of establishing a correlation between microbial control and mitigation practices and results, the research was effective in establishing baseline mitigation practices. With 55% of all packing houses responding to the microbial survey representing small, medium, and large companies, the survey results are reflective of the total market. Information collected during the survey provides insight into the types of microbial contaminants screened for by packing houses and how they are controlled, monitored, or tested.

BENEFICIARIES

The beneficiaries of this research include the Washington state packing houses and associations and research entities such as the NHC and the WTFRC that support the industry. The survey and test data results provide packing houses with information about similar companies in their industry – and this is especially beneficial for quality process validation, continuous learning and ultimately quality improvements.

LESSONS LEARNED

Individual company contact by IDS was a requirement in order to work through the complexities and concerns with confidentially. Obtaining data even after permission was granted was complicated by the workload demands of the harvest cycle. While there were logistical challenges to obtaining data, industry support for and participation in the project was achieved largely through the efforts of the NHC and WTFRC.

When industry data is collected for the first time, it is difficult to know exactly how many data records exist and the quality of available data. If the industry survey had been conducted before the project, it would have been possible to approximate the data available in the tree fruit industry. In completing this project, data was collected for apples, pears and cherries and therefore there is now a better understanding of data availability in the industry.

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PROJECT #23

Project Title: Increasing SC sales through education and marketing at Farmers Markets

Partner Organization: Washington State Farmers Market Association

PROJECT SUMMARY

The demand for Washington-produced, safe, sustainable specialty crops has increased in recent years due in part to the publicity from "buy local" campaigns, food safety scares, concern for farmers and farmland, as well as strong perceptions that local food is more ecological, healthier, and tastier. This interest has benefited Washington's farmers markets which have seen increased sales from $5 million in 1997 to an estimated $65 million in 2008.

Despite this market opportunity, many communities wanting to start or expand a farmers market have difficulty securing specialty crop farmers to sell at their market. There are two main reasons: 1) not enough diversified, specialty crop farmers who direct market who can meet this demand; and 2) Market managers and farmers have trouble simply finding each other and connecting. In addition, farmers change sales strategies over time. Markets must compete with each other to attract the best farmers; managers need to be able to assure farmers they can generate enough sales that it makes sense for them to participate at their market.

With the growing demand for more specialty crop farmers and their products and interest by local governments, communities and nonprofits to have better access to healthy food for low income residents, the need for services and programs to effectively connect consumers and producers has become even more important. This project sought to address these challenges by providing specialty crop farmers education on critical topics to help them succeed at farmers markets; and by helping specialty crop farmers and farmers markets connect more easily. This strategy was chosen because it could leverage existing trends and use the WSFMA's annual conference, so that both farmers and markets end up being more successful at what they are trying to do.

In addition, the project enabled WSFMA to improve its organizational capacity so that it could do a better job organizing conferences that offer a selection of workshops that address the wide range of skills and experience of farmers market managers and farmers, and included relevant topics that weren't offered at other workshops and trainings in Washington State.
This project did not build on any previous SCBG projects. It was the first SCBG project for WSFMA. However, it did build on a long history of annual conferences targeting both farmers market organizers and farmers who sell at farmers markets.

PROJECT APPROACH

This project used the annual conference as the basis to improve training to specialty crop farmers who want to sell at farmers markets and to help increase farmers market manager effectiveness at operating farmers markets to help increase sales to specialty crop farmers.
Through this project, WSFMA:

- Conducted two annual conferences that offered a total of 72 workshops attended by 316 market managers, specialty crop farmers, market boards of directors, non-profit partner organizations, state agency staff, WSU staff;
- Offered 30 workshops specifically addressing specialty crop farmers' needs that were attended by 81 farmers;
- Solidified WSFMA's reputation for offering a high quality conference;
- Built capacity within the organization so that it could continue the conferences with less grant support;

- Documented increased sales by specialty crop farmers attending the conferences; and,
- Developed new data that showed the increase in specialty crop farmers selling at farmers markets in Washington State.

WSDA staff helped identify farmer workshop topics and speakers for each of the two conferences and helped with recruiting speakers and moderating some panels. Patrice Barrentine, Claudia Coles, the organic program, and weights and measures all participated in workshops, offered one-on-one consulting sessions, and created table displays about WSDA's programs for conference attendees.
WSU Small Farms Program and Extension offered workshops and helped with outreach to farmers for each of the conferences. Karen Killinger offered workshops on food safety and food-borne illnesses. Colleen Donovan presented workshops on data collection and summarized statewide farmers market data to be used at the conferences. Rita Ordonez led workshops on WSU's farmers market technology work (another SCBG project) to expand farmers market participation and ability to accept shopper payments using electronic cards.

Other partners including WA Sustainable Food and Farming Network, Cascade Harvest Coalition, Tilth Producers of Washington, and member farmers markets all publicized the conference through their networks and provided information about their work for conference attendees.

Registration for any non-specialty crop growers that attended the conference, was paid for with matching funds. Any non-specialty crop growers were identified through the registration process. All funds were tracked to ensure grant funding was solely utilized to benefit specialty crops.

GOALS AND OUTCOMES ACHIEVED

The primary activities completed during the project were the two conferences in 2011 and 2012 and related surveys of managers and farmers. WSFMA's goal was to offer workshops that would both be of interest to specialty crop farmers to help increase their sales and of interest to market managers to do a better job managing their market to increase shopper counts and increased sales.
WSFMA's conference planning committee asked key specialty crop farmers, market managers, WSU and WSDA staff for suggestions on topics they have identified that farmers need the most help to increase sales at farmers markets. Each year, the committee had a full day planning meeting to identify workshop topics and potential presenters. The committee recruited the presenters, developed outreach flyers and email messages to send out regularly to various list serves and post on websites. A key strategy was to offer scholarships to low income farmers. WSFMA solicited donations from large member markets and key organizations such as a credit/debit card processor and a local government, to help cover farmer scholarships.

One goal was for the number of specialty crop farmers selling at farmers markets to increase by 10% each year of the project. As noted in progress reports, this was not tracked at the 2011 conference and was amended in year two to measure the number of new farmers selling at member markets. WSFMA surveyed member markets to determine the number of specialty crop farmers and new farmers selling during the 2012 market season. Surveys were sent to all 112 member markets and 35 were returned, representing 46 individual market locations (31% response rate). The number of farmers at a market ranged from a low of eight to a high of 80, with an average of 22.22 farmers per market. Extrapolating this would indicate 2,464 non-unique farmers at member markets. Specialty crop farmer counts ranged from three to 62 per market with an average of 18. Market managers were asked to identify the number of new vendors in the following categories:

- Specialty crop farmers – average 3.9 new farmers per market, 100% of markets reported new vendors
- Meat, dairy, seafood – average .56 new vendor per market, 39% of markets reported new vendors

- Processors – average 2.1 new vendors per market, 61% of markets reported new vendors
- Prepared foods – average 1.3 new vendors per market, 56% of markets reported new vendors
- Crafters – average 3.9 new vendors per market, 84% of markets reported new vendors

Every market reported bringing in new specialty crop farmers in 2012. The number of new specialty crop farmers at a market ranged from 1 – 11, with the average being 3.9 new farmers. This number is up from the number reported during the 2012 application process where 108 markets reported 249 new specialty crop farmers, or an average of 2.3 new farmers at each market. This is a significant increase of 70 new farmers, however the questions asked on the 2012 application and the followup survey were slightly different.

The data also demonstrates quite a bit of change in vendor composition at markets between 2011 and 2012, especially related to specialty crop farmers. These are new farmers to the market, not necessarily farmers new to farming. They could have transferred from one market to another or expanded into more markets. It could indicate increased demand for specialty crops.

Another goal was to increase the number of specialty crop farmers attending the annual conference by 50% each year. This goal was not met. In 2011, the goal of 40 farmers was met. In 2012, the goal was 60 farmers and was not met. There were 41 farmers attending. WSFMA and partner organizations publicized the 2012 conference via list serves, the website, and through member markets.

Another goal was that specialty crop farmers sales would increase by at least 5% each year. Because of the difficulty for market managers to track these sales separately, this goal was amended so that farmers attending the conference would self-report whether their sales increased or not, by how much and whether they learned new skills to apply to selling their products.

WSFMA surveyed farmers attending the 2012 conference regarding their sales in 2011 and whether the conference provided valuable information to help increase sales in 2012. 19 farmers returned the survey, reporting they most valued the social media and season extension workshops. They reported their sales increased 12% in 2011, over 2010.

These 41 farmers were again surveyed at the end of the 2012 market season to find out about changes in sales during the 2012 market season and whether they felt anything they learned at the 2012 conference had an impact on the sales. Ten farmers returned the survey. 50% noted their sales had increased and 50% reported sales remained the same (none reported a drop in sales). Because of a problem with the survey format, farmers could not enter the percentage change. The farmers reported the hoop house season extension workshop at the 2012 conference was very important to helping increase their sales. Also noted were sales and marketing workshops.

Specialty crop farmers selling at farmers markets will increase by 10% each year	Although the survey methods tracking the number of specialty crop farmers selling at farmers markets varied slightly for the 2011 and 2012 seasons, the average number of new specialty crops farmers at farmers markets increased from 2.3 in the 2011 season to 3.9 in the 2012 season, a 69% increase.
The number of specialty crop farmers attending the conference will increase by 50% each year	The number of specialty crop farmers increased 50% from the 2010 to the 2011 conference (25 farmers in 2010, 40 farmers in 2011). It was not

	met for the 2012 conference (41 farmers attending, goal was 60 farmers)
Specialty crop farmers sales will increase by at least 5% each year.	Farmers attending the 2012 conference reported average sales increase of 12% from 2010 to 2011 market season. Farmers attending the 2013 conference who completed the survey (n=14) reported an average 10.46% increase in sales from 2011 to 2012.

Overall Indicators	Outcomes
Increase in specialty crop farmers selling at farmers markets	Yes, surveys covering the 2011 and 2012 market seasons
Increase in sales for specialty crop farmers	Yes, per self reported surveys, sales increased 12% in 2011 and 10.5% in 2012
Farmers learned valuable skills at the conference to better market their crops	Yes, surveys indicate season extension, marketing and social media classes most useful
Increase in number of specialty crop farmers attending the conference	2010 – 25 farmers 2011 – 40 farmers 2012 – 41 farmers
Number of workshops targeting specialty crop farmers	30

BENEFICIARIES

The project has and will continue to benefit the Washington State Farmers Market Association, its 112 member farmers markets, non-member markets around the state, and the specialty crop farmers that sell at them. This includes not just the market manager but board members and others who work with specialty crop farmers.

Because many of the workshops included both market managers and farmers, the two groups were learning a common language and skills to use during market season. This will help managers communicate more effectively with farmers to help them improve booth displays, signage, customer relations, or farm materials to increase their sales.
It is hard to quantify the economic impact of the conferences to farmer sales. Specialty crop farmers that responded to surveys indicated their sales increased on average, 10.5% in 2012 and 12% in 2011.
More importantly for WSFMA, these farmers found value in the workshops that they felt would help them increase their sales at farmers markets. The ability to give farmers specific tools they believe will help them is essential to improving their business operations, and helping them feel optimistic about the farmers market portion of their business.

LESSONS LEARNED

This grant and a USDA Farmers Market Promotion Grant provided the financial underpinning and capacity for WSFMA to significantly improve the conference content and offering to specialty crop farmers and market managers. We learned how important it was to have a talented, experienced person coordinate the conference in order to improve the organization's ability to serve its increasingly sophisticated farmer vendors and market managers.

We learned that WSFMA has little visibility with farmers market vendors. Many years ago when there were fewer markets and farmers, there had been a stronger connection between WSFMA and farmers when planning the conference. This connection had been lost over the previous four-five years. As a result, WSFMA needs to do more than offer workshops at an annual conference to create meaningful

training sessions for farmers. It is difficult to educate once a year and have it be remembered. Although the farmers that participated in the conferences valued the workshops, it was hard to develop repeat attendance because there was no ongoing relationship or regular communication.

With increased training and education opportunities for specialty crop farmers, it became very apparent that for WSFMA to do an effective job, it has to be very clear about the educational services it offers and work closely with partners so they are complementary to other workshops and are unique. WSFMA used this grant to help position itself as the organization to provide workshops specifically geared to the specialty crop farmers' needs.

In addition, the WSFMA board will need to evaluate what are realistic expectations for attracting farmers to attend the annual conference. It may be that sponsoring farmers market related workshops at other conferences where there are more farmers may be a strategic way to offer a valuable service with less cost to farmers (because they are already at the conference).

Because the conference is focused on market managers, it required extra attention to make sure the famer track workshops and outreach were targeted to specialty crop farmers. Starting with the 2014 conference WSFMA will be organizing the conference using more committees to make sure one committee is focused on specialty crop farmer needs.

Another lesson learned is the importance of having copies of slide shows, power points, videos available after the conference for attendees and for others to watch on their own time. Not only does this provide more opportunities to strengthen specialty crop sales, but it also reinforces the idea of WSFMA as a resource for information to help specialty crop farmers increase their sales at farmers markets.
One workshop at the 2012 conference was about "consumer psychology." It was very popular and the presenter offered a follow up workshop for all attendees about two months after the conference. It was well attended by farmers and market managers. WSFMA still hears comments about how good that workshop was and how grateful attendees were for the opportunity to have a follow up meeting. This workshop has become a staple at the conference.

Based on the increased level of tracking communications at the WSFMA office, staff identified that farmers were emailing and calling the office on a regular basis with questions about selling at farmers markets. This activity helped confirm the importance of WSFMA offering workshops and provides a group of potential supporters for WSFMA in the future.

The 2013 conference had a couple farmer workshops led by young farmers who are doing an excellent job marketing their produce at farmers markets and retaining high quality sales employees. Because WSFMA has developed some stronger connections with farmers, these young farmers were enthusiastic about attending the conference and presenting in workshops. This was a very welcome outcome from this project.

At the annual WSFMA membership meeting, held during the 2013, the organization had the most nominations for open board positions it has had during the past 15 years. Every nominee brought years of experience and talent. The existing board felt sure this was in part due to the increased professionalization of the organization and the quality of the conference. This sentiment was confirmed by several of the nominees.

WSFMA did not reach its goal for farmer attendees at the 2012 conference, as described above. The key lesson is to recognize that there are multiple ways to educate farmers and that WSFMA must do a better job positioning itself so people understand its role and services. One way to do this is to network with

farmers and offer workshops at locations that are familiar to them, such as the Tilth Conference or as part of WSU's Cultivating Success classes.

Connected to this is the lesson that once a year workshops without follow up or other ongoing services really may not be as effective. WSFMA identified the need to improve its website, clarify its services so farmers know what to expect from the organization, offer other training options that might be more relevant to some farmers, such as onsite consulting on market day or periodic marketing tips during the selling season.

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PROJECT #24

Project Title: Creating New Culinary/Agritourism Markets for Specialty Crop Producers

Partner Organization: Washington State Department of Agriculture, OCO

PROJECT SUMMARY

Savor Washington is a program developed by Washington State Tourism and Washington State Department of Agriculture to acknowledge and promote culinary/Agritourism businesses that meet established criteria. The program recognizes businesses that grow, manufacture, sell and support local agriculture.

The work funded through this grant was intended to facilitate creation of new markets for Washington specialty crops by marketing farm experiences to regional travelers. Families, bird-watchers, wine-lovers and other locavores are fueling an increase in the number of travelers seeking to visit and better understand the farms that are so important to regional food systems. Agritourism serves not only tourists, but represents an important way for farms to diversify their income streams, and to increase farmgate income by adding services, experiences and value-added products to their offerings. Particularly during the far-reaching economic downturn that began in 2008 producers are seeing a need to diversify income streams in order to maintain a successful farm business. Few have capitalized on agritourism opportunities that abound in our state, and which continue to show potential for growth. Key to the development of agriculinary tourism was preparing people interested in entering the market with knowledge about the start-up and operation of this kind of enterprise. Additionally facilitating the growth and expansion of existing agritourism operations was a focus of educational offerings. In partnership with Washington State Tourism WSDA and partners conducted seven regional agri-culinary tourism training workshops for farmers and developed 15 culinary experience/agritourism travel itineraries that showcased farms' offerings. These agritourism itineraries were presented on the state's official tourism website and to media through marketing and public relations programs.

The primary focus of the grant was to:

- Conduct trainings for farmers seeking to develop or expand agri-tourism markets
- Develop regional itineraries to support visitorship to new and existing agri-tourism experiences
- Conduct media outreach to promote itineraries and experiences associated with the Savor Washington brand

This project was begun during the period of dramatic economic downturn associated with the near-collapse of the finance industry and the bursting of the housing "bubble" in 2008. Nature tourism is one of the fastest growing segments of the travel industry; Washington State has approximately 39,000 farms, more than 90% of which are small and family-owned. Farming is one of Washington's most important sectors of the regional economy, one that the then-Governor had prioritized as essential to mounting a statewide economic recovery. Farm operators, agriculture educators, and tourism industry groups provided feedback as WSDA and the Washington State Tourism Agency developed the proposed project workplan. During this period of economic contraction the state's farm operators needed guidance and technical assistance related to diversifying their income streams, and this project offered education to interested businesses, and ongoing publicity for existing and emerging agri-culinary tourism operators.

This project was not built on a previously funded SCBGP project.

PROJECT APPROACH

Business development workshops were conducted for seven groups of farm operators interested in developing an agri-culinary tourism business – regions in which they were conducted include the Long Beach Peninsula, Thurston County (Olympia) and the Puyallup Valley. Approximately 550 people attended the workshops.

15 Regional and travel itineraries were developed, (one of which is a statewide itinerary) in partnership with local businesses, tourism operators, agriculture advocates, and others. These itineraries were promoted via a variety of media including traditional magazine and newspaper, broadcast media including Northwest Backroads episodes (see attached report on NWBackroads), WSDA social media outlets, its own Facebook page, and other partner-led publicity.
http://agr.wa.gov/marketing/smallfarm/savorwa.aspx

Media relations included coverage in a multitude of local newspapers, especially covering the educational workshops. Individual businesses also were featured in news stories on agritourism as a result of the initial outreach regarding workshops. Media coverage included 10 Northwest Backroads episodes, a weekly outdoor magazine show highlighting the people, places and thing that make the Pacific Northwest unique.

Washington State's Scenic Byways & Road Trips is a 90-page full color guide available to visitors FREE. Project partners collaborated to provide detailed copy for these publications, including locally grown food, wineries, restaurants, hand-crafted brews and more along with many other activities and attractions. http://viewer.zmags.com/publication/b00d96ef#/b00d96ef/17

Washington State Tourism contracted with PR firm Green Rubino to assist with writing, photography, branding, designing and publicizing the Savor WA branded travel itineraries which number 14 + a statewide itinerary. The contracted firm assisted with promoting regional itineraries, and secured features with travel, leisure and news media outlets. Washington State Tourism also conducted "Familiarization Tours" to introduce agri-culinary tourism destinations to tour companies that serve domestic and international tourists visiting the Northwest U.S. These familiarization tours hosted eight German media representatives; five French media representatives; seven Chinese journalists; and five tour operators. Participation in tourism trade shows reached 60 domestic tour operators, and more than 100 international tour operators.

Washington State Tourism's contributions were significant - both with in-kind staff time, and with developing marketing materials, a branding campaign, conducting Familiarization Tours, and doing a strategic public relations campaign with the help of the PR firm, pitching media on stories. The conservative estimate of the value of the in-kind and other professional services that were contributed to this project by Tourism or through their contractors is $250,000.

Additional in-kind hours (approx. 10-20 hours on average per organization) have been contributed by:

- Washington State Convention & Visitors Bureaus - providing contact information for regional businesses featured on the itineraries, and continuing to serve as distribution partners
- Walla Walla Valley Chamber of Commerce assisted extensively with the development of a regional itinerary in the last six months
- Okanogan County Extension Service began the process of gathering information for a Savor WA itinerary and then experienced some scheduling conflicts that prevented the completion of the itinerary; however, their regional itinerary will still be developed and added to the existing collection of
- Seven two-day educational workshops statewide were facilitated and assisted by extension services, agriculture advocacy organizations, and regional travel promotion organizations.

These folks assisted with developing the region-specific content of presentations, conducting outreach, coordinating logistics, and capturing evaluations and feedback.

Agritourism encompasses many agricultural products, and agricultural operators from every sector across the state have shown interest in this promising new approach to increasing on-farm income. In order to ensure that Specialty Crop Block Grant funds did not benefit non-specialty crop producers, WSDA clearly delineated with its partner, Washington State Tourism, the kinds of outreach and services that only they would provide. When a question of a non-specialty crop producer either participating in an event, or being featured in the branding campaign came up, WST matching funds prevented WSDA from benefitting or appearing to benefit a non-specialty crop producer using Specialty Crop funds.

WST was an essential partner, contributing significantly both with in-kind staff time, and with the development of a branding campaign, assisted by Green Rubino Partners, a professional public relations firm. The campaign included marketing materials, a series of tourism industry Familiarization Tours, and a strategic media relations outreach plan. The conservative estimate of the value of the in-kind and other professional services that were contributed to this project by Tourism or through their contractors is $250,000.

For the agritourism business development workshops (attended by 550 participants from around the state) WSDA exclusively targeted outreach efforts to specialty crop producers and those who develop value added products and experiences associated with specialty crops. This outreach was conducted via Extension partners, commodity commissions, farmers markets, grower listservs, newsletters, flyers, direct email invitations, and the WSDA website. Additionally the workshops were conducted in growing regions where there was significant specialty crop producer interest in diversifying business income through tourism development. Where non-specialty crop producers expressed interest in participating, they were allowed to attend on a space-available basis - all expenses associated with non-specialty crop producers were covered using WST's budget, and were not paid for using WSDA's Specialty Crop grant budget.

The ongoing follow-up and measurement phase of this grant focused entirely on specialty crop producers. Follow-up included surveying participants in the educational agri-tourism events, tracking media hits and audience figures, and continuing to promote the Savor Washington-branded itineraries through media outreach and agency promotions. While a small number of non-specialty crop producers either were featured in media outreach or attended training events, the focus of the work was directed specifically to specialty crop growers and specialty crop value added businesses. The few, nominal expenses incurred related to non-specialty crop producer participation were covered using Washington State Tourism's contributions to the project.

Specialty crop producers were the focus of:

- Familiarization Tours for tourist industry representatives
- Regional tourism itineraries (13 regional and one statewide)
- Fresh Sheets
- Farm-stays
- Farmers markets
- Features and photographs highlighted in itineraries
- NW Backroads stories
- News media story pitches

The intent of the project was to pique the curiosity of tourists, encouraging them to integrate agriculture into tourism activities, and helping them better understand what Washington produces when, and where to find and buy those products. Because the nature of the project is *culinary* agritourism, occasionally a

business was featured that did not exclude non-specialty-crop products. Expenses associated with the inclusion of non-specialty crop producers were covered by the WST, while WSDA focused exclusively on facilitating the success of specialty crop producers in starting and growing culinary agri-tourism ventures.

GOALS AND OUTCOMES ACHIEVED

Seven regional educational workshop series were held for farm operators on the cusp of developing an agriculinary tourism experience and/or product on their farm. These workshops were attended by approximately 550 organizations and individuals.

14 regional and 1 statewide agriculinary travel itineraries were developed and distributed widely through partnerships with regional tourism offices, web-based marketing and media relations, and via Convention & Visitors Bureaus

Strategic media outreach included placing three agriculinary stories in a regional TV news magazine, Northwest Backroads, which ran live in 2011 and continues to be available for download; many regional newspaper features; inclusion in the Washington State Scenic Byways and Roadtrips Guides; development of a Savor Washington culinary agri-tourism Facebook page with more than 700 active followers. More than 35 culinary/agritourism businesses were feature in NW Backroads.
Presentation of the agritourism project workplan and reports at the National Trust for Historic Preservation's Annual Conference in Austin, Texas October 2010
Promoting agriculinary tourism is the primary long-term objective or outcome. There are many indications that Washington's agritourism business opportunities are increasing, and that travelers are more aware of the many ways they can have authentic experiences on and around farms in the diverse growing regions around the state. Those measures are recorded in greater detail in other parts of this narrative.

The goals of the project were to:

1. Promote agriculinary/agritourism specialty crop businesses
2. Provide technical assistance to farms considering starting or expanding an agriculinary business
3. Establish a connection and a distinctive sense of place that visitors are able to experience directly – both to promote economic development within the region, and to educate visitors about the scope, value and diversity of Washington's specialty crop industry
4. Increase specialty crop sales by $500,000 over the project performance period

The project clearly accomplished the majority of goals set out in the workplan, except that the increase in sales cannot be quantified as accurately as intended when the project was started. Anecdotal evidence that the target was reached is very strong. Given the current trends in tourism, (more travelers seeking shorter, more local trips, that include an 'authenticity' experience) and the extensive exposure that Savor Washington has enjoyed, it is reasonable to conclude that over the three year period during which WSDA and WST were planning the project with strategic partners, conducting education and promotional events, doing targeted media outreach and developing and promoting engaging itineraries, that the increase in income goals were realized.

Unfortunately WSDA's ability to accurately measure income change was strongly impacted by Washington State Tourism, WSDA's most essential partner, being de-funded by the Washington State legislature. As a result, tourism metrics that had been public as part of WST were no longer available – as the data was being transferred to a private tourism industry group that was unable to make them available.

Another unfortunate impact of the program closure was that when WSDA attempted to assemble the contact information of the approximately 1300 businesses featured on the statewide and regional culinary agri-tourism itineraries to survey them for economic impact indicators, it was no longer available. Unfortunately when WST closed its doors, this data set was not included in the Savor WA asset transfer to WSDA. WSDA conducted extensive follow-up with the advertising agency that should have housed the data. With WST officially closed we relied on the advertising agency for our access to the data; and in fact they were unable to locate the data in their system. WSDA did not change the intended outcome during the amended grant period because we were continuing to seek to uncover where the data was housed, until the final weeks when all the previously possible avenues to the data were definitively closed.

When the revised workplan was written, it was the intent of the team to enroll in a Salesforce CRM customization course. This was not possible, as the consultants and other service providers had significantly increased the cost of retaining their services, likely as a result of the enormous growth Salesforce has seen in the last two years. For example one eight-hour training in 2010 was quoted at $2500, the same training two years later was at least 4 times as much, with a low estimate of $10,000. The team worked on customization using free, online Salesforce tutorials in order to customize the existing database, but it was not as useful at quantifying economic outcomes as anticipated.

WSDA was able to survey the participants in the education workshops, and they provided valuable feedback on the impacts of Savor Washington on their businesses' growth and development. The workshops were well attended and surveys indicate they were successful at growing businesses. In fact:

- 83.3% of surveyed workshop participants indicated they either started a new, or expanded an existing, agritourism venture
- 57% indicated that they grew their agritourism business as a result of the education and training provided.
- One workshop was credited with having "influenced the creation and direction of a new regional culinary event, Bite of Bainbridge."

Following the broadcasts of Northwest Backroads segments, featured businesses reported:

- That the web traffic the weekend following the feature spiked as much as 70%.
- Weekend visits jumped to 65 different people in a single day, a significant increase from an average weekend day.
- They heard a regular refrain for approximately two months following that visitors had seen them on the show and had made a special trip as a result.

WSDA's website gets approximately 30,000 unique visitors every month.

- Web traffic reports show significant traffic to Savor Washington pages, with 5000 downloads of itineraries during September 2013 alone, the final month of the grant period (a period when itineraries had been re-printed and distributed, plus a new itinerary had recently launched, with strong media support). Exposure has been significant, over a lengthy period of time, via a wide variety of media.
- Washington State's Culinary Agritourism Facebook page has attracted more than 750 followers during the grant period from 2010-2013.

Quantifying the increase in income associated with this evidence of economic growth is difficult to do without comparing after-project income to pre-project income, which can be clearly tied back to this culinary agri-tourism project.

However, at the close of the project there is compelling evidence of success: economic impact success, as well as growing momentum and enthusiasm for tourism that is enriched by on-farm experiences from

U-Pick, to grape crushings, farm-stays to farm-stands. While collection of metrics on income growth generated by this project were hamstrung by the closure of our partner agency, the project does show significant success in the marketplace, and has strong potential to continue to benefit specialty crop producers across Washington.

BENEFICIARIES

Several different kinds of constituents can be described as having benefited from the Savor Washington agri-culinary tourism project including farm operators who participated in agri-culinary workshops, food businesses that were featured in 10 Northwest Backroads episodes, and food/farm businesses that were included in an agri-culinary regional itineraries. Educators who joined the workshops also benefited because they learned more about this kind of business, which prepares them to more capably advise constituents as needed. Media outlets were exposed to the concept and were provided with contacts in different regions that allowed them to develop engaging content with a slightly different twist - agritourism.

Small farm operators depend upon diverse operations in order to manage the risks associated with operating a business that is uniquely subject to weather, market, and consumer taste trends. Approximately 550 different individuals attended educational workshops on the development and expansion of agritourism opportunities, which can be a natural extension of a farm business. Whether the attendee is an educator, a future farmer, or a current operator of a farm, learning more about this kind of business development opportunity is a great benefit to Washington farms.

Regional tourists have a previously unavailable resource available to them as a result of this project. The itineraries are easily accessed via www.agr.wa.gov, and via the tourism offices around the state that distribute hard copies of the itineraries, as well as refer farm visitors to the website.
Agri-culinary businesses have benefited from significant media coverage of the project as well, including coverage of the educational workshops, and ongoing articles featuring individual businesses, which can be attributed to the initial media relations conducted on the project. Finn River Cidery was featured in a news magazine "Northwest Backroads" that has continued to be available online in the years since its production, and is considered by that business to have been the most important and impactful promotion in the history of their business. The Washington State DOT Scenic Byways publications were a focus of this work as well, and agritourism was featured in 25 different features in these publications including Chinook Pass, Coulee Corridor, Mountain to Sound Greenway, and all the way from Omak to Yakima.
83.3% of surveyed workshop participants indicated they either started a new or expanded an existing agritourism venture.
One of the workshops was credited with having "influenced the creation and direction of a new event, Bite of Bainbridge".
Following the airing of Northwest Backroads segments, featured business reported

- That the web traffic that weekend spiked 70%.
- Weekend visits jumped to 65 different people in a single day, a significant increase from an average weekend day.
- They they heard a regular refrain for the two months following that visitors had seen them on the show and had made a special trip as a result.

LESSONS LEARNED

An important piece of information that has come out of post-project interviews with participants is that a closer connection between farms and schools nets strong repeat visitor-ship. Not only are the families of children who visit a farm on a school field trip likely to come visit the farm on another separate day, but those families also tend to become regular seasonal visitors. So future agri-culinary tourism outreach could be linked to farm-to-school programming, in order to target this audience strategically.

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ADDITIONAL INFORMATION
Washington State Tourism contributed approximately $250,000 of their agency staff and budget to the agri-culinary tourism project.

Their work included:

- Story concept-ing
- Media relations
- Photography/brand image development
- Development of visual concepts
- Familiarization tours with international tour operators
- Copy writing and editing for Scenic Byways publications
- Copy writing and editing for Savor Washington itineraries
- Pitching NW Backroads episodes and managing the relationship with the production team and featured farms
- Contracting with a PR firm for support services related to all of the above

https://www.facebook.com/#!/savorwashington

(2) Washington State Culinary Agritourism - Windows Internet Explorer
https://www.facebook.com/#!/savorwashington
File Edit View Favorites Tools Help
Favorites
Web Slice Gallery
Suggested Sites
Should Farmers Mar...
Eventbrite - Create ...
Washington State >...
(2) Washington ...
Page Safety Tools
Washington State Culinary Agritourism
Home Save
Create Page
Washington State Culinary Agritourism
Liked
Message
747 likes
Farming/Agriculture
Agritourism community members can join this group for updates on the agritourism initiative and networking possibilities with other like-minded organizations.
About - Suggest an Edit
Photos
Likes
747
Post
Photo / Video
Write something...
Washington State Culinary Agritourism
December 20, 2012
Discovered great little Facebook page featuring local foods and restaurants on the Southwest Washington coast. Check out and
2 Friends
Like Washington State Culinary Agritourism
Invite Your Friends to Like This Page
See All
Type a friend's name...
Invite
Sponsored
Create Ad
New UGG Boots at Zappos®
zappos.com
New styles and old favorites at Zappos®. Free shipping & returns. Shop now!
Designer Shoes on Gilt™
gilt.com
Save up to 60% on Top Designers. Join Gilt Today!
Overstocked Clogs 80% Off
cully.com
No Joke. Overstock designer Clogs at up to 80% off retail price.
Recent
2011
2010
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Chat (15)
Internet | Protected Mode: Off
100%

PROJECT #25

Project Title: *European Grapevine Moth (Lobesia botrana) Survey*

Partner Organization: Washington State Department of Agriculture (WSDA) Pest Program

PROJECT SUMMARY

Washington State's vineyard and stone fruit industries are threatened by the recent detection of the European grapevine moth (EGVM) in California. Eradication of EGVM in California also becomes increasingly unlikely as the known infestation area continues to grow. The larvae of this pest insect feed on the grapes, cherries and other commercially important stone fruit. No reproducing populations of EGVM are known to exist in Washington; however, introduction through commercial and private pathways pose a serious threat to the grape and stone fruit industries of the state.

Establishment of EGVM in the state would increase production costs by adding additional pest control measures and direct damage to fruit that would lower commodity grades or remove the fruit from trade. In addition to the direct costs, the impacted fruit industries would face domestic and international quarantine restrictions that would dictate costly mitigation measures before Washington fruit could gain access to protected markets.

PROJECT APROACH

To develop a trap density and placement plan using GIS resources, WSDA used its own WSDA/USDA Exotic Pests of Grapes Survey (EPOGS) Manual created by Entomologist Michael W. Klaus in 2010. WSDA then placed traps according to known commercial grape areas, historical GIS maps from WSDA's Perry Beale, past knowledge/experience from grape phylloxera survey from Entomologist Michael Klaus, and information learned from the 2010 EPOGS.

To develop and conduct outreach to industry stakeholders, WSDA communicated with Vicky Scharlau, the Executive Director of the Washington Association of Wine Grape Growers (WAWGG) to disseminate information to affected growers. The 2011 EGVM survey was supported by WAWGG and the organization also assisted the agency in the industry stakeholder work and outreach needed to place traps in production vineyards.

Logistical/ordering needs were calculated by Michael Klaus and Dr. Jim Marra based on many factors including: knowledge acquired from 2010 EPOGS, extensive knowledge and experience of grape growing areas by Michael Klaus and veteran seasonal trapper supervisors, and review of google earth maps and other maps. WSDA then provided USDA APHIS with a Workplan. Traps arrived from USDA APHIS PPQ Trapping Services, Moore Air Base, Edinburg, Texas.

WSDA Public Information Officer, Mike Louisell, worked with Entomologist Michael Klaus to produce a Press Release and door hangers and to arrange meetings with Yakima Valley reporters for a media event/picture opportunity.

Supplies were staged at the WSDA Yakima field office and the routine agency methods were used to advertise and hire trapper positions. The trapper positions were also posted on the WSDA Employment Opportunities website at http://agr.wa.gov/Employment/.

WSDA used the standard USDA provided traps and lures for the 2011 survey and followed the approved Cooperative Agricultural Pest (CAPS) methods described in the National Grape Commodity Pest Survey. WSDA placed and monitored traps for European Grapevine Moth (EGVM) from June 24 through September 30 in sixteen Washington State counties using traps baited with pheromone lures

(See **Table 1.A**). Traps were checked every two to four weeks and changed at least every four weeks.

Trap deployment focused on commercial wine and juice grape vineyards, non-commercial, residential grape vines in populated areas, abandoned vineyards, and feral, roadside grape vines. Host plants included only grape vineyards or backyard grape vines. These types of hosts were targeted because they represented the greatest risk of pest introduction and propagation.

Table 1.A
Counties Trapped for EGVM in 2011

Adams	Douglas	Klickitat	Snohomish
Benton	Franklin	Okanogan	Walla Walla
Chelan	Grant	Skagit	Whatcom
Columbia	Kittitas	Skamania	Yakima

The 2011 EGVM survey was supported by the Washington Association of Wine Grape Growers. The WAWGG has assisted the agency in the industry stakeholder work and outreach needed to place traps in production vineyards.

GOALS AND OUTCOMES ACHIEVED

In 2011, WSDA monitored a total of 914 EGVM trap sites as detailed in Table 1.B. Traps were placed throughout June, July and August, and monitored bi-weekly until removal in late September. The Expected Measurable Outcome of demonstrating one-third of Washington State to be a pest-free area of production with regards to EGVM by surveying one-third of vineyard acreage was achieved. WSDA surveyed approximately 27,000 acres out of approximately 65,000 total acres – over 40% of the total acreage.

All project goals were achieved.

Goal 1. The pest free status of Washington State will be maintained by early detection and possible eradication of an economically important group of insect pests. The results of this project demonstrate that the pest free status of a major grape production area in Washington State is maintained.

Goal 2. Washington State's grape industries will be protected from an important group of destructive pest insects. The negative results of this survey demonstrated the state's agricultural industry remains protected from an important pest of grapes and stone fruit.

Goal 3. The survey will help maintain the unregulated export of fruit from Washington State to international markets. International markets for grapes and stone fruits will remain open and unregulated for the European Grapevine moth.

2011 EGVM Trap Results

Table 1.B – Trap Sites by County

COUNTY	Number of EGVM Traps	Number of Positive Traps Sites
ADAMS	18	0
BENTON	126	0
CHELAN	15	0
COLUMBIA	1	0
DOUGLAS	8	0
FRANKLIN	104	0

GRANT	146	0
KITTITAS	7	0
KLICKITAT	14	0
OKANOGAN	1	0
SKAGIT	74	0
SNOHOMISH	25	0
WALLA WALLA	71	0
WHATCOM	52	0
YAKIMA	249	0
TOTALS	914	0

This 2011 season, no EGVM moths were caught. The EGVM pest free status of Washington State will remain.

BENEFICIARIES

The recently completed state-wide survey supports and benefits the grape and stone fruit producers of Washington State by maintaining the unregulated export of fruit to other states and countries.

European grapevine moth threatens a commercially important segment of specialty crops. For example, grapes are the 10th leading agriculture commodity in Washington, valued at $210.1 million and in 2009; Washington vineyards produced 350,000 tons of grapes on 65,000 acres, the second highest total in the U.S. (USDA/NASS 2010). Additionally, sweet cherry production in Washington leads all states producing 245,000 tons on 35,000 acres valued at $215.1 million. Cherries rank eighth in dollar value among Washington's agriculture commodities

LESSONS LEARNED

The introduction of EGVM is of great concern to the grape industry. The positive result of this project is that a major area of Washington State's fruit production is free of invasion by the European Grapevine Moth.

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ADDITIONAL INFORMATION

See **Report 12-25-B-1102 Attachment C** for the following:

1. Washington State's American Viticultural Areas
2. WSDA News Release, June 23, 2011
3. Yakima Herald Republic article, June 23, 2011
4. Reported Status of EGVM through December 7, 2011

PROJECT #26

Project Title: Linking the Specialty Crop Community with Emergency Food Distribution

Partner Organization: Washington State Department of Agriculture, Food Assistance Program

PROJECT SUMMARY

Emergency food providers (distributors, food banks, and meal programs) are experiencing challenges of saturation of certain seasonal food and a deficit in other seasonal food which can limit nutritional variety throughout the year. The goal of Washington's emergency food providers is not only to feed the hungry, but to help them balance their nutritional needs so clients can develop healthy eating habits.

On the other hand, emergency food providers should do what they can to ensure a healthy agricultural industry. When the agricultural industry is strong, farmers are better able to contribute to the emergency food system thus helping emergency food providers have sufficient nutritious food to provide to their low-income clients. The working relationship between emergency food providers and farmers plays a critical role in the goal to ensure Washington's hungry have access to nutritious food.

The move of the Food Assistance Programs from the former Department of General Administration and the Department of Commerce to the Washington State Department of Agriculture (WSDA) created an opportunity to strengthen the relationship between the farmer and the emergency food provider. A strong collaboration should provide innovative and mutually beneficial ways to get healthy food to the 1 in 5 Washington residents that visit emergency food providers.

PROJECT APPROACH

WSDA Food Assistance Programs (FAP), in partnership with the Washington Food Coalition (WFC) and Rotary First Harvest (RFH), hosted four Harvest Against Hunger (HAH) Area Summits in Wenatchee, Yakima, Olympia, and Everett which invited stakeholders in the emergency food and farming communities to come together to learn how their businesses intersect and find potential options for growth. A major accomplishment from the summits is a combined 22 pilot projects which will increase commerce and strengthen partnerships between the two groups, many of which are already being implemented by our partnering agencies.

Each of the HAH Area Summits provided many unique insights and opportunities to see growth in the connections established between emergency food providers and farmers. Each location had unique focuses that led to in-depth discussion on how to overcome certain barriers. At the Wenatchee Area Summit in September, the issues of storage and transportation were highlighted as barriers to collaborate on and overcome somehow. The Yakima Area Summit in January offered insightful discussion into the opportunity of one-to-one connections between small-scale farmers and local food programs. At the HAH Olympia Area Summit in February, ideas were shared on how emergency food programs can reach out and market themselves to local growers. Later in February, at the HAH Seattle Area Summit, discussions arose about educating youth on how to grow food, as well as ideas on how to make small-scale farming more economically viable.

It was also evident that certain issues and ideas continued to arise at each HAH Summit, no matter where in the state it was held. The utilization of Food Hub (food-hub.org) to locate and connect with food sources had a large amount of interest. The development of materials and tools addressing liability as well as methods of donations to provide to growers was discussed widely. Understanding individual growers and the best way to tap into their production line is another discussion that was brought up statewide. In addition, the opportunity for emergency food programs to position themselves as a paying customer whenever it is possible was an idea that provided opportunity for long-term sustainability in these relationships. These ideas, along with many others, were clearly applicable in all areas of the state.

An unexpected result from the HAH Area Summits is that many communities have begun to replicate the format of the area summit to increase communication between emergency food providers and farmers within those areas and generate ideas that can work at the local level.

Separate from the HAH Area Summits FAP contracted with WFC to develop a recipe resource that highlights specialty crops in meals prepared using predominately food bank food.

WFC and RFH played significant roles in the development of the project. Through contracts with WFC, they provided outreach for the area summits as well as an in-depth role in the development and implementation of the summit agendas. RFH used their extensive network with both the farming and emergency food communities to recruit panel participants at each of the summits and lead the discussion of the meetings.

FAP has continued to work with WFC and RFH to generate interest and participation in the 22 pilot projects developed during the HAH Area Summits. Through this continued partnership, many of the 22 projects have been completed. RFH has also committed the resources of one of their AmeriCorps Vista volunteers in 2013 to implement the 12 most critical pilot projects that were developed during the summits.

Internal WSDA partners also offered outreach support with Kelly Frost from the Commodity Commissions assisting in the development of a letter from WSDA executive management inviting growers to participate in the area summits. Tricia Kovacs from Small Farms & Direct Marketing sent the letter out to many small and mid-sized farms throughout the state.

Invites to participate in the Harvest Against Hunger Area Summits only went out to specialty crop producers. Other organizations involved included emergency food providers who purchase a significant amount of specialty crops for their organizations. Discussion topics focused on those initiatives that would increase flow of specialty crops to emergency food providers.

GOALS AND OUTCOMES ACHIEVED

Participation from farmers at the area summits was lower than expected despite numerous forms of advertisements included emails sent to an estimated 1,500 farmers and all of the commissions, booths at various farming events and conferences that promoted the area summits, advertisements in an agricultural newspaper, a story published by the same paper, letters from Director Newhouse, and changes in the location of the summits to be at events hosted by the farming community.

Many of the farmers in attendance didn’t produce at the capacity to support purchases from emergency food providers, so there was not a significant reported increase in sales to those who participated in the area summits. However, as mentioned above, emergency food providers have taken the ideas shared at the summits and are using them to shift their long-term strategy in building working relationships with specialty crop farmers. While those in attendance haven’t reported a large increase with emergency food providers, we are confident that those outside the area summits are seeing the benefit from these events. The overall target of the project was to create increased awareness of specialty crops among emergency food providers and also bring the emergency food community together with local small and medium size specialty crop farmers to help these groups learn to do business with one another. In the short term we believe this was accomplished, but we feel that the area summits acted more as a launching point facilitating the process to identify those pilot projects that will help reshape the long-term relationship between emergency food providers and specialty crop farmers. Our target won’t fully be accomplished until the some of the most critical pilot projects are implemented.

Over the course of the last seven months, RFH, WSDA, and WFC have built capacity for pilot projects derived from the HAH Area Summits. Rotary First Harvest designated an AmeriCorps*VISTA from their Harvest Against Hunger program to focus on project development from December 2012 to November 2013. During the first three months of this term, the WSDA, WFC and RFH worked together to distill 22 pilot ideas into 12 organized and prioritized projects. Each organization was assigned to lead certain projects based on resources and skill sets.

The greatest accomplishment to date of this continued effort stemming from the HAH Area Summits has been the Washington State Grower Round Table series. The project was an effort to better understand and support growers' relationships to their community, state and the wider hunger-relief network. AmeriCorps*VISTA from Rotary First Harvest's HAH program hosted gathering of growers statewide to discuss their perceptions of hunger and motivations for community involvement. A total of seven round tables occurred between February and April 2013 with a participation of over 50 growers. The findings lift up the voices of Washington farmers and help organizations better identify ways to strengthen agriculture and alleviate community hunger. The project confirms that ideas developed in collaborative environments, such as the HAH Area Summits, can directly lead to new solutions and concrete outcomes. A 22-page WA State Grower Round Table publication of summarized results is available for broad consumption. The grower round table report can be found at:
http://issuu.com/bobanickdb/docs/grtreport_full_exsummary_detail_2_e66bfc2af4838e
Initially, it was anticipated that the major accomplishments would be found in the Expected Measurable Outcomes and that those farmers who participated would see an increase in sales to emergency food providers. However, many of the emergency food providers noted that the farmers in attendance didn't produce at levels sufficient to meet the purchasing demand of the emergency food providers.
An AmeriCorps Vista working with Northwest Harvest in Yakima shared with WSDA the success she was having with implementing ideas that came from the HAH Area Summits. She noted that the ideas shared at the area summits helped turn an unsuccessful gleaning project at the Farmers Market and turn it into one that benefited both farmers and the emergency food providers. She said:

> "I took the ideas from the area summits to create mutually beneficial relationships with farmers and leverage our purchasing power. We now collect donations cash donations from those shopping at the market and use this cash to purchase from the participating farmers when the market is closing. Before, when we would glean after the market we wouldn't get much. Now that we have a presence, we get lots of donations to purchase from farmers. Later on the farmers now work with us more because they know we are customers instead of gleaners."

A total of 117 participants from 72 different organizations attended the four area summits. Of these participants, 18 represented the agricultural industry, 80 represented emergency food providers, 15 represented government agencies, and 4 were from other organizations – predominately in the food distribution sector. These numbers far exceeded our projections on participation of the 25 lead agencies from WSDA Food Assistance Programs; however, we were 22 participants away from meeting our goal of 40 from the agricultural industry. A large part of this can be attributed to a winter storm in January of 2012 which forced us to postpone the Seattle HAH Area Summit which had 70 participants RSVP (including over 30 farmers). The majority of those registered to participate in January, did not attend on the rescheduled February date.

WSDA only received 9 post-survey responses one year after the Area Summits. This made it difficult to estimate the economic impact achieved through the HAH Area Summits. While we do know of several thousand dollars in purchases made from food banks to farmers participating in the summits, they are reporting that for the most part those farmers that participated do not have the capacity to handle the size of order needed.

BENEFICIARIES

Emergency food providers and specialty crop farmers have benefitted from the project and accomplishments.

It is difficult to quantify the data that concerns the beneficiaries of the project. While it is clear that the results of the project have had a positive economic impact, however, there is currently no mechanism in place at this time to quantify the specifics of this impact.

The Harvest Against Hunger Area Summits had 18 participants from the agricultural industry. While that is not at target with original projections, this created a significant amount of awareness of the link that can be made between specialty crop producers and emergency food providers and started the discussion on who to improve the collaborative relationship between these two groups.

From these discussions came the Grower Round Table series put on by WSDA, Washington Food Coalition, and Rotary First Harvest to host gatherings across Washington State to better understand and support growers' relationships with their community, state and the wider hunger-relief network. The project arose from the 22 ideas identified during the four Harvest Against Hunger Area Summits and included over 50 specialty crop farmers.

Initiatives like the 22 pilot projects and the Grower Round Table series continues to strengthen the relationship between specialty crop producers and emergency food providers. However, much of the outcomes are in still intangible and no baseline data exists to measure against. Some of these initiatives have served to reduce barriers related to doing business with emergency food providers, such as the explanation of the Good Samaritan Act that was provided by a legal professional. This analysis helped beneficiaries of this project to better understand how to mitigate the risks associated with non-profit organizations.

At a minimum, this project has served as a niche market for small-scale specialty crop farmers to move their products in a way that has benefited their organization as well as their community.

LESSONS LEARNED

Outreach to farmers was a critical component in the project. In retrospect, additional funding would have been requested for outreach using other media sources such as radio and newspaper. We would have also allowed more time to perform outreach and postponed the project to later dates.

It was also important to choose venues that would draw farmers to the meetings. It was noted that when venues centralized in agricultural locations, there was more farmers were in attendance.

We would have also focused more on the long-term outcomes that could be realized. It is the consensus of the partners involved in the planning and implementation of the HAH Area Summits that the true benefit from the summits will be realized as more of the pilot projects are implemented. It was slightly naïve of us to believe that farmers and emergency food providers would show up to a meeting and suddenly start working together. Additional time was needed to develop the plans in order to realize the benefits.

The unexpected outcome was the excitement this project generated among emergency food providers in coming up with new ways to work with the agricultural industry. Prior to the Area Summits, there was little, or no, effort to find solutions that benefited both emergency food providers and producers. Many communities are replicating on a smaller scale the structure of the HAH Area Summits to see how farmers and emergency food providers specific to those communities can better work together. While it is difficult to quantify this outcome, emergency food providers are reporting back to WSDA the success that has resulted in hosting the HAH Area Summits.

As mentioned in Question 12, Expected Measurable Outcomes would have been more achievable had we focused on the long-term outcomes as opposed to short term measurables. The Area Summits served as a forum to layout the framework and additional time was needed to implement the plans to achieve the economic impact. It would have served us well to vet longer-term quantifiable outcomes that cover a broader range of beneficiaries beyond those in attendance of the meetings and focus on those outcomes instead of short-term economic impacts that would only benefit those that participated. We believe that the summits can benefit all specialty crop farmers and emergency food providers, regardless of attendance.

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ADDITIONAL INFORMATION

$5,000 – EFAP contract increase with WFC to provide additional involvement in the HAH Area Summits.
$3,512 – Staff salaries

PROJECT #27

Project Title: Commodity-focused trade missions led by WSDA's Director

Partner Organization: Washington State Department of Agriculture, International Marketing Program

PROJECT SUMMARY

The purpose of these missions was to develop new market opportunities and increase export sales and address trade barrier issues. The project utilized the high profile of the director of agriculture and a focused, product-specific trade contingent to create awareness of--and demand for--the target products, address barriers that limit sales of these products, and identify future market potential. (Target products are tree fruit, potatoes and wine.) The missions allowed participating companies and commission representatives to conduct invaluable market reconnaissance and learn first-hand from key importers and distributors. In addition, delegates met with local government officials, and USDA in-market officials to address trade barrier issues.

Within all of the identified markets, there is growing demand for specialty crop products. However, there is strong competition within these marketing, governments have established unfounded barriers and buyers and end users lack information about Washington specialty crop products. While Washington suppliers have a competitive advantage for each of the products indentified in this project, buyers and end users need information about these products in order to establish a strong foothold, and for products sales to meet their full potential. Buyers and end users do not have full knowledge of what products are available, the variety of – and uses for- these products, the quality characteristics of these products and in many instances buyers and users need information on how to source and handle these products. Moreover, Washington specialty crop suppliers need a better understanding of how they can fulfill the needs of the local markets, and a greater understanding of handling and distribution capabilities. Without this information and without working to capitalize upon current opportunities and reduce market barriers, Washington suppliers will not be able to meet local demand and will lose sales to competitors in these markets.

Some of the challenges faced in the individual country or regional markets are as follows:

- Asia: Food service and retail opportunities are expanding in the target marketing. In Hong Kong and Korea, there are no longer import tariffs for win and other policies are improving.. Competition and lack of information by local trade and end users limits access for Washington products, while Washington food manufacturers and wineries need more information to tailor their products to meet local demand.
- India: There is a 50% tariff on apple imports, a 30% tariff on many other fruit and vegetable products and a minimum effective tax rate of 150% on wine. There is a methyl bromide fumigation requirement for cherries which is counter to requirements in nearly all other markets. Indian trade and consumers lack information on Washington specialty crop products, while Washington exporters can improve their market offerings with a better understanding of the Indian market and its handling practices and distribution channels. India has already risen to become one of the top five markets for Washington apples and has potential for continued growth.

This project provided much needed information to buyers, end users and media representatives who can influence purchases of Washington specialty crop products, including tree fruits, potatoes and potato products, and wine. Purchasing decision makers had the opportunity to sample new products and gain firsthand knowledge about these products during the promotions undertaken through this project.
This project was not built on a previously funded SCBGP project.

PROJECT APPROACH

Mission 1 – SE Asia

The mission to SE Asia was completed in November 2011. Washington State Department of Agriculture (WSDA) and Oregon Department of Agriculture (ODA) teamed up on a Director led mission to Vietnam, Singapore, Macau and Hong Kong. The mission included meetings with importers and government officials as well as product promotions in each market.

In Hong Kong and Singapore, food service and retail promotions were undertaken, and promotions focused on showcasing food service items, including potato products, wines, and fruits, to importers, distributors, chefs and food and beverage purchasing managers. In Hong Kong, retail promotions were conducted, including an educational component to highlight characteristics and uses of participating Washington specialty crop products. Educational seminars were conducted in Singapore for distributors, purchasing decision makers and food and beverage managers. A US chef conducted product demonstrations at all locations. Technical materials detailing product information, handling information and a suppliers' directory were distributed to key contacts. In each location, delegates toured wholesale markets, met with key importers and trade officials, and met with US and local government officials for market briefings and to address relevant trade issues. In Vietnam, the primary emphasis was to assess new and expanded opportunities for specialty crop products through visiting local markets and meeting with importers, distributors and purchasing managers.

Missions 2 & 3 – India and Korea

The missions to India and to Korea were completed in October 2012. WSDA led a delegation from the Washington State Potato Commission, NW Horticultural Council and the Washington Wine Commission. The group travelled to India and Korea in parallel with Washington State Governor Chris Gregoire's trade mission to the two countries.

The delegation first traveled to the key markets of Delhi, Mumbai and Chennai to discuss mitigation of the 50% tariff on apples and the lifting of the methyl bromide fumigation requirement for cherries; and also met with importers, retailers and distributors. Briefings were also conducted with USDA/F AS lndia staff. Press coverage of in-store promotions raised awareness of and increased demand for Washington tree fruit and other relevant specialty crop products. The delegation then traveled to Seoul to discuss the mitigation of phytosanitary barriers to apples and met with importers, retailers and distributors. Briefings were also conducted with USDAIF AS/Korea staff. Press coverage of in-store promotions raised awareness of and increased demand for Washington potatoes, wine, and other specialty crops.

Mission 1 – SE Asia

The Washington State Potato Commission (WSPC), Oregon Potato Commission (OPC) and Oregon Department of Agriculture (ODA) all participated in and contributed to this mission to SE Asia. The Commissions were integral to the potato promotions in each market and contributed product, technical manuals and merchandising materials.

Mission 2 – India

The Northwest Horticultural Council (NWHC) and Washington State Potato Commission (WSPC) attended and participated in the India mission. The group met with importers, retailers, Indian government officials and US government officials.

Mission 3 – Korea

The Northwest Horticultural Council, Washington State Potato Commission and Washington Wine Commission all participated in the Korean trade mission. WSPC hosted a potato promotion at a Popeye's restaurant in Seoul. WSPC and WWC donated ingredients, wine and spirits for an importer reception hosted at the ambassador's residence.

Only specialty crop commodities will be included in the trade missions.

MISSION 1 – SE ASIA
Washington State Potato Commission - $12,000 travel/$9,700 staff time

Oregon Potato Commission - $12,000 travel/$9,700 staff time

MISSIONS 2 & 3 – INDIA & Korea
Washington Pea and Lentil Commission - $1,000 product samples and shipping

Washington State Potato Commission

Total Number of Staff Hours for Planning & Participation	**328 Hours**
Direct Costs of Planning & Participation	
Travel/Airfare	$33,337.40
Product Samples	$203.70
Printing & Promotional Materials	$1,024.51
Other Misc. Costs	$290.40
Total	**$34,856.01**

NW Horticultural Council

Total Number of Staff Hours for Planning & Participation	**100 Hours**
Direct Costs of Planning & Participation	
Travel/Airfare	$1,299.20
Total	**$1,299.20**

Washington Wine Commission

Total Number of Staff Hours for Planning & Participation	**144 Hours**
Direct Costs of Planning & Participation	
Travel/Airfare	$2,599.40
Product Samples	$3,708.00
Printing & Promotional Materials	$115.25
Other Misc. Costs	$10.00
Total	**$6,432.65**

GOALS AND OUTCOMES ACHIEVED
Mission 1 – SE Asia
The mission to SE Asia was completed in November 2011. Washington State Department of Agriculture (WSDA) and Oregon Department of Agriculture (ODA) teamed up on a Director led

mission to Vietnam, Singapore, Macau and Hong Kong. The mission included meetings with importers and government officials as well as product promotions in each market.
In Hong Kong and Singapore, food service and retail promotions were undertaken, and promotions focused on showcasing food service items, including potato products, wines, and fruits, to importers, distributors, chefs and food and beverage purchasing managers. In Hong Kong, retail promotions were conducted, including an educational component to highlight characteristics and uses of participating Washington specialty crop products. Educational seminars were conducted in Singapore for distributors, purchasing decision makers and food and beverage managers. A US chef conducted product demonstrations at all locations. Technical materials detailing product information, handling information and a suppliers' directory were distributed to key contacts. In each location, delegates toured wholesale markets, met with key importers and trade officials, and met with US and local government officials for market briefings and to address relevant trade issues. In Vietnam, the primary emphasis was to assess new and expanded opportunities for specialty crop products through visiting local markets and meeting with importers, distributors and purchasing managers.

Missions 2 & 3 – India and Korea
The missions to India and to Korea were completed in October 2012. WSDA led a delegation from the Washington State Potato Commission, NW Horticultural Council and the Washington Wine Commission. The group travelled to India and Korea in parallel with Washington State Governor Chris Gregoire's trade mission to the two countries.
The delegation first traveled to the key markets of Delhi, Mumbai and Chennai to discuss mitigation of the 50% tariff on apples and the lifting of the methyl bromide fumigation requirement for cherries; and also met with importers, retailers and distributors. Briefings were also conducted with USDA/F AS lndia staff. Press coverage of in-store promotions raised awareness of and increased demand for Washington tree fruit and other relevant specialty crop products. The delegation then traveled to Seoul to discuss the mitigation of phytosanitary barriers to apples and met with importers, retailers and distributors. Briefings were also conducted with USDAIF AS/Korea staff. Press coverage of in-store promotions raised awareness of and increased demand for Washington potatoes, wine, and other specialty crops.

There was no long term Expected Measurable Outcome(s) for this project.

Goals	Activity	Actuals	Comments
1. $4.8 million in additional sales within 1 year of mission • $2.8 million fruit • $1.0 million potato • $1.0 million wine 2. 10 new products available in markets	Mission 1	1. $6.1 million in additional sales within 1 year of mission • $5.3 million tree fruit • $750,000 potatoes (1,558 MT) • $0 wine 2. 1 new variety of potato	In the 12 months following the mission, exports of tree fruit and potatoes from Washington to Vietnam increased by $6.1 million over the 12 months preceding the mission.
	Mission 2	1. $2.3 million in additional sales within 8 months of mission • $2.3 million potatoes/fries 2. Only 8 months of data are available for India and the monthly averages are increased over the monthly	In the 8 months following the mission, exports of frozen potato products were up $2.3 million over the 12 months prior to the mission. Tree fruit and wine exports were increased on an average monthly basis during the 8 months following the mission vs. the 12 months prior to the mission.

		average prior to the mission: • Fruit: $9.45 million/month vs. $8.81 million/month • Wine: $14 thousand/ month vs. $12 thousand/ month	
	Mission 3	1. $10.2 million in additional sales within 8 months of mission • $6.6 million tree fruit • $3.1 million potatoes/fries • $465,000 wine	In the 8 months following the mission, exports of tree fruit, potatoes and wine were up $10.2 million over the 12 months preceding the mission.
Current Project Total:		1. $18.6 million in sales within 1 year 2. 1 new product available in markets	

Sales from Washington to Market in the 12 months preceding missions			
Mission	**Fruit**	**Potatoes/French Fries**	**Wine**
1 – Vietnam	$15.4 million	$0	$0
2 – India	$105.8 million	$1.1 million	$155,000
3 – Korea	$41.2 million	$56.4 million	$426,000

Source: GTIS

Sales from Washington to Market in the 8-12 months following missions				
Mission	**Elapsed Time**	**Fruit**	**Potatoes/French Fries**	**Wine**
1 – Vietnam	12 Months	$20.7 million	$750,000	$0
2 – India	8 Months	$75.6 million	$3.4 million	$112,000
3 – Korea	8 Months	$47.8 million	$59.5 million	$891,000

Source: GTIS

BENEFICIARIES

Direct beneficiaries of this project are tree fruit growers, processing potato growers, varietal potato growers and wine grape growers of Washington State.

Sales from Washington to Market in the 12 months preceding missions			
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Source: GTIS

LESSONS LEARNED

Trade missions can provide much needed market information and increased understanding of market dynamics and needs. Leveraging the high profile of Director's of Agriculture and the Governor gains access for high level governmental meetings to address market access issues.

There we no unexpected outcomes or results that were an effect of implementing this project.

We did not achieve our goal of number of new products to market. Creating a market for a new product requires much more long-term persistence than trade missions of this kind can provide. While many new products were introduced, only 1 new product is now consistently available in market that was not before the missions. Future short-term efforts (like trade missions) should continue to focus on increasing sales of products already available in market. New product introductions require longer term commitments.

CONTACT PERSON

Cameron Crump
WA State Department of Agriculture
360-902-1833
ccrump@agr.wa.gov

END OF REPORT

Additional Information

Supporting information is provided in the following documents (attached to final report):

1. Washington Growers Clearing House press release announcing Specialty Crop Block Grant award.
2. Washington Association of Wine Grape Growers letter requesting grower participation in acreage survey effort.
3. Northwest Tree Fruit Coalition – request for grower participation in survey effort. This letter of support was sent with the survey to all growers.
4. Grape Posts (sample of three) highlighting survey and need for growers to participate.
5. Washington Grape Society announcement and request for grower participation in survey.
6. Washington Growers Clearing House – poster requesting grower participation in survey effort (mailed; displayed at all sister organization booths at Washington State Annual Horticultural Conference)
7. Washington Growers Clearing House – Industry Info 24 November 2010 – announcement of tree acreage survey; opportunity to complete survey at Hort Convention. This is a sample. The invitation ran in the Industry Info newsletter for two issues.
8. Washington Growers Clearing House Bulletin – 25 January 2011 – Tree Fruit Acreage Survey reminder to complete survey. This is a sample. The reminder ran for four weeks in the Bullet.
9. WAC letter supporting Specialty Crop Block Grant acreage survey results.

NEWS ADVISORY

FOR IMMEDIATE RELEASE
DATE: OCTOBER 04, 2010

CONTACT INFORMATION
DAN KELLY (509) 662-6181

WASHINGTON GROWERS CLEARING HOUSE RECEIVES SPECIALTY CROP BLOCK GRANT FROM USDA

The Washington Growers Clearing House has partnered with the Washington Wine Industry Foundation to receive a Specialty Crop Block Grant in the amount of $99,500 from USDA. The Washington Growers Clearing House will oversee the tree fruit portion of this grant.

The Washington Growers Clearing House will also be partnering with Agricultural Statistics (NASS), Farm Credit Services NW, Tree Top, Pear Bureau NW and USDA-ARS.

The title of the grant is *"Tree Fruit & Grape Acreage Survey."* This partnership will provide for the development of acreage inventories in Washington by crop, variety, age and production to assist grape and tree fruit growers in their decision-making processes and reduce the impacts of year-to-year variability.

The tree fruit industry will use this data, the industry would be able to work with the growers, marketers, and warehouses to be better prepared for the new crop. This information would allow the growers to make more informed decisions and improving their risk management.

FOR MORE INFORMATION CALL (509) 662-6181 or email dkelly@waclearinghouse.org

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WASHINGTON ASSOCIATION *of*
WINE GRAPE GROWERS

December 2010

TO: All Washington State Grape Growers
FR: Vicky Scharlau, Executive Director, Washington Association of Wine Grape Growers
RE: Grape Acreage Survey

Would you help us, help you?

Detailed acreage information is critical to fruit growers for decision-making that maximizes production and labor efficiencies. The information is also valuable for associated agribusiness service-providers including lenders, nurseries, input suppliers, wineries, processors as well as for the management of labor supplies, transportation, etc. Maintaining a regular trend for collection of industry data is necessary for risk management, future planning and also determining our economic impact to the state and nation!

Five years ago, we worked with the Washington tree fruit industry and the National Ag Stats Service to develop and implement a tree fruit and grape acreage survey funded by a USDA research grant awarded through the Washington Wine Industry Foundation.

This year, the Washington Growers Clearing House was awarded a grant from the State Department of Ag's Specialty Crop Block Grant Program to complete an updated tree fruit and grape acreage survey.

Without the support of these grants, our specialty crop industries would not be able to engage in the important work of acreage surveys.

The Washington Association of Wine Grape Growers committed to provide in-kind support for this project including:

- List building
- Questionnaire review
- Publicity to encourage grape growers to respond
- Technical issue consultation
- Dissemination of results

The Association also agreed to provide matching cash funds to help implement and disseminate the grape portion of the survey.

Thank you, in advance, for filling out this acreage survey and helping us, to help you.

Northwest Tree Fruit Coalition

Dear Washington Tree Fruit Grower,

Please participate in an important survey you will be receiving in December 2010 from the National Agricultural Statistics Service (NASS).

Earlier this year, the Washington Growers Clearing House was awarded a Specialty Crop Block Grant to fund a new Tree Fruit Acreage Survey, which will be conducted by USDA's NASS in December and early 2011, in the same manner a similar survey was conducted in 2006. This survey is an essential tool for setting the direction of the various Washington tree fruit industry organizations. Strong grower participation is needed so that these organizations can align their work with the realities of current industry varietal plantings and future growth projections. It is vital that greater consumer demand be created through the proper allocation of resources.

Changes in varietal acreage plantings, ever more trees per acre, and the effects of accelerating industry consolidation are a few of the components that are driving the need for industry organizations to stay current with what is happening at the orchard level. Identifying current varietal production is paramount to the long term success of our growers on multiple levels;

- Confirming the ever-changing varietal plantings alerts commissions to the proper allocation of resources to promote and market our tree fruits. Domestic and international marketing strategies must align if we are to grow future demand supported by the most opportune promotional activities.
- Export market access is critical to protecting our domestic market and improving grower profitability. As our varietal trends change, keeping and gaining access to current, new, and emerging markets is mandatory to our overall industry's long term success.
- Getting more healthy and nutritious Washington tree fruits into consumers' hands—at a profit to growers—is our true success. Confirming acreages and extrapolating future volumes provides the guidance necessary to stay ahead of the production curve with consumption-increasing messages.

Being responsive to grower needs is the focus of all of our industry organizations. Confirming the current and future growth path of Washington tree fruits is important to the success of each of our organizations. We all understand the effort needed by you to complete the NASS survey, but know that once this information has been collected and complied, it will be put to the best use in representing you and your fellow growers in building towards a 'fruitful' future.

Your assistance in participating in the NASS Tree Fruit Acreage Survey would be greatly appreciated!

Sincerely,

Washington Apple Commission

Washington Growers Clearing House

Yakima Valley Growers - Shippers Assn

Northwest Horticultural Council NHC

Washington State Fruit Commission

Pear Bureau Northwest

Wenatchee Valley Traffic Association WVTA

Northwest Fruit Exporters

Washington State Horticultural Assn

The Marketing Associations

Washington State University Tree Fruit Research Commission

Sara Cornell

From: Vicky Scharlau [vicky@wawgg.ccsend.com] on behalf of Vicky Scharlau [info@wawgg.org]
Sent: Thursday, August 18, 2011 4:11 PM
To: sara@wawgg.org
Subject: WAWGG: Grape Post for August 2011

Categories: WAWGG

the GRAPE POST

AN OFFICIAL PUBLICATION OF THE WASHINGTON ASSOCIATION of WINE GRAPE GROWERS

August 2011

WINE SCIENCE CENTER

Today the Washington State Wine Commission made the formal announcement to dedicate increased assessment funds to build a Wine Science Center at WSU Tri-Cities. The assessment increase for grapes and on wine - $2/ton and $.02/gallon - will go into effect this harvest. Over the next 10 years the increase will generate $7.4 million to help secure public and private funding to complete the project. To read the letter please click here. If you are a Washington winery or grower and did not receive this letter directly from the Commission today it means you have not yet signed up for their email distribution. To do so, please click here.

If you'd like to read the press release on the announcement click here.

WINE ECONOMICS FORUM

The Washington Wine Industry Foundation and Moss Adams teamed up to present topics that help strengthen your business operations. Presentations target both wineries and vineyards and include:
- Strategic Accounting & Tax Planning Opportunities
- Current Consumer Behavior Trends
- Breakout Sessions for Owners and Controllers
- Washington Wine Benchmarking Survey Recap

Thursday, December 8, 2011
9:00am-4:30pm
Three Rivers Convention Center
Kennewick, WA
Registration required and is $125.
Early registration at $95 ends September 15.
To register and for more information:
www.washingtonwinefoundation.org

SUMMER TOUR HIGHLIGHTS SYRAH

The full day of education, centered on the theme "Berry to Bottle: A Review of Yakima Valley Syrah," began at Red Willow Vineyards, west of Yakima, where Mike Sauer spoke on the unique characteristics of his location and Efeste Winemaker, Brennon Leighton, along with winemaking consultant, Erik Brasher, commented on the attributes of Red Willow grown Syrah. From there, Dick Boushey let the group through

WEBSITE HOTLINKS

EVENTS
Events, classes and workshops

BULK WINE DATING
2 new listings

GRAPE DATING
23 new listings

ADVERTISING
Advertise with WAWGG

CLASSIFIEDS
Items For Sale or Rent

EMPLOYMENT
Job Seeking and Postings

VINEWISE
Guide to sustainable viticulture

WINERYWISE
Coming soon!

MEMBERSHIP DUES SET FOR 2012

At their July meeting, the WAWGG Board of Directors approved holding 2012 membership dues at the same rate as those in 2011. And remember, you must be a 2012 WAWGG member to receive the member discount on annual meeting, convention, and trade show registration!

WAWGG MANAGES WINE ADVISORY COMMITTEE

The Washington State Wine

Boushey Vineyards, near Grandview. Among the distinctive qualities of his location was a slightly cooler climate than neighboring vineyards. Ron Bunnell of Bunnell Family Cellars and Brennon Leighton shared their opinions and insights of the resulting Syrah in their winemaking.

After lunch the group headed to Ciel du Cheval Vineyards on Red Mountain where Jim Holmes discussed yet another set of unique characteristics as well as some of the differences in Syrah clones. Ryan Johnson, of Ciel du Cheval Vineyards, and Brennon Leighton were on hand to follow up from the winemaking perspective.

Next, Scott Williams welcomed the group to Kiona Winery, where a tasting of Syrah from all three vineyards preceded the tour's conclusion. Throughout the day, Dr. Alan Busacca of Alma Terra Wines shared his knowledge of Yakima Valley geology.

Mark your 2012 calendar for the first Thursday in August for next year's Summer Tour.

(In photo below: Mike Sauer-Red Willow Vineyards, Brennon Leighton-Winemaker at Efeste, Erik Brasher- Winemaking Consultant)

2011 CROP ESTIMATE

The WAWGG Crop Estimating Work Group estimated the 2011 Washington State wine grape crop at 128,441 tons and the Washington office of National Ag Stats Service announced their crop forecast at 135,000 tons. It is important to note that these are NOT harvest estimates. As a means of comparison, the 2010 actual and projected tonnage and 2011 projected tonnage and estimated acres are below. The WAWGG crop estimate last year was 155,700 tons and the National Ag Statistics Service actual crush figure was 160,000 tons.

SOURCE-	2009	2010	2011	2012 (potential)
Crop Estimate (WAWGG)	149,373	155,700	128,441	176,000 (est.)
Actual (NASS)	156,000	160,000	TBD	TBD

While the crop is down from last year, the potential for rebound in 2012 is great and the industry is urged to give consideration to the impact.

Suggested prices by variety were mailed to WAWGG grower and winery members. Consideration was given to marketplace supply and demand for both grapes and wine, by individual varieties and based on discussions with wineries and growers. It is important for growers to base their prices

Commission has contracted with WAWGG to manage the Wine Advisory Committee for 2011/2012. The WAC is made up of growers appointed by WAWGG and wineries appointed by the Washington Wine Technical Group who identify industry research priorities and then recommend funding to WSU based on funds received from the state budget, liquor taxes as well as funds from the Commission. While the amount varies year-to-year, the recent total has been just under $600,000.

2012 NATIONAL WINE AND GRAPE POLICY CONFERENCE DATES SET

The conference is set for March 11-14, 2012 at the Washington Court Hotel, Washington, D.C. Cutoff date for the room block is February 10. For hotel reservations, call the Washington Court Hotel at (800) 321-3010 and reference the Wine and Grape Policy Conference to receive the special group rate. Contact WineAmerica if you have problems reserving a hotel room: (202) 783-2756.

COP CALCULATOR NEARS COMPLETION OF UPDATE

The Northwest Grapes Vineyard Cost of Production calculator is in the final stages of being updated. The workgroup conducting the updating is now seeking volunteers to help test. If you have interest, please contact WAWGG at info@wawgg.org or 509-782-8234. The COP Calculator was made possible with funds from a grant partnership between the Washington Wine Industry Foundation and the US Department of Ag. The COP Calculator is maintained by WAWGG.

2011 VINEYARD ACREAGE REPORT NOW AVAILABLE

Please click here for the Washington Vineyard Acreage Report 2011 released on August 16, 2011. Please visit the NASS website for more information:

Sara Cornell

Subject: FW: WAWGG: Grape Post for March 2011

From: Vicky Scharlau [mailto:vicky@wawgg.ccsend.com] **On Behalf Of** Vicky Scharlau
Sent: Tuesday, March 22, 2011 10:25 AM
To: julie@wawgg.org
Subject: WAWGG: Grape Post for March 2011

the GRAPE POST

AN OFFICIAL PUBLICATION OF THE WASHINGTON ASSOCIATION of WINE GRAPE GROWERS

March 2011

DOT BEGINS ROADSIDE SPRAYING

In an effort to be good neighbors, the Washington State DOT contacted WAWGG recently about their plans to start spraying the herbicide "Payload" on roadsides in certain areas through the end of March.

The areas to be sprayed are:
SR-243 Milepost 0.0-28.0
SR-28 Milepost 22.0-29.0
SR-262 Milepost 0.0-24.0
SR-26 Milepost 25.0-29.0
SR-17 Milepost 40.0-44.0

For information or to be sure DOT is aware of your vineyard contact Randy Gunderson (DOT Spray Tech) at 509-431-1384 or Kirk Poldervart, Supervisor at 509-765-6145 or cell at 750-4312.

Our thanks to the DOT for their outreach efforts.

Click here for more information about drift monitoring and leaf indexing.

WAWGG HIRES AG LOBBYIST

Starting last month, WAWGG hired Mike Schwisow as a contract lobbyist. A Ritzville native, Cougar Alumni, and former Deputy Director of the Washington State Department of Agriculture, Mike will provide legislative and regulatory monitoring year-round on behalf of WAWGG. Mike is also a lobbyist for the Columbia Basin Development League, which addresses depletion of the aquifer in the Odessa Ground Water Management Area, as well as a lobbyist for the Washington State Water Resources Association, which represents the state's irrigation districts. Mike serves on the Columbia River Policy Advisory Group, advising Ecology on implementation of the Columbia River Water Management Program.

THANKS TO YOU!

The WAWGG Board and staff extends sincere gratitude to all participating in the 2011 Annual Meeting, Convention, and Trade Show: speakers, sponsors, session managers, exhibitors, volunteers, students, friends and attendees. From organization and preparation, to execution and feedback, YOU are key to the event's success.
Thank you!

2011 LATINO AG GRADUATION

Latino Ag Education Program
Certificate of Completion
Award Ceremony

Honoring graduates of
Introduction to Viticulture
and
Advanced Viticulture
6:00 p.m. Friday, March 25
Reception & Mariachi band follows

Yakima Valley Community College
Grandview Campus
Vineyard and Winery Technology
Workforce Education Center
Conference Room
500 W. Main Street, Grandview
Please RSVP to: Heidi@wawgg.org

ADVERTISE IN SERVICE & SUPPLIER DIRECTORY

Place your company in front of Washington's leading growers and

Click Here to see a list of 2011 State Legislature Bills

NATIONAL CLEAN PLANT NETWORK-GRAPE BOARD MEETS

The grape board of the NCPN met earlier this month at UC Davis. The National Clean Plant Network is a voluntary association of specialty crops joined to promote pathogen-tested, healthy plant material for food crops in the US. NCPN operates under three USDA agencies: Animal and Plant Health Inspection Service (APHIS), Agricultural Research Service (ARS) and National Institute of Food and Agriculture (NIFA), and they cooperatively support research, quarantine and outreach.

The impetus for NCPN came from the grape and fruit tree industries in 2005 when a national group formed devoted to provide foundation materials that are tested, treated and maintained as a healthy source of plant materials. Since then, "networks" for both grape and fruit tree developed with industry, scientists and others. Then in 2010, berries, citrus and hops were added. Each specialty crop "network" has a board and charter. Washington is represented by Ken Eastwell, WSU plant pathologist and Vicky Scharlau, WAWGG Executive Director.

The grape clean plant centers within the grape clean plant network include:

- Grapevine, Fruit Tree and Nut Tree Clean Plant Program at Foundation Plant Services, University of California, Davis, California
- Southeast Vine Improvement and Distribution Program, Florida A&M University, Tallahassee, Florida
- Midwest Grapevine Tissue Culture and Virus Testing Program, Missouri State University, Mountain Grove, Missouri
- Eastern Regional Grape Importation, Indexing and Clean Plant Program, Cornell University - New York State Agricultural Experiment Station, Geneva, New York
- Clean Plant Program of the Northwest, Washington State University - IAREC, Prosser, Washington

The headquarters of the grape clean plant network is at Foundation Plant Services at UC-Davis. They also manage the primary foundation vineyard for the NCPN.

AG STATS NEARING END OF ACREAGE SURVEY

USDA National Ag Stats Service is in the final phase of data collection and expects to complete work by March 31. If you have not yet reported your grape acres, please do so by the end of the month. The next step will beface-to-face interviews. USDA will contact all growers in 100 land segments over the next two months. However, even if you have already responded, you will be asked to respond to six specific questions:

1. Land operated in land segment
2. Tree fruit acres operated in land segment
3. Vineyard acres operated in land segment
4. Total acres operated, both inside and outside land segment
5. Total tree fruit acres inside and outside land segment

wineries as they look for services and supplies. The 2011 Service & Supplier Source Directory, mailed to all WAWGG members, serves as an industry reference guide. Deadline for placing an ad is March 25. Click here for rates and details.

ALSO: If you haven't already confirmed that your company listing is correct in the directory, please contact julie@wawgg.org

COMMISSION SPOT OPEN

A grower position on the Washington State Wine Commission is opening and WAWGG is requesting that interested individuals submit a bio for consideration. The position must be filled by a grower with 50 or less acres. Submit your letter of interest and a bio to WAWGG by Friday, April 8.

SAVE THE DATE!

Members: Mark your Calendar for the Annual WAWGG Members-Only Summer Tour Thursday August 4th. Details coming soon! Not a member? Join Here!

RADIATION FROM JAPAN

To help with questions you may receive about radiation and food, USDA and FDA released joint talking points on imports. Click Here for information. Radiation from damaged nuclear reactors in Japan is not a health risk in Washington. The Department of Health takes hourly measurements from monitors in four locations: Richland, Seattle, Spokane and Tumwater with information posted daily. Click Here to learn more about radiation monitoring.

STAKEHOLDER BILL

Thanks to the Washington Wine Institute, SB 5788 contains language that will address winery and industry trade shows. If passed, SB 5788 would allow wineries to pay booth fees to a charitable organization hosting an event, (a practice currently illegal). The bill would also simplify the process of payment for wine and would make clear that wineries and their employees do not need an Agents License to sell their own wine. Of specific interest and benefit to WAWGG

6. Total vineyard acres inside and outside land segment

The "area frame" is used to measure completeness of the grower list and to adjust data.

GRAPES ADDED TO NCPN ED/OUTREACH WORKING GROUP

Vicky Scharlau, representing national grape stakeholders, was added to the National Clean Plant Network Education/Outreach Working Group which met last month in Dallas. NCPN was created in the 2008 Farm Bill for pathogen diagnosis and elimination. The Network is to work with existing clean plant centers (including WSU IAREC at Prosser) to provide clean plant material to states for certification programs, the Network receives $5 million/year and currently covers fruit trees, grapes, citrus, berries and hops. The Education/Outreach group is tasked with creating and executing a national plan to communicate benefits of clean plants including higher yields, better quality fruit, greater variety, improved longevity, increased sustainability, improved competitiveness, and more environmentally friendly. Participants included:

- Tom Bewick, USDA/NIFA (NCPN Governing Board)
- Don Ferrin, Louisiana State Univ. (Tier 2 Citrus)
- Deborah Golino, Univ. of California at Davis (Tier 2 Grapes)
- Rosemary Hallberg, NC StateUniv. (IPMCenter - Southern)
- Linda Herbst, Univ. of California (IPMCenter - West)
- Lynnae Jess, Michigan State Univ. (IPMCenter - North Central)
- Sam Johnson, USDA/APHIS (NCPN Governing Board)
- Tim Martinson, CornellUniv. (Tier 2 Grapes)
- Terri Reddout, Washington State Univ. (Tier 2 Fruit Trees/Hops)
- Bill Shane, Michigan State Univ. (Tier 2 Fruit Trees)
- Nancy Sweet, Univ. of California at Davis (Grapes)
- Ioannis Tzanetakis, Univ. of Arkansas (Tier 2 Berries)
- Jim VanKirk, NC StateUniv. (IPMCenter - Southern)
- Vicky Scharlau, WA Assn of Wine Grape Growers (Tier 2 Grapes)
- Georgios Vidalakis, Univ. of California at Riverside (Tier 2 Citrus
- Erich Rudyj, USDA/APHIS (NCPN Coordinator)

NATIONAL GRAPE AND WINE POLICY CONFERENCE

Jointly sponsored by WineAmerica and the Winegrape Growers of America, the annual Grape and Wine Policy Conference in Washington, D.C. is an important opportunity to discuss and evaluate Federal policy issues affecting the wine industry, and to communicate directly to Members of Congress and the Administration. The meetings play an important role in the critical process of relationship building which is central to our mission of favorably influencing policy outcomes. It is also a opportunity for wine industry leaders from across the country to network with each other in formal and informal settings.

Hotel: Phoenix Park Hotel at 800-824-5419 ($275/night, tax not included)

Register here: www.wineamerica.org/membership/meetchoice.cfm

The Conference is Sunday, May 8 through Wednesday, May 11 and WAWGG will be setting appointments with all Washington's Congressional Delegation.

SUPPORT OF WINEAMERICA/OPPOSE CARE ACT

Lew Parker, owner of Willowcroft Farm Vineyards in Virginia and a WineAmerica board member is urging wineries to support and other industry trade shows, the bill adds a provision that will allow barrel vendors to provide wine samples at wine related trade shows. Without this change, the practice is illegal.

MCFA TECH CMTE MEETS

The Minor Crop Farmer Alliance Technical Committee met in Washington D.C. last month on a wide range of issues the group is addressing. The meeting included reports and updates from governmental representatives on issues critical to specialty crop farmers. MCFA provides a forum to address significant issues and a voice for action in domestic and international venues. Membership to MCFA is from commodity boards and food and agriculture trade associations including WAWGG. To read the MCFA Bulletin click here.

AG FORESTRY GRAPE SEAT

Recognizing the value of professional development for the industry's future leaders, WAWGG, the Washington Wine Industry Foundation (WWIF), and Ste. Michelle Wine Estates have been working over the last several years toward funding a Grape Seat in the Ag Forestry Leadership Program. The goal may soon be realized with the necessary dollars to fund a seat every other year now existing! WAWGG hopes to work with WWIF and Ste. Michelle Wine Estates to initiate funding a seat

yet this year.

WAWGG Board of Directors

Chair:
Lynne Chamberlain
Spofford Station Vineyards, LLC

Vice Chair:
Todd Newhouse
Upland Vineyards, LLC

Treasurer:

the GRAPE POST
AN OFFICIAL PUBLICATION OF THE WASHINGTON ASSOCIATION of WINE GRAPE GROWERS

October 2010

CROP INSURANCE MAY COVER GRAPE DAMAGE

Producers may be eligible to file a crop insurance claim that covers and has an adjustment for quality issues with production. Mature marketable grape production may be adjusted for quality deficiencies. Production is eligible for quality adjustment if, due to insurable causes, it has a value of less than 75 percent of the average market price of undamaged grapes of the same or similar variety. The average market price of the undamaged production will be calculated by averaging the prices being paid by usual marketing outlets for the area during the week in which the damaged grapes were valued. Grape production that is eligible for quality adjustment will be reduced by dividing the value per ton of the damaged grapes and multiplying this result by the number of tons eligible.

You must notify your insurance company within 3 days of the date harvest should have started if the crop will not be harvested. If the crop has been damaged during the growing season and you previously gave notice, you must also provide notice at least 15 days prior to the beginning of harvest if you intend to claim from the previous reported damage. Losses must be filed by the end of the insurance period of November 10th in Washington. Contact your insurance agent for more information.

Producers are encouraged to spend time between now and the sales closing date working with their crop insurance agent to learn specific details for the 2011 crop year. A list of crop insurance agents is available on the RMA website at: http://www3.rma.usda.gov/tools/agents

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WSDA FUNDS TREE FRUIT & GRAPE ACREAGE SURVEY

The Washington Growers Clearing House and WAWGG received a Specialty Crop Block Grant for $99,500 from the WSDA to provide for the development of acreage inventories in Washington by crop, variety, age and production. This project will provide powerful information tools for producers, not only to make decisions specific to our businesses, but also to communicate critical issues to legislators, regulators, consumers, other participants in the supply chain, and financial institutions. These pieces are vital ingredients to being able to accurately, efficiently, and effectively tell our story. The last survey was done in 2006.

Beginning in December, growers will receive survey forms to report acreage by variety, location, age, and production system. Additionally, you will be asked to report future intentions and any crop losses incurred this year. USDA's National Agricultural Statistics Service (NASS) will be collecting the data.

GETTING PAID WORKSHOP

Held at Grape Society Annual Meeting

Getting Paid: Tools for Washington Grape Growers
Friday, November 19, 2011
12:00 P.M. - 3:00 P.M.
Grandview

Session includes attorneys, bankers, and real life grower examples of grape sale contracts, processor liens, and PACA regulations. There is NO reason you should ever NOT get paid. The law is on your side.

WSGS registration deadline is **November 5**, so register today.

Additional *'Getting Paid'* workshops will be held on February 8 in Kennewick and on March 10 in Yakima.

These free workshops are presented by the Washington Wine Industry Foundation through a USDA Risk Management Agency Grant

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2011 BOARD NOMINATIONS

Nomination forms are being mailed for three board positions with terms expiring in February. The positions are currently held by Todd Newhouse, Lynne Chamberlain, and Kevin Corliss. According to the newly-adopted bylaws, candidates may be nominated by petition signed by a member in good standing for membership year 2010. The Board will review nominations at its January board meeting and a ballot will be mailed to members to be returned and counted before the February 10 annual meeting in

Tree Fruit & Grape Acreage Survey Announcement
Prepared for the Washington State Grape Society Annual Meeting
November 18-19, 2010

Making informed production, risk management and marketing decisions is dependent on good information. To improve access to sound information the tree fruit and grape industries are partnering to conduct another acreage survey. This project will provide powerful information tools for us as producers, not only to make decisions specific to our businesses, but also to communicate critical issues to legislators, regulators, consumers, other participants in the supply chain, and financial institutions. These pieces are vital ingredients to us being able to accurately, efficiently, and effectively tell our story.

Beginning in December, growers will receive survey forms to complete about their vineyards. You will be asked to report acreage by variety, location, age, and production system. Additionally, you will be asked to report future intentions and any crop losses incurred this year. USDA's National Agricultural Statistics Service (NASS) will be collecting the data.

All members of the industry will benefit from more accurate and timely industry data. For example:

- Acreage and density allows industry members to estimate crop volume. More specifically, varieties by acreage allows for assumptions to be made relative to yield potential and, thus, generate more accurate crop estimates.
- Assessing potential risks associated with variety concentrations in a given area, and measuring geographic dispersion of crop damage after weather events.
- Accurate acreage statistics provide an indication of the "health" of the industry and, thus, allows producers and affiliated agribusinesses to project both the long-term and short-term viability of the industry.
- Accurate data allows those of us who are growers, who are spending millions and paying significant amounts into the tax coffers, to make business decisions that keep us viable and sustainable for the long term.
- Analysis of the age of vineyards (including bearing and non-bearing acreage) also has a significant impact on crop analysis and the projection of crop estimates.
- Better collaboration with other agricultural producers and organizations to improve overall sustainability of agriculture within Washington State and, therefore, encouraging a greater degree of international competitiveness.
- (…. Add other applicable benefits)

Forms will be mailed to growers in early December. Please complete and promptly return the forms. The report will be published in August 2011.

The Washington State Grape Society is one partner in this project along with the Washington Association of Wine Grape Growers, Washington Wine Industry Foundation and several tree fruit organizations, led by the Washington Growers Clearing House Association. If you have questions, please see one of the board members or visit the NASS booth in the Trade Show.

Please take the time to complete your

Tree Fruit Acreage 2011 Survey

This survey is an essential tool used in setting direction for the various Washington tree fruit industry organizations. Only through your participation, will we be able to accurately plan for future market growth.

Identifying current varietal production is paramount to the long-term success of our growers and our industry. The tree fruit acreage study will enable us to:

- Properly allocate resources to promote and market our tree fruit varieties
- Maintain and expand existing markets, and gain access to new and emerging markets, based on varietal trends
- Stay ahead of the production curve with consumption-increasing messages to consumers

Help Us Build A

Fruitful Future

Together

With thanks, from

WASHINGTON GROWERS CLEARING HOUSE

WASHINGTON GROWERS CLEARING HOUSE

INDUSTRY INFO

MARKETING

Overall apple demand and movement has been excellent. Due to a delayed harvest the industry is behind the previous couple of season's shipment rates, but the state had record shipments this past week.

Red Delicious – Strong demand for premium fruit and sizes 88 & lgr. Size 125 & smaller will be a marketing challenge this season. A lot with no seeds.

Golden Delicious – Movement has been slow/flat. Despite heavy diversion and fruit left in orchard still picked a good sized crop. Just qualified for Mexico which has improved movement – concerns over potential impact of the Mexican tariff.

Gala – Excellent market on all sizes.

Granny Smith – Heavier to US Xfcy. Not many small sizes, fewer bag sizes. Could exceed indicated crop.

Fuji – Movement has been excellent. Currently packing five grades to ensure a consistent pack. Excellent color, blending with flecking.

Braeburn – Excellent color. Movement is slow. Cameo – Movement has been slow. Sizes are a bit small.

Honeycrisp – Hot market, movement has been excellent. Large sizes. Potential market for this apple through mid-January is between nine and eleven million boxes. If long term storage regime is determined we could sell fifteen to seventeen million boxes. . The demand for Honeycrisp has hurt early movement of Braeburn, Cameo & Jonagold, etc. Retailers want to stay with Honeycrisp as long as possible. Note: A lot of other state production areas are planting Honeycrisp.

Pink Lady – Size up slightly.

Bartlett pears – Very strong market, sold too many early. Nice very clean crop. Expect grower returns to be higher than last season.

D'anjou pears – packouts have been good. Domestic and export demand has been very good. Custom is currently focusing on selling fancy and 3rd grade fruit though mid-December. Custom is currently conditioning d'anjou pears but not Bartlett.

Bosc - Could use a few more. Very good market.

CLEARING HOUSE BUDGET

As expected the association incurred a loss in 2009-10, due in part to the final costs associated with the data base upgrade and increased health care costs. The recommended six month reserve account remained intact.

The Clearing House board approved the 2010-11 budget

REGISTER OR RE-REGISTER FOR THE WEB SITE?

Go to www.waclearinghouse.org. Click on the **Register** button on the upper left side. Complete the member registration form by filling in your name, phone number, email address, who packs your fruit (non growers enter your company name), create a password, enter it in again, click **Submit**.

Your registration will be processed and checked to see if you are a current member prior to approval.

You will get an email to let you know that you have been approved. Then go back to the web site and enter in your **email address** and **password**. Click on **Submit** to enter the members only section.

If you forgot your password, click on **Forgot Password** and it will be emailed to you.

A member with this email address was not found. Please check your entry. You will need to re-register.

Everyone needs to re-register once a year for security reasons.

Tree Acreage Survey.

The Tree Acreage survey will be mailed out December 1st. A joint industry group letter will be mailed to growers encouraging them to participate in the survey. Growers will also have the opportunity to complete a survey at the Horticultural Association Annual Convention in Yakima on December 6, 7th and 8th.

The survey will determine industry trends on conventional and organic acreage, varieties planted and density, etc. which will be a valuable tool for grower, marketer, warehouse, supplier, banker, etc. planning.

Growers are encouraged to fill out the survey.

FUTURE OF FARMING

WSDA had invited all commodity groups to attend and present brief comments on each commodity groups activities related to the recommendations outlined in the Future of Farming strategic plan. Manager Kirk Mayer had submitted a written list of tree fruit industry activities that corresponded to those recommendations. Jon Devaney, Yakima Growers & Shippers also participated. Additional presentations included: Office of Farmland Preservation, WSDA Farm to School program, WSDA Food Assistance program, Puget Sound Regional Food Council, WSDA-Implications of NMFS' Salmon/Pesticide BiOP, WSU President - Dan Bernardo, and Assistant WSDA Director Bob Gore.

YOUR TREE FRUIT GROWER BOARD OF DIRECTORS

Frank Lyall, Pres.....Lower Yakima Valley
Scott Dorsing VP……..South Columbia Basin
Dennis Berdan…….....…….Squilchuck
Dave Bitterman.....…East Wenatchee
Mark Clayton.....…….……...Orondo
Phyllis Gleasman...…….....……...Manson
Sam Godwin…….....…...…Tonasket
Kurt Guelich…….....Omak-Okanogan
Kent Karstetter……..…....North Columbia Basin
Kim Kennedy.. ……....……..……Cashmere
Ed Kenoyer.....Monitor
Kevin Knight.....…Upper Yakima Valley
James Koempel……..…...Dryden
Tim McLaughlin…….Wenatchee-Sunnyslope
Gary Middleton……..…..…Tri-Cities Area
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Dennis Nicholson…..Peshastin-Leavenworth
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Allan Schmidt..……..…Mid Yakima Valley
Mark Stennes….....……..Methow-Pateros
Richard Thomason……..….....…..Brewster
Brian Westerdahl……..……Bridgeport
Vacant.....Malaga

YOUR STAFF
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MANAGER
DAN P KELLY
ASST MGR
VALERIE HARTNETT
ADMIN ASST
CHARLOTTE RANDOLPH
MEMBERSHIP

Volume 15
November 24, 2010

PERIODICALS
PREFERENTIAL HANDLING

November 24, 2010

WA GROWERS CLEARING HOUSE BULLETIN (ISSN-0746-3553) is published weekly with an additional mailing every 2nd & 4th Thursday of the month with two additional mailings the third week of February & October, which is included in the annual membership of the WA Growers Clearing House Assn Inc 2900 Euclid Ave. Wen. WA 98801. Periodicals postage paid at Wen. WA Postmaster; Send address corrections to WA GROWERS CLEARING HOUSE 2900 Euclid Ave Wenatchee, WA 98801.

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www.waclearinghouse.org

"Serving Tree Fruit Growers Since 1941"

DISTRICT CROP REPORTS AS OF November 18

Kevin Knight, Upper Yakima Valley – Good apple crop, expect Red Delicious and Fuji picked short. Some blocks of Red Delicious not picked due to poor size. Pear crop was lousy, rough looking, due to cold weather, hail, etc. Honeycrisp being planted.

Sam Godwin, Tonasket – Apples down 4 ½%; pears down 15%. Good year but not a big year. Mild weather allowing growers to put orchards to bed quickly. Labor was tight.

Kurt Guelich, Omak/Okanogan – Overall apples and pears were down 15 to 20%. Fruit size was down on everything except Golden Delicious and Honeycrisp. Poor weather in April & May hurt fruit cell division. Very good October and early November weather. Adequate labor. Aggressively pruning before snow.

Mark Stennes, Methow/Pateros – Red Delicious and d'anjou crops were down significantly. Good Golden Delicious crop picked to estimate, very clean crop. Aggressively pruning, cheaper with no snow.

Gary Middleton, Tri-Cities – Since last meeting picked Fuji and Pink Lady. Fuji down slightly, with a lot of flecking. Pink Lady size was down slightly. Quality issues, mostly russet and bruising will reduce packouts/yields.

Kent Karstetter, North Columbia Basin – Red Delicious some blocks didn't size, even those with seeds. Golden Delicious were rough. Fuji had size issues. Braeburn good size. The district is hard to estimate due to the fact that there are a lot of young high density trees coming into production. Some orchard removal but being fumigated for replant. Some new Honeycrisp plantings.

Allen Schmidt , Mid Yakima – Still picking some Fuji and Pink Lady apples. A lot of new high density plantings in the Royal and Benton City areas. Some plantings have 1,000/1,500 trees per acre. Red Delicious size was down. Golden Delicious & Fuji – heavier to lower grades. Some Golden Delicious blocks have been removed. Labor was tight all season.

Maurice Sawyer, Oroville – Down about 17 to 18% across the board. Some replanting of newer varieties. Growers are aggressively conducting fall work in anticipation of heavy snows, etc. Had beautiful fall, adequate labor.

Tim McLaughlin, Wenatchee/Sunnyslope – Red Delicious had good size and color. Golden Delicious hit hard by hail, attempted to field sort but packouts too low to continue. Hail insurance didn't work. Orchard in South Bento County – heavy field sorting of Gala & Fuji due to russet, flecking and wind damage. Orchards managed North of I-90 has excellent quality, heavier to premium fruit. Growers are pruning as fast as possible. Forecast is for 10 to 15 degrees next week.

Brian Westerdahl, Bridgeport – Nice fall weather, good progress on orchard cleanup. A lot of sawing going on. Labor was a little tight.

Richard Thomason, Brewster – The district's crop was down about 25% overall. Warehouse has cut the number of shifts and is reducing overtime. The area had a shortage of legal available workers and as a result used H-2A workers. The workforce was hard working but about 75% effective. Guaranteed hourly wage rate didn't help.

Jim Koempel, Dryden – Bartlett's picked to estimate. D'Anjou down ten to fifteen percent. Pruning is about 25% done. Excellent fall weather but concerned about forecasted cold weather.

Frank Lyall, Lower Yakima Valley – Still picking some Fuji and Pink Lady apples. Fuji have mixed sizes and quality issues due to russet and flecking. Some orchard removal.

Allan Robison, Chelan - Missed estimate on Red Delicious due to smaller sizes. Delayed harvest on Braeburn and Fuji due to lack of color which helped size. Encouraged by the fact the state had its best week of apple shipments last week. Strong market. It appears that the marketers made a market adjustment in November rather than waiting for January. Quality is an issue, some 3rd grade fruit has been sold at $10.00 per box well below grower breakeven.

Scott Dorsing, South Columbia Basin – Overall the volume was slightly above average. Red Delicious had good color, varied in size, size slightly below normal. Golden Delicious despite being thinned two or three times, more field sorting, and more direct diversion than usual, still picked a large crop. Fuji color was slow to break, quality rough due to russet and flecking. A Braeburn (organic) block and a 100 acre cherry orchard have been removed but the land is expected to be replanted to orchard.

Kim Kennedy, Cashmere – Harvest was about seven to ten days later than usual which helped size. Bartlett pears picked to estimate. d'anjou pear crop was down 10 to 12%. Pears were very clean, good packouts are expected.

Ed Kennoyer, Monitor – Good pear crop. Firelight has been an issue. Apples were down about 4%; Fuji down 50%.Some orchard removal: Concord pears, Golden Delicious & cherries are being replaced by Bartlett, d'anjou and Bosc pears.

Phyllis Gleasmon, Manson - Deer already coming into the orchards, a sign that an early winter is expected. On November 8th & 9th Phyllis attended a Pacific NW Food Safety workshop in Portland. Retailers are increasing their demands regarding food traceability from orchard to consumer plus other orchard food safety and worker issues. Rumor is that Wal-Mart will require orchard food safety certification by July 2013. Warehouses are dealing with issues related to the segregation of fruit with food safety certification and that without. It is unclear how retailers will address verification of food safety on purchases of foreign produce.

Dave Bitterman, East Wenatchee – Color was late to break delaying harvest. Labor was tight, even with a crop that picked seven million boxes below initial estimates. Would everything have gotten picked if we had picked to estimate? Production continues to move South of I-90. High density plantings continue.

Washington Growers Clearing House Bulletin

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Sales reported from **WENATCHEE ASSOCIATED MARKETERS & YAKIMA DISTRICT**
Sales reported from Jan 17-22, 2011
Bulletin No. 21
January 25, 2011

NOTE: FOB sales & averages do not include consigned sales or any price adjustments that might occur after the initial sale.

TOTAL	THIS WEEK		LAST	SEASON TO DATE TOTALS			
FOB AVG	CARS	FOB	WEEK	¢/LB	10/11	09/10	08/09
RED	739	**$17.35**	$17.29	.41¢	$16.57	$15.15	$16.48
GOLD	274	**$18.11**	$18.29	.47¢	$18.58	$16.77	$17.96
BRAEBURN	98	**$15.81**	$16.01	.45¢	$17.69	$16.20	$18.92
FUJI	344	**$20.16**	$19.22	.51¢	$20.27	$19.99	$21.36
JONAGOLD	19	**$16.70**	$15.42	.45¢	$17.99	$17.56	$20.16
GALA	528	**$21.32**	$21.09	.49¢	$19.57	$19.29	$20.99
ROME	8	**$14.73**	$15.04	.43¢	$17.24	$15.72	$18.14
HONEYCRISP	43	**$49.95**	$53.10	$1.13	$45.37	$40.29	$44.02
GRANNY SMITH	297	**$19.74**	$19.87	.47¢	$18.95	$17.29	$18.13
CAMEO	29	**$20.32**	$18.91	.50¢	$19.98	$16.50	$20.18
CRIPPS PINK	70	**$25.23**	$25.03	.66¢	$26.20	$23.85	$25.51
TOTAL ALL APPLES	2,474	**$19.86**	$19.67	.50¢	$20.05	$18.53	$20.12
D'ANJOU	156	**$21.95**	$22.99	.48¢	$21.12	$17.03	$20.95
RED ANJOU	11	**$28.19**	$25.59	.56¢	$25.03	$21.11	$24.87
BARTLETT	48	**$23.83**	$24.68	.45¢	$19.75	$16.78	$19.76
BOSC	47	**$21.01**	$20.97	.49¢	$21.46	$17.39	$18.93
TOTAL ALL PEARS	270	**$22.31**	$23.13	.48¢	$20.99	$17.34	$20.57

This table is all grades & sizes.

CARS ARE IN 1,000 BOX UNITS

This Bulletin is not an all-inclusive report. It is primarily the highlights.

Growers actual prices may differ due to grade, packout, fruit size, quality, & when sold.

Apples are **40#,** & Pears **44#** ctn. equivalents.

ALL PRICES SHOWN ARE CA & REGULAR STORAGE COMBINED

WAXF	GRANNY SMITH				RED DELICIOUS			
TRAY PACK	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX
72 & Lgr	34	$22.62	$10	$31	49	$19.87	$12	$26
80/88	39	$23.79	$15	$31	58	$19.56	$8	$25
100	34	$22.36	$15	$29	68	$18.13	$13	$21
113	18	$22.27	$17	$29	57	$17.73	$12	$21
125	9	$22.00	$19	$24	31	$16.85	$11	$20
138 & Sml	6	$21.58	$14	$24	13	$15.81	$11	$21
ALL EURO	15	$21.42	$15	$27	22	$20.05	$19	$25

RED DELICIOUS WAXF GRADE BREAKDOWN		
GRADE	CARS	AVG FOB
PREM	318	$18.74
WAXF #1	216	$16.99
WAXF #2	138	$16.40
TOTAL	673	$17.70

WAXF	GALA				FUJI				GOLDEN DELICIOUS			
TRAY PACK	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX
72 & Lgr	27	$24.08	$14	$30	51	$22.24	$11	$31	28	$20.50	$13	$27
80/88	59	$23.46	$14	$29	21	$24.71	$11	$31	30	$20.35	$12	$27
100	57	$20.53	$14	$25	21	$18.02	$11	$24	49	$19.27	$14	$23
113	48	$19.19	$15	$24	9	$16.86	$11	$23	28	$17.93	$11	$23
125 & Sml	29	$17.39	$13	$21	8	$14.20	$10	$20	19	$14.94	$7	$23
ALL EURO	39	$23.04	$21	$27	11	$24.31	$21	$31	21	$22.04	$21	$25

WAXF GRADE BREAKDOWN BY VARIETY

	RED	GOLD	BRAEBURN	FUJI	JONAGOLD	GALA	HONEYCRISP	GRANNY
WAXF PREM	$18.74	$19.76	$16.98	$24.87	$17.66	$23.27	$55.57	$23.39
WAXF #1	$16.99	$18.54	$14.97	$20.36	$15.76	$20.91	$53.54	$20.84
WAXF #2	$16.40	$17.16	$12.31	$19.57	$12.04	$19.16	$25.02	$19.96
TOTAL WAXF	$17.70	$19.24	$15.87	$21.91	$16.76	$21.68	$52.96	$22.16

WAXF	HONEYCRISP				BRAEBURN				JONAGOLD			
TRAY PACK	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX
72 & Lgr	15	$51.38	$26	$61	29	$16.67	$9	$26	8	$16.11	$9	$23
80/88	7	$52.61	$30	$70	25	$17.31	$9	$23	4	$19.29	$14	$25
100 & Sml	2	$34.85	$21	$59	18	$12.88	$9	$23	3	$13.45	$10	$20

US #1	ANJOU				BARTLETT				BOSC			
Std PACK	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX	CARS	AVG FOB	MIN	MAX
90 & Lgr	28	$23.32	$21	$27	21	$27.33	$25	$31	17	$24.27	$18	$29
100	10	$22.58	$20	$25	2	$25.09	$25	$25	4	$22.01	$20	$27
110	10	$20.72	$19	$24	5	$21.84	$17	$27	3	$20.85	$16	$23
120 & Sml	12	$19.94	$17	$23	4	$17.57	$13	$23	6	$15.71	$14	$18
ALL EURO	30	$23.48	$19	$28	10	$24.48	$22	$29	6	$24.00	$22	$31

Bulletin No. 21 January 25, 2011

''SERVING WASHINGTON TREE FRUIT GROWERS SINCE 1941''

SHIPMENTS WENATCHEE & YAKIMA SEASON 10-11 COMPARISON W/09-10 & 08-09*

	WENATCHEE			YAKIMA			BOTH DISTRICTS			EST STG
AS OF 01/23/11	**10-11**	**09-10**	**08-09**	**10-11**	**09-10**	**08-09**	**10-11**	**09-10**	**08-09**	**10-11**
RED DELICIOUS	218	245	253	479	454	480	697	699	733	20,031
GOLDEN DELICIOUS	105	101	139	135	117	150	240	218	289	7,485
GRANNY SMITH	98	117	109	197	177	238	295	294	347	7,953
GALA	247	178	199	406	337	362	653	515	561	10,104
FUJI	137	155	160	234	274	284	371	429	444	8,728
JONAGOLD	11	6	10	23	34	29	34	40	39	601
BRAEBURN	38	32	40	74	82	91	112	114	131	2,146
CAMEO	15	18	20	16	24	18	31	42	38	597
CRIPPS PINK	31	33	27	76	57	68	107	90	95	1,959
HONEYCRISP	19	4	0	43	44	31	62	48	31	785
OTHER	68	39	33	32	15	18	100	54	51	1,189
WEEKLY TOTAL	**987**	**928**	**990**	**1,715**	**1,615**	**1,769**	**2,702**	**2,543**	**2,759**	
SEASON TOTAL	**13,782**	**15,455**	**14,302**	**28,717**	**27,353**	**26,305**	**42,499**	**42,808**	**40,607**	
SEASON ORG APPLES	**1,634**	**1,736**	**1,502**	**1,759**	**1,468**	**1,197**	**3,393**	**3,204**	**2,699**	**12,227**
SEASON ORG PEARS	**381**	**374**	**386**	**140**	**157**	**115**	**521**	**531**	**501**	**154**
EST STORAGE LEFT	**18,984**	**18,183**	**21,866**	**42,407**	**39,175**	**43,072**	**61,391**	**57,358**	**64,938**	**61,391**
DOMESTIC WEEK	645	526	594	1,174	1,128	1,209	1,819	1,654	1,803	
DOMESTIC SEASON	**9,480**	**10,710**	**9,792**	**19,947**	**20,418**	**20,087**	**29,427**	**31,128**	**29,879**	
EXPORT WEEK	342	402	396	541	487	560	883	889	956	
EXPORT SEASON	**5,290**	**5,673**	**5,497**	**10,486**	**8,551**	**7,987**	**15,776**	**14,224**	**13,484**	
BARTLETT WEEK	52	28	25	5	8	2	57	36	27	
BARTLETT SEASON	**1,844**	**2,028**	**1,759**	**721**	**745**	**735**	**2,565**	**2,773**	**2,494**	139
ANJOU WEEK	179	199	148	58	50	27	237	249	175	
ANJOU SEASON	**2,370**	**2,829**	**2,213**	**979**	**902**	**784**	**3,349**	**3,731**	**2,997**	5,104
BOSC WEEK	49	58	39	20	32	13	69	90	52	
BOSC SEASON	**531**	**508**	**495**	**406**	**353**	**354**	**937**	**861**	**849**	850

*Report from Wenatchee Valley Traffic Association

PROCESSING PRICES: Juice **$120-$150**/ton; Peelers **$120-$160**/ton. Pear Juice **$20-$50**/ton, limited supply.
ORGANIC: Juice **$140-$180**; Peeler **$140-$200**; Pear Juice **$150**.

MARKET COMMENT: Apple shipments for the week were above last season and just under two seasons ago by 57 cars. Domestic apple shipments were above both of the last two seasons. Export shipments for the week were below both of the last two seasons. January appears to be on pace for record apple shipments for the month. Organic apple shipments for the week and the season are above both of the last two seasons. Pear shipments were behind the larger crop last season and ahead of two seasons ago. Season to date pear shipments remain behind last season and ahead of two seasons ago. Organic pear shipments were ahead of both of the last two seasons. Season to date organic shipments are just behind last season and ahead of two seasons ago.

GRAS^{2}P "Tip of the Week" – – Accident Prevention Program (APP) An APP outlines the policies, procedures, and rules that you put in place to maintain a safe, injury-free work environment. A template for your APP is available in the GRAS2P manual or with sister organizations such as Washington Growers League and Washington Farm Bureau. The off-season is a good time to complete your APP and have it in place before the pruning activities commence. This is part of USDA GAP (G-14) and GlobalG.A.P. (AF3.3, 3.4, 3.5; CB8.8; FV4.1) and WAC (296-800-140).

TREE FRUIT ACREAGE SURVEY: Growers are reminded to complete your tree fruit acreage survey. If you have misplaced your survey or would like another call 800 435-5883 and they can help you. This is valuable information that the industry, growers and suppliers use for planning purposes. It's important to have a high number of grower responses.

CLEARING HOUSE BOARD DISTRICT ELECTIONS—Pesticide Credits Available—ALL GROWERS INVITED:
Brewster: Jan. 27, Camparos Restaurant, 10:00 AM. Pesticide Safety-2 credits. Incumbent: Richard Thomason.
Orondo: Jan. 27. Orondo Fire Hall, 2:00 PM. Pesticide Safety-2 credits. Incumbent: Mark Clayton

INDUSTRY MEETINGS:
9th Annual Hort Tree Fruit Day: Feb 01 Olympia. Growers need to pre-register by Jan 20th. Contact 509 665-9641.
Okanogan Hort Day: Feb. 02. Horticulture & pest management, Okanogan Co. Agriplex. 9:00 to 3:00. (2 credits)
WSDA Pesticide Hands On Training – Brewster March 01. Pre-registration required, contact Clearing House (6 credits)

CLEARING HOUSE ANNUAL MEETING: FEB. 8th WAC - Wenatchee. Agenda: 11:00 **NW Farm Credit Services**-Economic Update & helpful management & loan tools for growers; 1:00 **NW Hort Council** –Chris Schlect-Food Safety, Foreign Trade & other federal issues. Lunch is provided, pre-registration required for lunch count.

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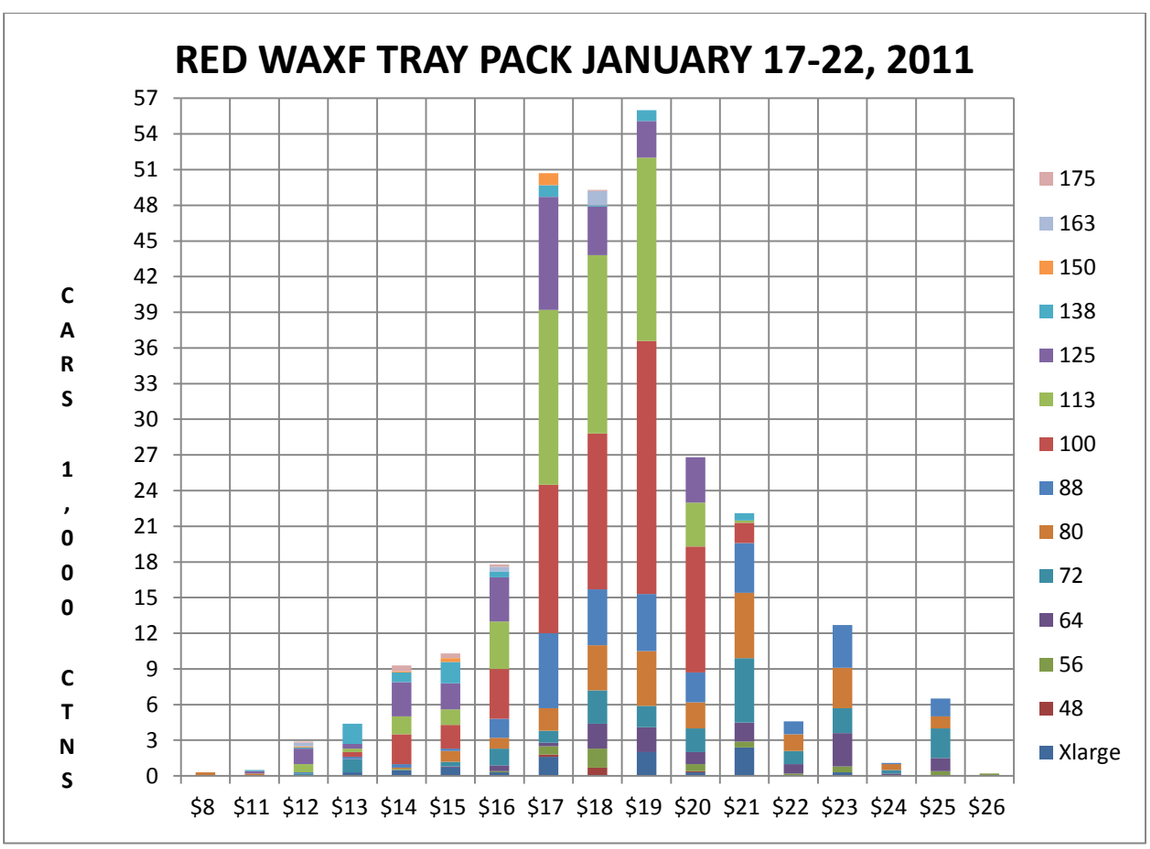
WASHINGTON GROWERS CLEARING HOUSE

RED WAXF TRAY PACK																		
	$8	$11	$12	$13	$14	$15	$16	$17	$18	$19	$20	$21	$22	$23	$24	$25	$26	TOTAL
Xlarge				0.3	0.5	0.7	0.3	1.6		2.0	0.3	2.4		0.3				8.4
48								0.2	0.7		0.1							1.0
56					0.1		0.1	0.7	1.6		0.6	0.5	0.2	0.5		0.4	0.2	4.9
64						0.1	0.5	0.3	2.1	2.1	1.0	1.6	0.8	2.8	0.2	1.1		12.6
72			0.2	1.1		0.4	1.4	1.0	2.8	1.8	2	5.4	1.1	2.1	0.3	2.5		22.1
80	0.3	0.2			0.1	0.9	0.9	1.9	3.8	4.6	2.2	5.5	1.4	3.4	0.5	1.0		26.7
88			0.1	0.2	0.3	0.2	1.6	6.3	4.7	4.8	2.5	4.2	1.1	3.6	0.1	1.5		31.2
100				0.4	2.5	2.0	4.2	12.5	13.1	21.3	10.6	1.7						**68.3**
113			0.7	0.3	1.5	1.3	4.0	14.7	15.0	15.4	3.7	0.2						56.8
125		0.2	1.3	0.4	2.9	2.2	3.7	9.5	4.1	3.1	3.8							31.2
138		0.1	0.1	1.7	0.8	1.8	0.5	1.0	0.1	0.9		0.6						7.6
150			0.1		0.1	0.3	0	1.0										1.5
163			0.3				0.4		1.2									1.9
175			0.1		0.5	0.4	0.2		0.1									1.3
TOTAL	0.3	0.5	2.9	4.4	9.3	10.3	17.8	50.7	49.3	**56.0**	26.8	22.1	4.6	12.7	1.1	6.5	0.2	**275.5**



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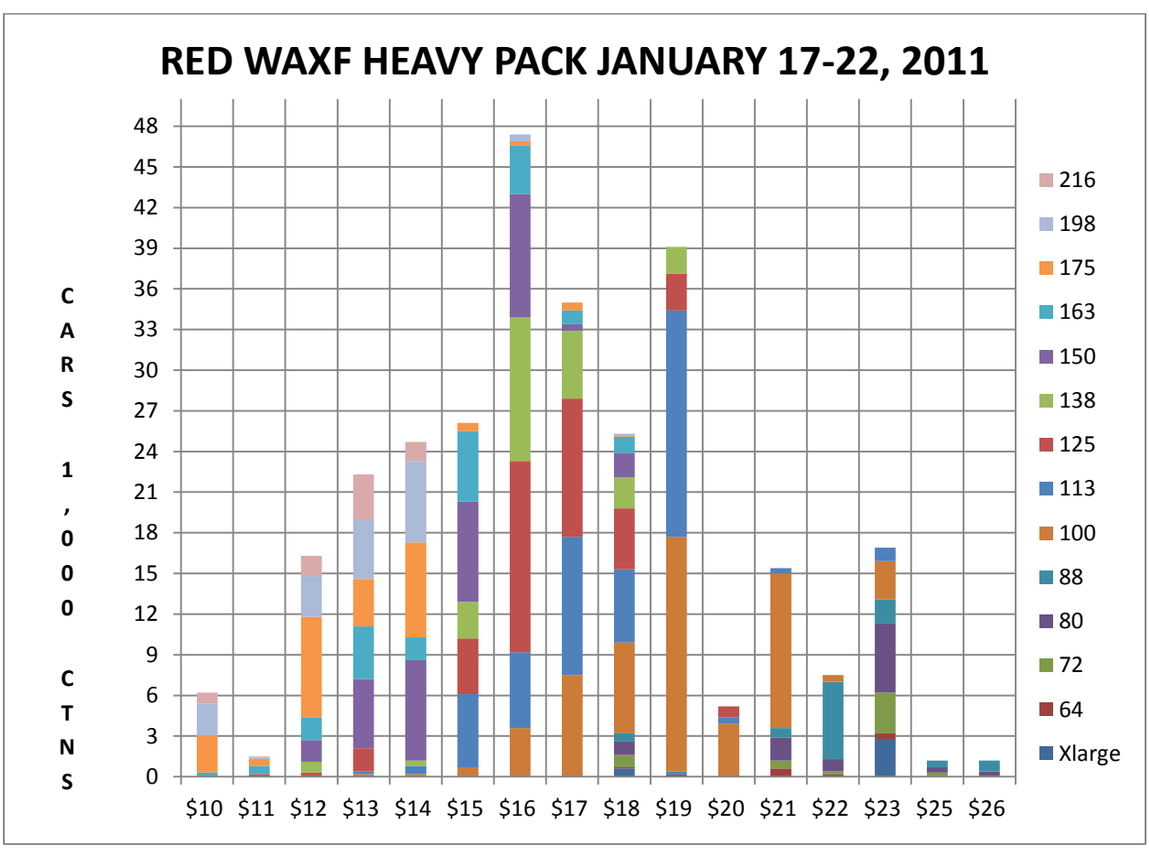
WASHINGTON GROWERS CLEARING HOUSE

RED WAXF HEAVY PACK																	
	$10	$11	$12	$13	$14	$15	$16	$17	$18	$19	$20	$21	$22	$23	$25	$26	TOTAL
Xlarge									0.6					2.8			3.4
64									0.1	0.1		0.6	0.2	0.4			1.4
72									0.9			0.6	0.2	3.0	0.3	0.1	5.1
80									1.0	0.1		1.7	0.9	5.1	0.4	0.3	9.5
88									0.6	0.2		0.7	5.7	1.8	0.5	0.8	10.3
100				0.2	0.2	0.7	3.6	7.5	6.7	17.3	3.9	11.4	0.5	2.8			**54.8**
113			0.1	0.2	0.6	5.4	5.6	10.2	5.4	16.7	0.5	0.4		1.0			46.1
125		0.2	0.2	1.7		4.1	14.1	10.2	4.5	2.7	0.8						38.5
138			0.8		0.4	2.7	10.6	5.0	2.3	2.0							23.8
150			1.6	5.1	7.4	7.4	9.1	0.5	1.8								32.9
163	0.3	0.6	1.7	3.9	1.7	5.2	3.6	1.0	1.2								19.2
175	2.7	0.5	7.4	3.5	7.0	0.6	0.3	0.6	0.1								22.7
198	2.4	0.1	3.0	4.4	6.0		0.5		0.1								16.5
216	0.8	0.1	1.5	3.3	1.4												7.1
TOTAL	6.2	1.5	16.3	22.3	24.7	26.1	47.4	35.0	25.3	**39.1**	5.2	15.4	7.5	17	1.2	1.2	**291.3**



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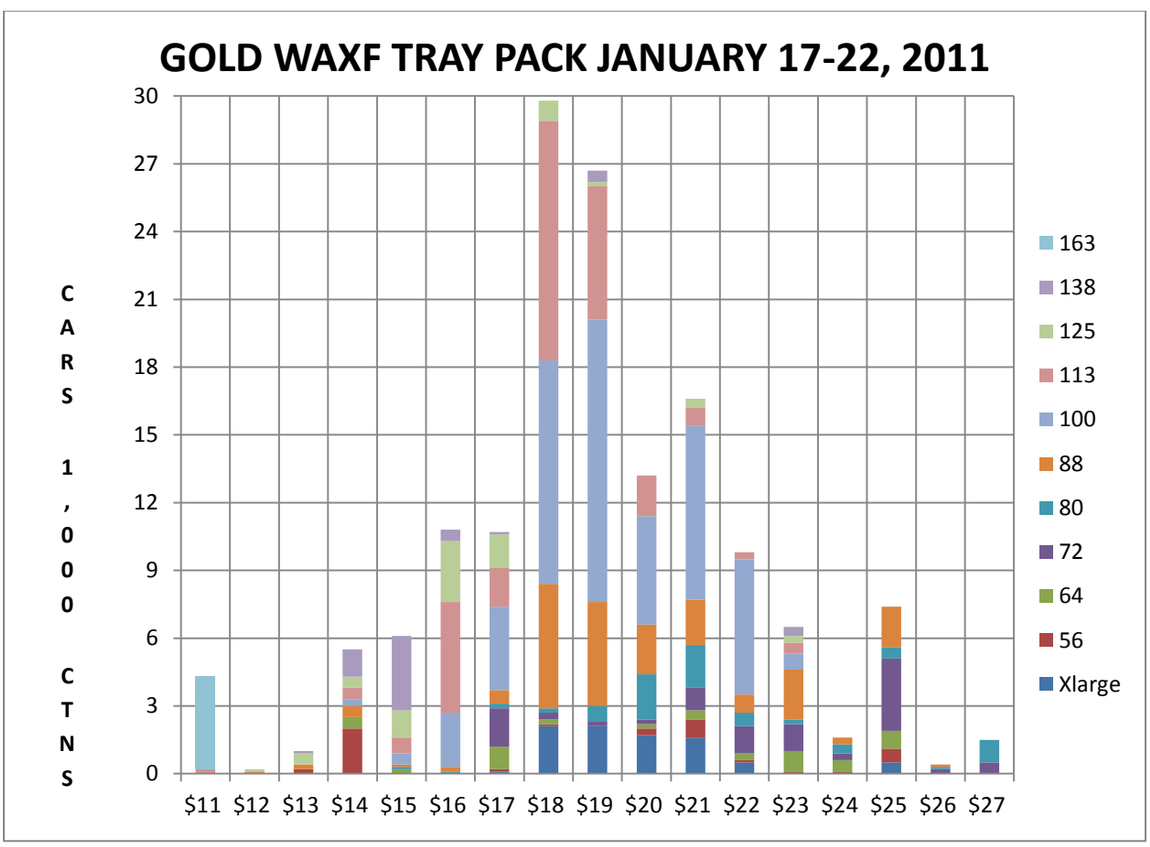
GOLD WAXF TRAY PACK																		
	$11	**$12**	**$13**	**$14**	**$15**	**$16**	**$17**	**$18**	**$19**	**$20**	**$21**	**$22**	**$23**	**$24**	**$25**	**$26**	**$27**	**TOTAL**
Xlarge							0.1	2.1	2.1	1.7	1.6	0.5			0.5			8.6
56			0.2	2.0			0.1	0.1		0.3	0.8	0.1	0.1	0.1	0.6			4.4
64				0.5	0.2		1.0	0.2		0.2	0.4	0.3	0.9	0.5	0.8			5.0
72							1.7	0.3	0.2	0.2	1.0	1.2	1.2	0.3	3.2	0.2	0.5	10.0
80					0.1	0.1	0.2	0.2	0.7	2.0	1.9	0.6	0.2	0.4	0.5	0.1	1.0	8.0
88		0.1	0.2	0.5	0.1	0.2	0.6	5.5	4.6	2.2	2.0	0.8	2.2	0.3	1.8	0.1		21.2
100				0.3	0.5	2.4	3.7	9.9	12.5	4.8	7.7	6	0.7					**48.5**
113	0.2			0.5	0.7	4.9	1.7	10.6	5.9	1.8	0.8	0.3	0.5					27.9
125		0.1	0.5	0.5	1.2	2.7	1.5	0.9	0.2		0.4		0.3					8.3
138			0.1	1.2	3.3	0.5	0.1		0.5				0.4					6.1
163	4.1																	4.1
TOTAL	4.3	0.2	1.0	5.5	6.1	10.8	10.7	**29.8**	26.7	13.2	16.6	9.8	6.5	1.6	7.4	0.4	1.5	**152.1**



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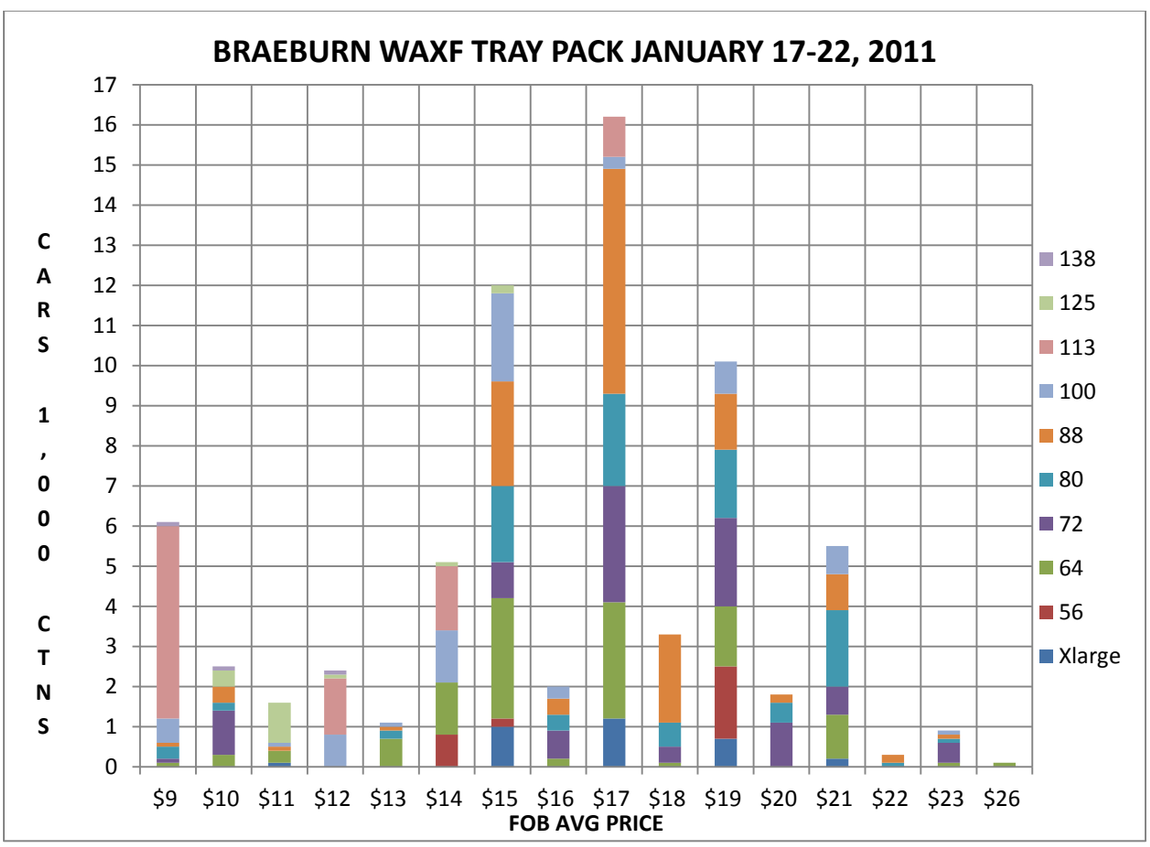
BRAEBURN WAXF TRAY PACK																	
	$9	$10	$11	$12	$13	$14	$15	$16	$17	$18	$19	$20	$21	$22	$23	$26	TOTAL
Xlarge			0.1				1.0		1.2		0.7		0.2				3.2
56						0.8	0.2				1.8						2.8
64	0.1	0.3	0.3		0.7	1.3	3.0	0.2	2.9	0.1	1.5		1.1		0.1	0.1	11.7
72	0.1	1.1					0.9	0.7	2.9	0.4	2.2	1.1	0.7		0.5		10.6
80	0.3	0.2			0.2		1.9	0.4	2.3	0.6	1.7	0.5	1.9	0.1	0.1		10.2
88	0.1	0.4	0.1		0.1		2.6	0.4	5.6	2.2	1.4	0.2	0.9	0.2	0.1		**14.3**
100	0.6		0.1	0.8	0.1	1.3	2.2	0.3	0.3		0.8		0.7		0.1		7.3
113	4.8			1.4		1.6			1.0								8.8
125		0.4	1.0	0.1		0.1	0.2										1.8
138	0.1	0.1		0.1													0.3
TOTAL	6.1	2.5	1.6	2.4	1.1	5.1	12.0	2.0	**16.2**	3.3	10.1	1.8	5.5	0.3	0.9	0.1	**71.0**



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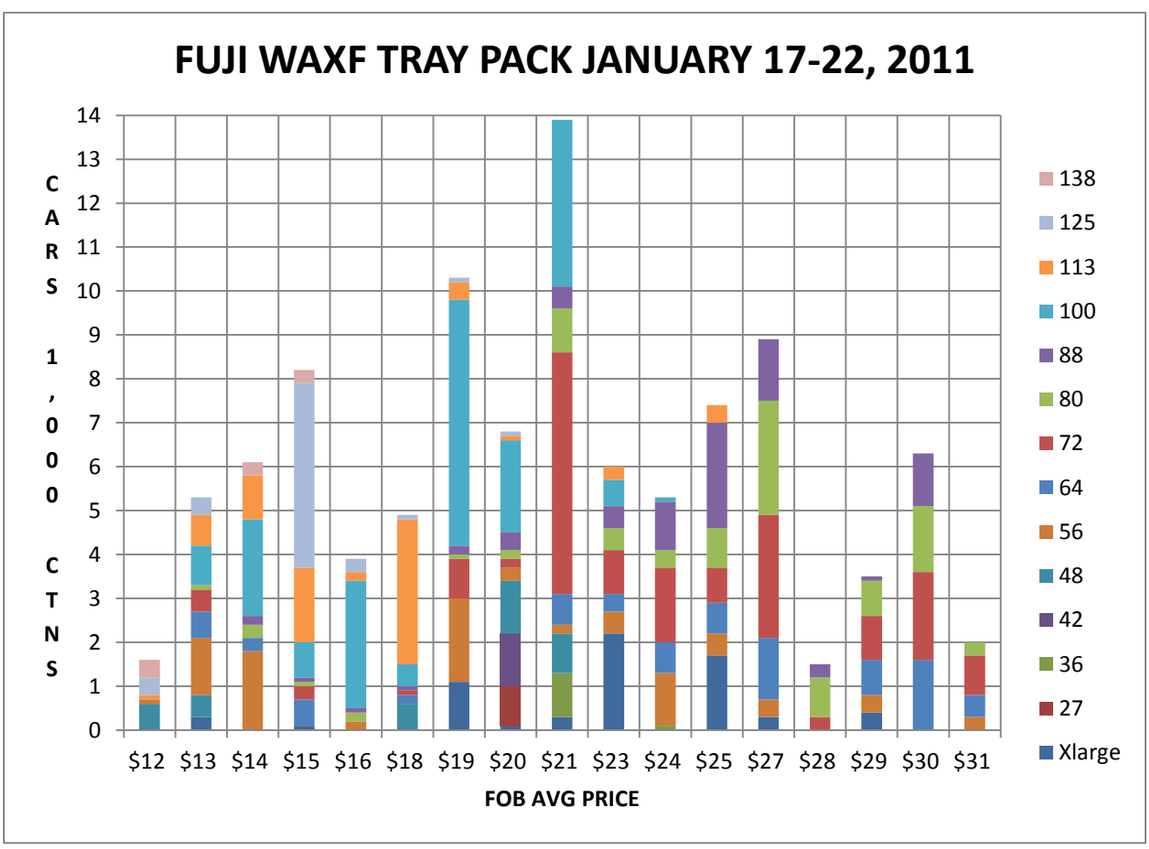
FUJI WAXF TRAY PACK																		
	$12	**$13**	**$14**	**$15**	**$16**	**$18**	**$19**	**$20**	**$21**	**$23**	**$24**	**$25**	**$27**	**$28**	**$29**	**$30**	**$31**	**TOTAL**
Xlarge		0.3		0.1			1.1	0.1	0.3	2.2		1.7	0.3		0.4			6.5
27								0.9										0.9
36									1.0		0.1							1.1
42								1.2										1.2
48	0.6	0.5				0.6		1.2	0.9									3.8
56	0.1	1.3	1.8		0.2		1.9	0.3	0.2	0.5	1.2	0.5	0.4	0	0.4		0.3	9.1
64		0.6	0.3	0.6		0.2			0.7	0.4	0.7	0.7	1.4		0.8	1.6	0.5	8.5
72		0.5		0.3		0.1	0.9	0.2	5.5	1.0	1.7	0.8	2.8	0.3	1.0	2.0	0.9	18
80		0.1	0.3	0.1	0.2		0.1	0.2	1.0	0.5	0.4	0.9	2.6	0.9	0.8	1.5	0.3	9.9
88			0.2	0.1	0.1	0.1	0.2	0.4	0.5	0.5	1.1	2.4	1.4	0.3	0.1	1.2		8.6
100		0.9	2.2	0.8	2.9	0.5	5.6	2.1	3.8	0.6	0.1							**19.5**
113	0.1	0.7	1.0	1.7	0.2	3.3	0.4	0.1		0.3		0.4						8.2
125	0.4	0.4		4.2	0.3	0.1	0.1	0.1										5.6
138	0.4		0.3	0.3														1.0
TOTAL	1.6	5.3	6.1	8.2	3.9	4.9	10.3	6.8	**13.9**	6.0	5.3	7.4	8.9	1.5	3.5	6.3	2.0	**101.9**



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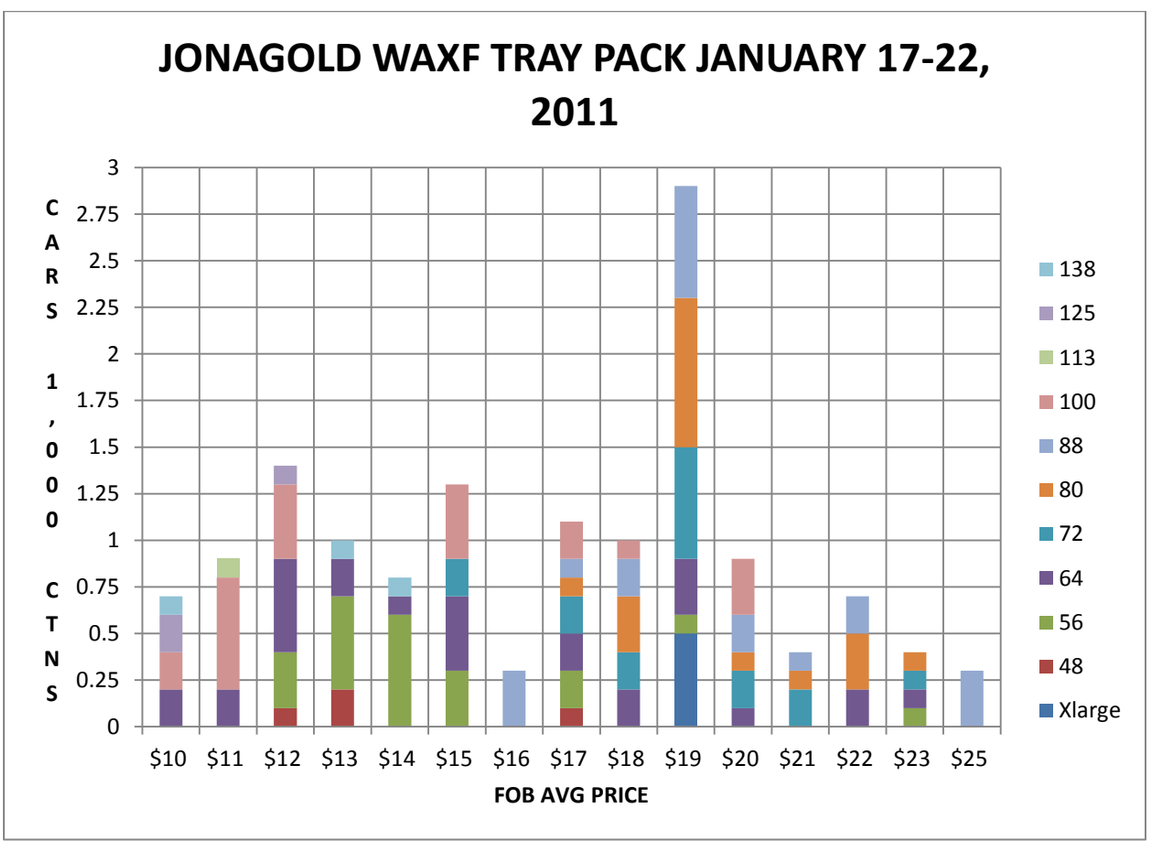
JONAGOLD WAXF TRAY PACK																
	$10	**$11**	**$12**	**$13**	**$14**	**$15**	**$16**	**$17**	**$18**	**$19**	**$20**	**$21**	**$22**	**$23**	**$25**	**TOTAL**
Xlarge										0.5						0.5
48			0.1	0.2				0.1								0.4
56			0.3	0.5	0.6	0.3		0.2		0.1				0.1		2.1
64	0.2	0.2	0.5	0.2	0.1	0.4		0.2	0.2	0.3	0.1		0.2	0.1		**2.7**
72						0.2		0.2	0.2	0.6	0.2	0.2	0	0.1		1.7
80								0.1	0.3	0.8	0.1	0.1	0.3	0.1		1.8
88							0.3	0.1	0.2	0.6	0.2	0.1	0.2		0.3	2.0
100	0.2	0.6	0.4			0.4		0.2	0.1		0.3					2.2
113		0.1														0.1
125	0.2		0.1													0.3
138	0.1			0.1	0.1											0.3
TOTAL	0.7	0.9	1.4	1.0	0.8	1.3	0.3	1.1	1.0	**2.9**	0.9	0.4	0.7	0.4	0.3	**14.1**



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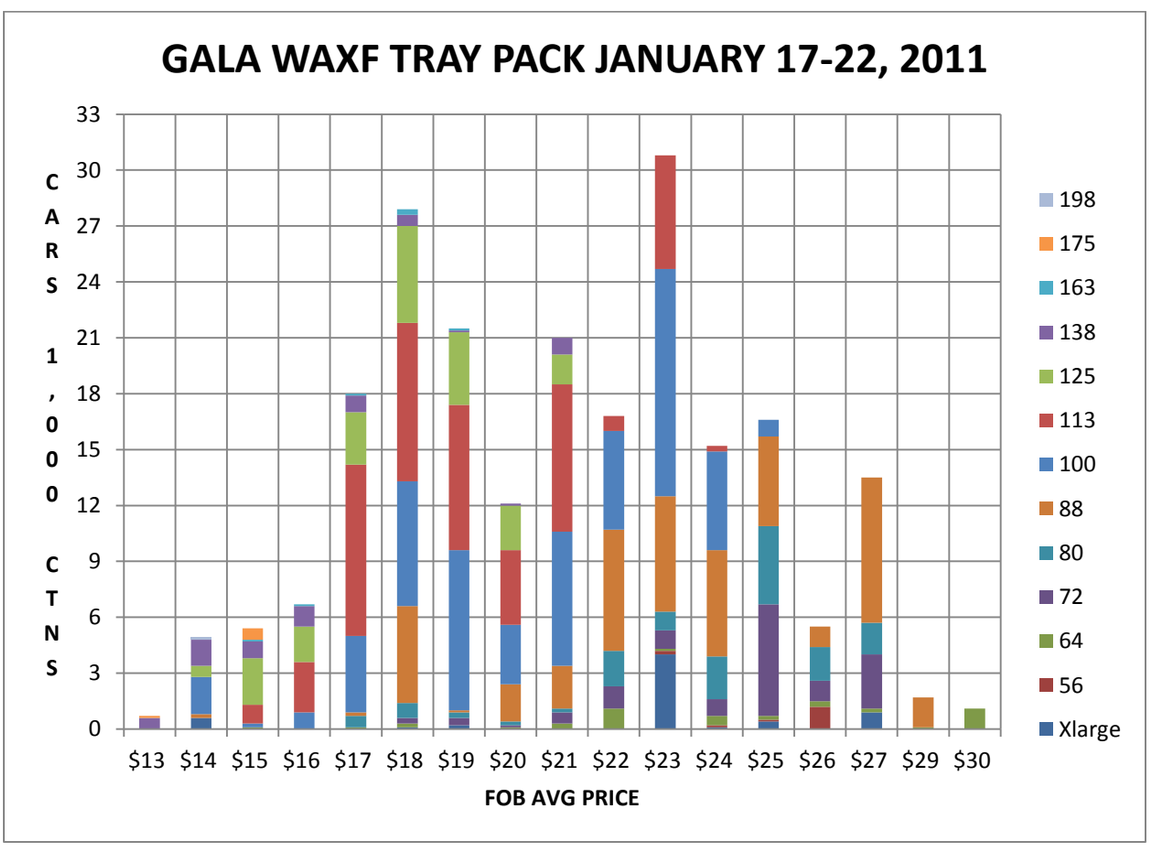
GALA WAXF TRAY PACK																		
	$13	$14	$15	$16	$17	$18	$19	$20	$21	$22	$23	$24	$25	$26	$27	$29	$30	TOTAL
Xlarge		0.6				0.1	0.2				4.0	0.1	0.4		0.9			6.3
56											0.2	0.1	0.1	1.2				1.6
64			0.1		0.1	0.2		0.1	0.3	1.1	0.1	0.5	0.2	0.3	0.2	0.1	1.1	4.4
72						0.3	0.4	0.1	0.6	1.2	1.0	0.9	6.0	1.1	2.9			14.5
80					0.6	0.8	0.3	0.2	0.2	1.9	1.0	2.3	4.2	1.8	1.7			15.0
88		0.2			0.2	5.2	0.1	2.0	2.3	6.5	6.2	5.7	4.8	1.1	7.8	1.6		43.7
100		2.0	0.2	0.9	4.1	6.7	8.6	3.2	7.2	5.3	12	5.3	0.9					**56.6**
113			1.0	2.7	9.2	8.5	7.8	4.0	7.9	0.8	6.1	0.3						48.3
125		0.6	2.5	1.9	2.8	5.2	3.9	2.4	1.6									20.9
138	0.6	1.4	0.9	1.1	0.9	0.6	0.1	0.1	0.9									6.6
163			0.1	0.1	0.1	0.3	0.1											0.7
175	0.1		0.6															0.7
198		0.1																0.1
TOTAL	0.7	4.9	5.4	6.7	18.0	27.9	21.5	12.1	21.0	16.8	**30.8**	15.2	16.6	5.5	13.5	1.7	1.1	**219.4**



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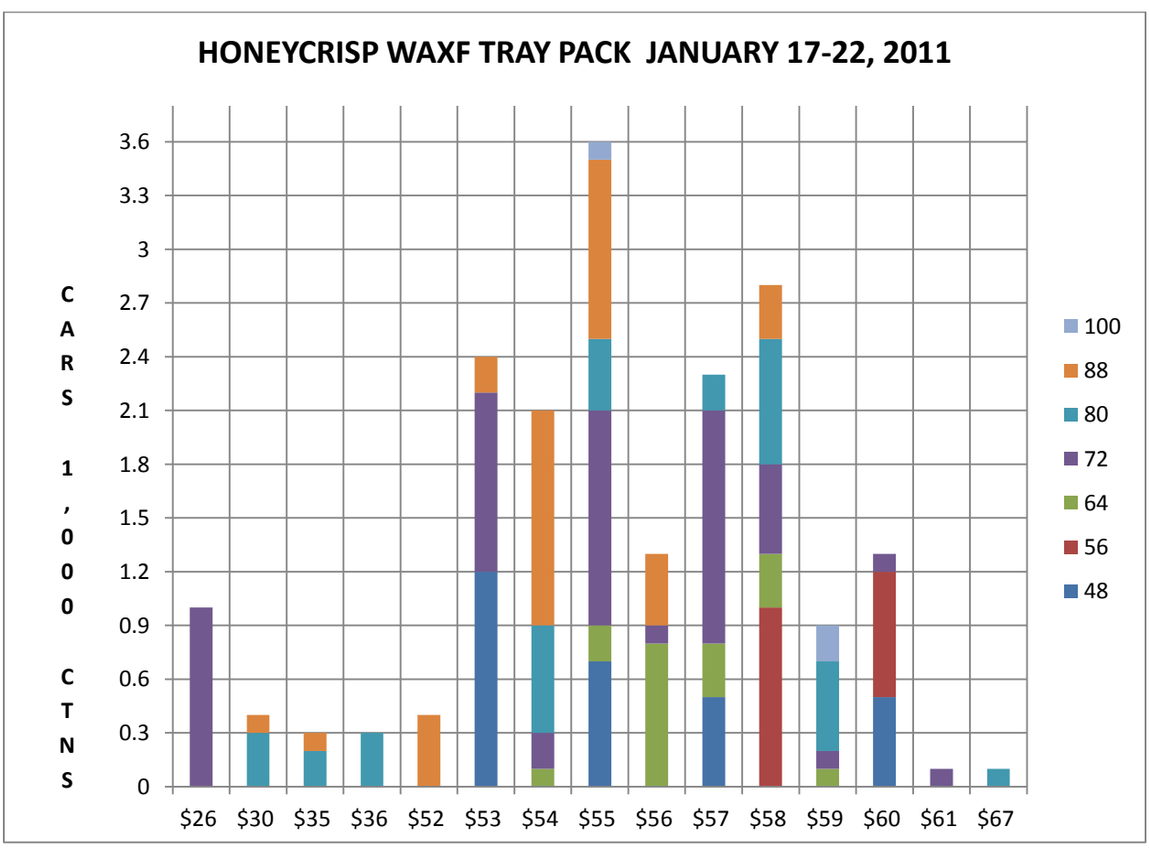
HONEYCRISP WAXF TRAY PACK																
	$26	$30	$35	$36	$52	$53	$54	$55	$56	$57	$58	$59	$60	$61	$67	TOTAL
48						1.2		0.7		0.5			0.5			2.9
56											1.0		0.7			1.7
64							0.1	0.2	0.8	0.3	0.3	0.1				1.8
72	1.0					1.0	0.2	1.2	0.1	1.3	0.5	0.1	0.1	0.1		**5.6**
80		0.3	0.2	0.3			0.6	0.4		0.2	0.7	0.5			0.1	3.3
88		0.1	0.1		0.4	0.2	1.2	1.0	0.4		0.3					3.7
100								0.1				0.2				0.3
TOTAL	1.0	0.4	0.3	0.3	0.4	2.4	2.1	**3.6**	1.3	2.3	2.8	0.9	1.3	0.1	0.1	**19.3**



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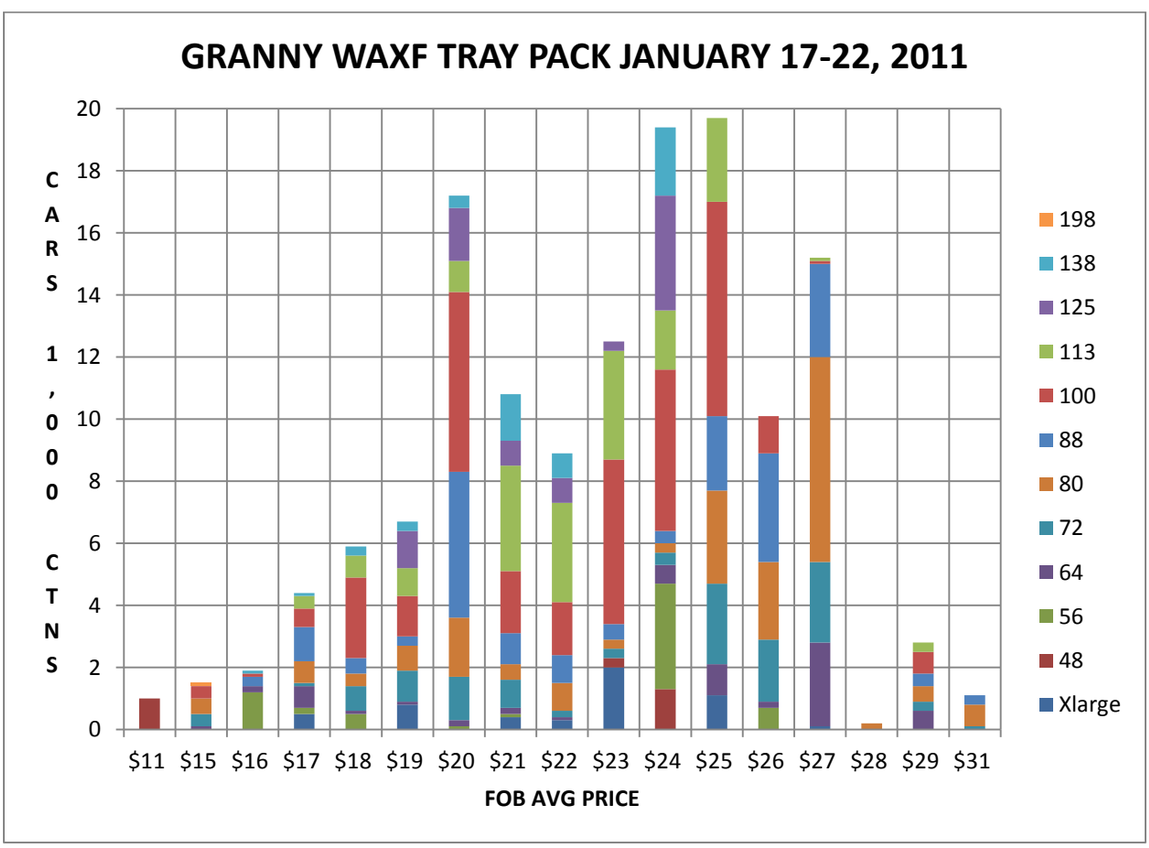
GRANNY WAXF TRAY PACK																		
	$11	**$15**	**$16**	**$17**	**$18**	**$19**	**$20**	**$21**	**$22**	**$23**	**$24**	**$25**	**$26**	**$27**	**$28**	**$29**	**$31**	**TOTAL**
Xlarge				0.5		0.8		0.4	0.3	2.0		1.1		0.1				5.2
48	1.0									0.3	1.3							2.6
56			1.2	0.2	0.5		0.1	0.1			3.4		0.7					6.2
64		0.1	0.2	0.7	0.1	0.1	0.2	0.2	0.1		0.6	1.0	0.2	2.7		0.6		6.8
72		0.4		0.1	0.8	1.0	1.4	0.9	0.2	0.3	0.4	2.6	2.0	2.6		0.3	0.1	13.1
80		0.5		0.7	0.4	0.8	1.9	0.5	0.9	0.3	0.3	3.0	2.5	6.6	0.2	0.5	0.7	19.8
88			0.3	1.1	0.5	0.3	4.7	1.0	0.9	0.5	0.4	2.4	3.5	3.0		0.4	0.3	19.3
100		0.4	0.1	0.6	2.6	1.3	5.8	2.0	1.7	5.3	5.2	6.9	1.2	0.1		0.7		**33.9**
113				0.4	0.7	0.9	1.0	3.4	3.2	3.5	1.9	2.7		0.1		0.3		18.1
125						1.2	1.7	0.8	0.8	0.3	3.7							8.5
138			0.1	0.1	0.3	0.3	0.4	1.5	0.8		2.2							5.7
198		0.1																0.1
TOTAL	1.0	1.5	1.9	4.4	5.9	6.7	17.2	10.8	8.9	12.5	19.4	**19.7**	10.1	15.2	0.2	2.8	1.1	**139.3**



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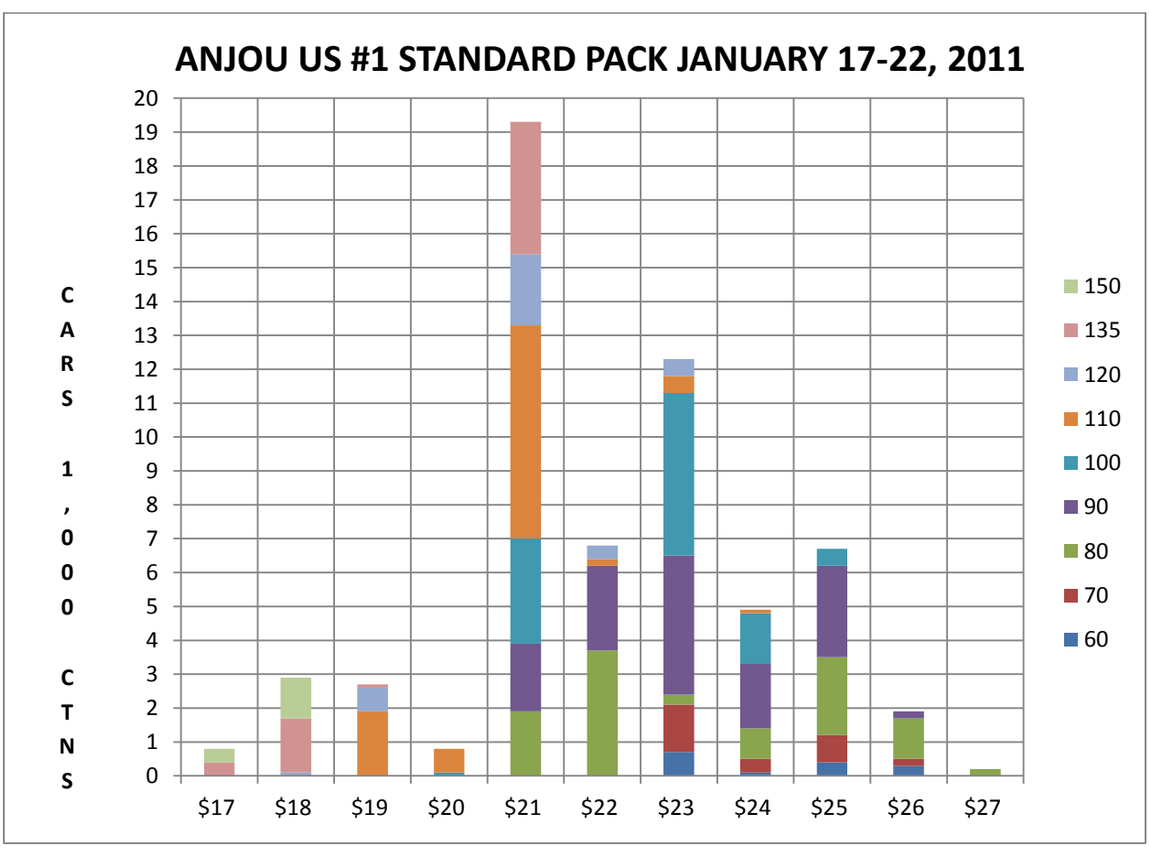
D'ANJOU US#1 STANDARD PACK												
	$17	$18	$19	$20	$21	$22	$23	$24	$25	$26	$27	TOTAL
60							0.7	0.1	0.4	0.3		1.5
70							1.4	0.4	0.8	0.2		2.8
80					1.9	3.7	0.3	0.9	2.3	1.2	0.2	10.5
90					2.0	2.5	4.1	1.9	2.7	0.2		**13.4**
100				0.1	3.1		4.8	1.5	0.5			10.0
110			1.9	0.7	6.3	0.2	0.5	0.1				9.7
120		0.1	0.7		2.1	0.4	0.5					3.8
135	0.4	1.6	0.1		3.9							6.0
150	0.4	1.2										1.6
TOTAL	0.8	2.9	2.7	0.8	**19.3**	6.8	12.3	4.9	6.7	1.9	0.2	**59.3**



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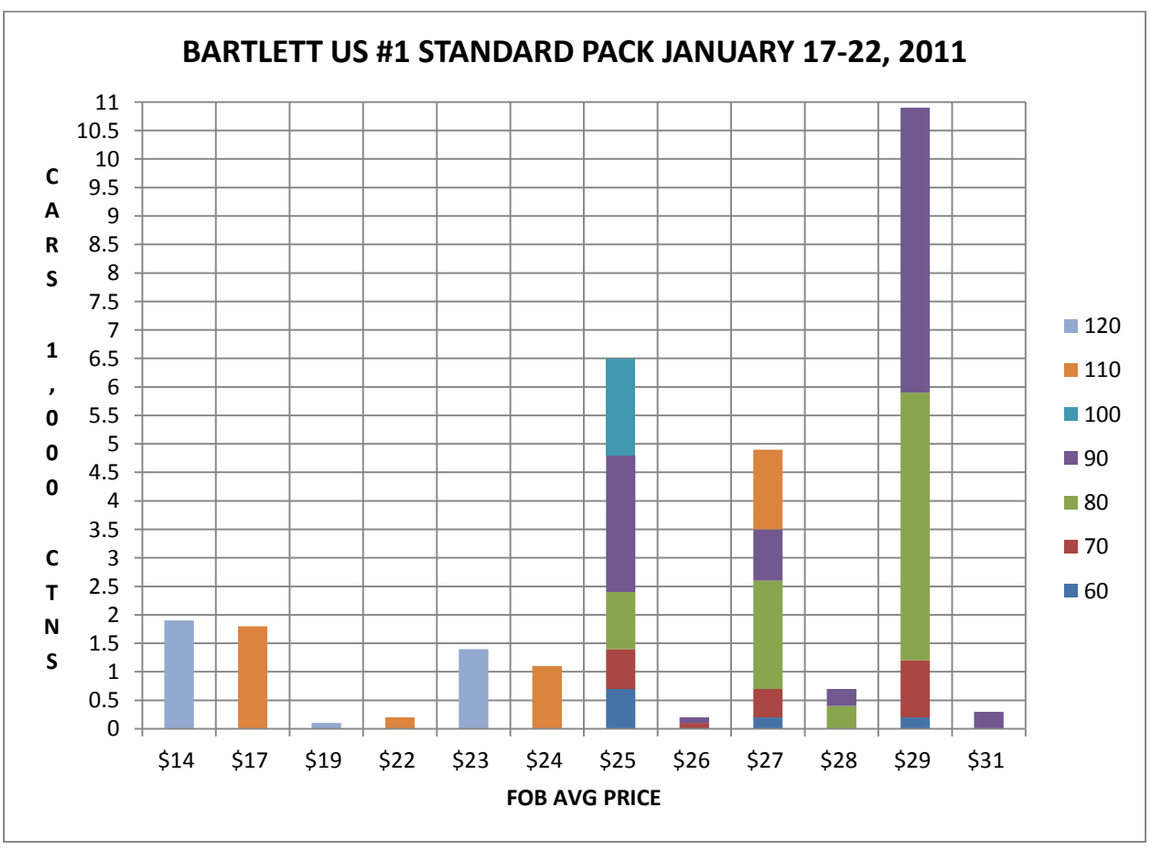
BARTLETT US#1 STANDARD PACK													
	$14	$17	$19	$22	$23	$24	$25	$26	$27	$28	$29	$31	TOTAL
60							0.7		0.2		0.2		1.1
70							0.7	0.1	0.5		1.0		2.3
80							1		1.9	0.4	4.7		8.0
90							2.4	0.1	0.9	0.3	5.0	0.3	**9.0**
100							1.7						1.7
110		1.8		0.2		1.1			1.4				4.5
120	1.9		0.1		1.4								3.4
TOTAL	1.9	1.8	0.1	0.2	1.4	1.1	6.5	0.2	4.9	0.7	**10.9**	0.3	**30.0**



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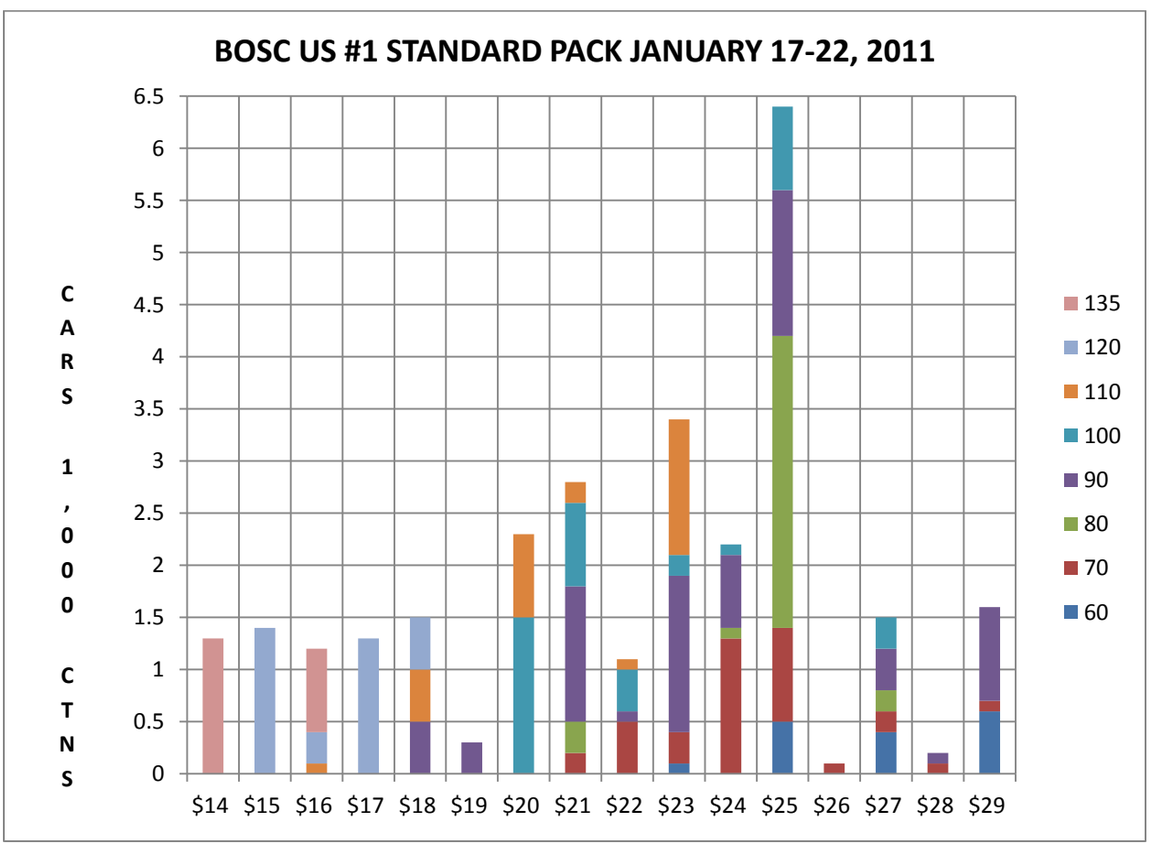
BOSC US#1 STANDARD PACK																	
	$14	**$15**	**$16**	**$17**	**$18**	**$19**	**$20**	**$21**	**$22**	**$23**	**$24**	**$25**	**$26**	**$27**	**$28**	**$29**	TOTAL
60										0.1		0.5		0.4		0.6	1.6
70								0.2	0.5	0.3	1.3	0.9	0.1	0.2	0.1	0.1	3.7
80								0.3			0.1	2.8		0.2			3.4
90					0.5	0.3		1.3	0.1	1.5	0.7	1.4		0.4	0.1	0.9	**7.2**
100							1.5	0.8	0.4	0.2	0.1	0.8		0.3			4.1
110			0.1		0.5		0.8	0.2	0.1	1.3							3.0
120		1.4	0.3	1.3	0.5												3.5
135	1.3		0.8														2.1
TOTAL	1.3	1.4	1.2	1.3	1.5	0.3	2.3	2.8	1.1	3.4	2.2	**6.4**	0.1	1.5	0.2	1.6	**28.6**



Washington Apple Commission

26 September 2011

To whom it may concern;

NASS Tree Survey

The Washington Apple Commission sees the Tree Survey as a useful tool from the standpoint of aligning our promotional activities with the varietal trends within the industry. Reacting to the varietal makeup of Washington's apple crop isn't a wise business plan, and with the Tree Survey, we are able to anticipate increased varietal volumes and match production with export varietal makeup potential.

As the domestic market stabilizes, and planting trends continue up, the export markets will be critical for the long term success of the industry. Looking through the window glass to total industry volumes for the next five years emphasizes our need to expand, maintain and realign our activities to increase international consumer demand. Increased volumes are just one component determining the future success of WA apple growers.

Best regards,

Todd M Fryhover
Washington Apple Commission President

P.O. Box 18 • Wenatchee, WA 98807-0018
(509) 663-9600 • FAX: (509) 662-5824 • www.bestapples.com

PERAS USA ROAD SHOW 2011

A. Northwest Pear sales during the promotional period

	CITY	STORES	SALES BEFORE	SALES DURING
SORIANA	MEXICO CITY	24	72	96
	GUADALAJARA	26	65	78
	MONTERREY	51	112.2	204
	QUERETARO	11	22	33
SMART	MONTERREY	2	4	10
WALMART	GUADALAJARA	12	27.6	36
	MONTERREY	15	22.5	52.5
BODEGA AURRERA	MEXICO CITY	29	58	101.5
	GUADALAJARA	8	20	36
	MONTERREY	8	24	40
COMERCIAL MEXICANA	CUERNAVACA	4	12	16
	QUERETARO	3	7.5	9
	GUADALAJARA	4	12	16
MERKABASTOS	GUADALAJARA	1	3	5
CHEDRAUI	GUADALAJARA	3	9	18
		Total sales	470.8	751

Average sales increase of Northwest pears during the promotional period 60%

Sales before = Sales on the same day of the week, 1 week prior to promotion
Sales during = Sales on the day of the promotion, for all outlets of participating retailers

increase in sales with each retailer during the promotional period - boxes per day

	STORE	CITY	DATE	SALES BEFORE (boxes)	SALES DURING (boxes)	SALES AFTER (boxes)
1	SORIANA TLALPAN	MEXICO CITY	February 2, 2011	2	5	4
2	SORIANA MIRAMONTES	MEXICO CITY	February 9, 2011	2	6	4
3	SORIANA PLAZA CANTIL	MEXICO CITY	February 11, 2011	3	6	4
4	SORIANA LA VIGA	MEXICO CITY	February 12, 2011	2	6	3
5	SORIANA LA VIGA RECREO	MEXICO CITY	February 15, 2011	3	4	3
6	COMERCIAL MEXICANA TULYEHUALCO	MEXICO CITY	February 16, 2011	3	6	3
7	SORIANA COAPA	MEXICO CITY	February 17, 2011	3	5	3
8	SORIANA DIVISION DEL NORTE	MEXICO CITY	February 18, 2011	2	4	3
9	SORIANA SANTA LUCIA	MEXICO CITY	February 22, 2011	3	5	3
10	SORIANA TLAHUAC	MEXICO CITY	February 23, 2011	3	6	4
11	MEGA CUERNAVACA III JACARANDAS	CUERNAVACA	February 24, 2011	3	7	5
12	MEGA LA DIANA CUERNAVACA	CUERNAVACA	February 26, 2011	3	6	5
13	WALMART JIUTEPEC CUERNAVACA	CUERNAVACA	February 27, 2011	3	5	5
14	MEGA ZARAGOZA QRO	QUERETARO	March 2, 2011	3	4	3
15	MEGA PEÑUELAS/ESTADIO QRO	QUERETARO	March 3, 2011	2	4	2
16	SORIANA LA CAPILLA QRO	QUERETARO	March 4, 2011	2	6	3
17	WALMART SUPER CENTER RIO NILO	GUADALAJARA	March 8, 2011	2	5	5
18	COMERCIAL MEXICANA MEGA RAFAEL SANZIO	GUADALAJARA	March 9, 2011	3	4	3
19	BODEGA AURRERA REVOLUCION	GUADALAJARA	March 10, 2011	2	6	3
20	BODEGA AURRERA MATATLAN	GUADALAJARA	March 11, 2011	2	5	4
21	BODEGA AURRERA SAN GASPAR	GUADALAJARA	March 12, 2011	3	4	3
22	MERKABASTOS	GUADALAJARA	March 13, 2011	3	6	4
23	SORIANA RIO NILO	GUADALAJARA	March 15, 2011	2	5	4
24	BODEGA AURRERA SAN PEDRO	GUADALAJARA	March 16, 2011	3	5	3
25	BODEGA AURRERA AGAVES	GUADALAJARA	March 17, 2011	1	6	4
26	SORIANA BELENES	GUADALAJARA	March 18, 2011	2	5	5
27	WALMART LOPEZ MATEOS	GUADALAJARA	March 22, 2011	2	4	4
28	COMERCIAL MEXICANA NUEVA MEGA GALICIA	GUADALAJARA	March 23, 2011	3	6	4
29	SORIANA SANTA FE	GUADALAJARA	March 24, 2011	3	5	4
30	CHEDRAUI ACUEDUCTO	GUADALAJARA	March 25, 2011	3	7	5
31	SORIANA ADOLFO HORNS	GUADALAJARA	March 26, 2011	2	4	5
32	SORIANA ESTADIO	GUADALAJARA	March 27, 2011	3	4	4
33	SORIANA CAMICHINES	GUADALAJARA	March 29, 2011	3	5	4
34	SORIANA TLAQUEPAQUE	GUADALAJARA	March 30, 2011	2	6	5
35	BODEGA AURRERA TOLUQUILLA	GUADALAJARA	March 31, 2011	2	4	3
36	SORIANA GOBERNADOR CURIEL	GUADALAJARA	April 1, 2011	3	3	2
37	BODEGA AURRERA MIRAMAR	GUADALAJARA	April 2, 2011	3	4	3
38	BODEGA AURRERA SANTA PAULA	GUADALAJARA	April 3, 2011	2	6	4
39	WALMART 16 SEPTIEMBRE	GUADALAJARA	April 5, 2011	3	4	3
40	SORIANA CHAPALA	GUADALAJARA	April 6, 2011	3	3	3
41	SORIANA LINCOLN	MONTERREY	April 8, 2011	2	5	4
42	SMART SOLIDARIDAD	MONTERREY	April 9, 2011	2	6	5
43	WALMART LINCOLN	MONTERREY	April 10, 2011	2	5	6
44	SORIANA COLON	MONTERREY	April 11, 2011	2	4	5
45	SORIANA CUMBRES	MONTERREY	April 13, 2011	3	7	4
46	BODEGA AURRERA SOLIDARIDAD	MONTERREY	April 15, 2011	3	3	5
47	SORIANA SOLIDARIDAD	MONTERREY	April 16, 2011	2	4	3

48	SORIANA SANTA CECILIA	MONTERREY	April 18, 2011	2	5	4
49	SORIANA AZTLAN	MONTERREY	April 19, 2011	3	5	5
50	SMART CONTRY	MONTERREY	April 20, 2011	2	7	5
51	SORIANA FELIX GOMEZ	MONTERREY	April 21, 2011	2	6	2
52	WALMART LAS TORRES	MONTERREY	April 22, 2011	1	5	5
53	SORIANA FUNDIDORA	MONTERREY	April 25, 2011	2	5	3
54	SORIANA CONTRY	MONTERREY	April 26, 2011	2	5	4
55	SORIANA COLON	MONTERREY	April 27, 2011	2	5	4
56	MEGA MIXCOAC	MEXICO CITY	May 11, 2011	3.5	6	5
57	MEGA INSURGENTES	MEXICO CITY	May 12, 2011	2	7	4
58	BOD. COMERCIAL MEXICANA TACUBA	MEXICO CITY	May 13 2011	2	6	5
				141.5	297	226
					110%	60%
					Sales increase during	Sales increase after

Sales before = Sales on the same day of the week, 1 week prior to promotion
Sales during = Sales on the day of the promotion
Sales after = either the day after or the second day after the promotion

ROAD SHOW

2010-11

NUTRITOUR

MEXICO

Base del tallo suave
Pera Madura

USA

www.perasusa.com

TM

Road Show 2010-11

During 2010-11 season USA Pears conducted a Road Show by their own in order to achive the Mexican market in a fun and interactive way teaching consumers to have a balance diet including USA Pears daily taking advantage of their versatility and diferent varieties.

Dates and cities

- **Mexico City:** February 8-23 / May 5 - 26
- **Cuernavaca:** February 25-28
- **Queretaro:** March 2 - 5
- **Guadalajara**: March 8 – April 6
- **Monterrey:** April 8 – 27

USA

DINAMIC

A professional team formed by chef, nutritionist, costume and animator teach consumers regarding benefits, characteristics, nutritional values, season and versatility of USA Pears.

Additionally during the show USA Pears distributed recipe consumers materials such as recipe brochure, pear packers, pear slicers, reusable lunch bag, perachute and kitchen cloth. We also distribute different varieties of USA Pears.

Consumer Materials

kitchen cloth

reusable lunch bag

perachute

recipe brochure

pear packers

pear slicers

Chef

The chef prepared several recipes combining pears with pasta, chicken, tuna, meat or vegetables (among others) to enjoy their delicious taste, teaching consumers their versatility.

Nutritionist

Nutritional talks were carried highlighting the attributes and nutritional values of USA Pears.

Additionally, the nutritionist offered personalized consultations where people's weight, height, body mass index, body fat, muscle mass and metabolism were measured. According to the results, the nutritionist recommended a certain balanced diet with daily fruit requirements.

Nutritionist

Animator

The animators encouraged the audience to participate in interactive contests, games, riddles and the various dynamics to reinforce what the Chef and Nutritionist taught them

Demonstrator

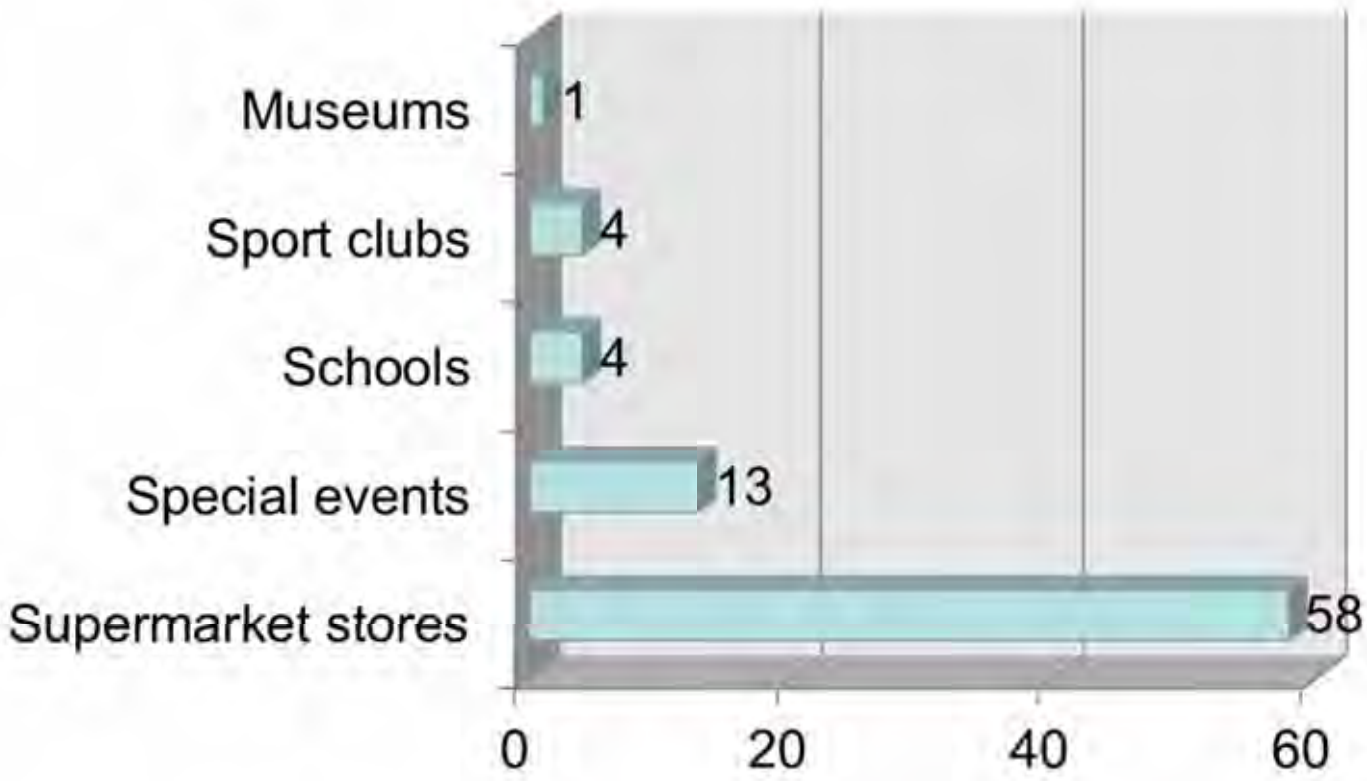
The demonstrator support all the activities

Costume

Truck Design

Events

During the Road Show , USA Pears covered 58 stores, 13 events, 4 schools, 4 sport clubs, 1 museum



USA Pears reached 44,835 contacts

Covered chains

Comercial mexicana

S-Mart

CHEDRAUI

Walmart

BODEGA AURRERA

Merkabastos

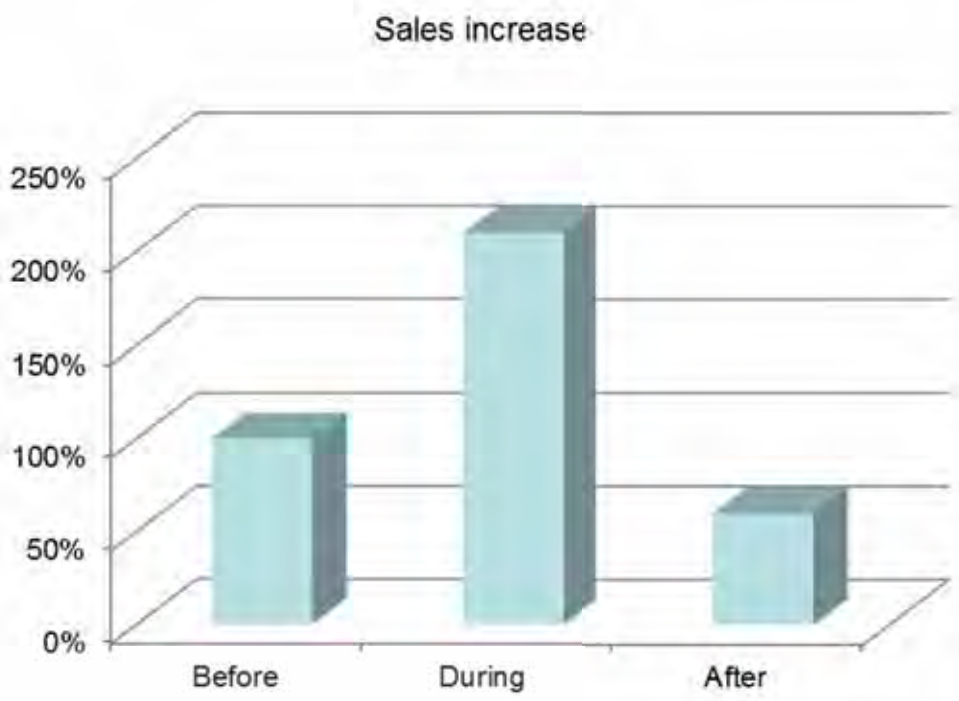
SORIANA

Performance Measures

Performance Measures	2010-11 Goals	2010-11 Results
# of consumers educated about US Fresh Fruits	32,000	44,835
% of those consumers who were reported that information will influence their purchase behavior positively to buy more pears	32%	83%
% of consumers who eat at least 3 servings of fresh fruit and vegetables a day	37%	42%
% of consumers who became more educated about Northwest pears after visiting the Road Show	38%	86%
% of consumers who consider health and nutrition important purchase decision motivators	55%	57%

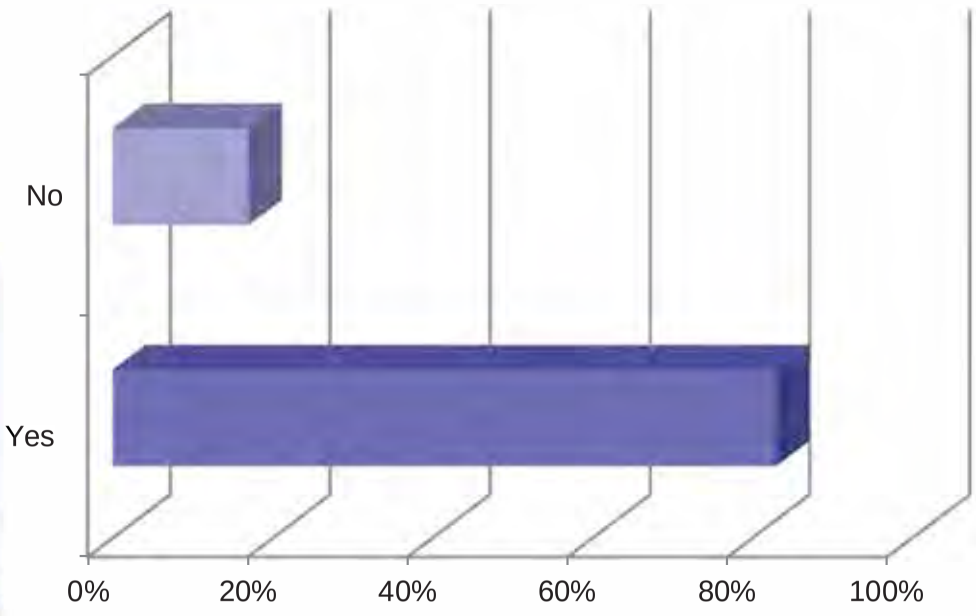
Sales increase

Sales increased an average of 110% during the promotions and 60% after compares with a normal period



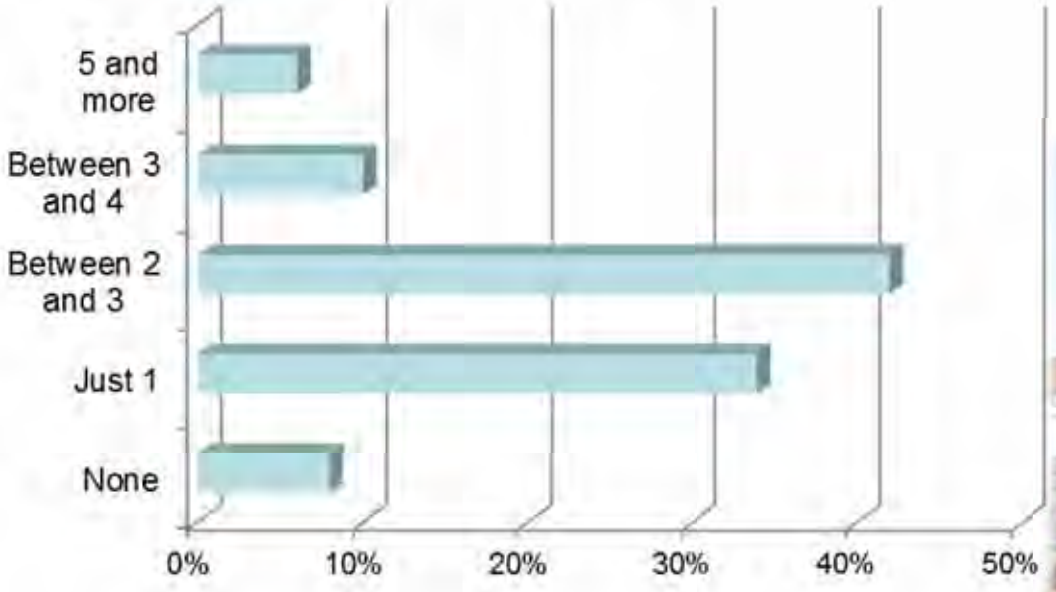
Survey

The provide information and activities impulse you to buy more pears?



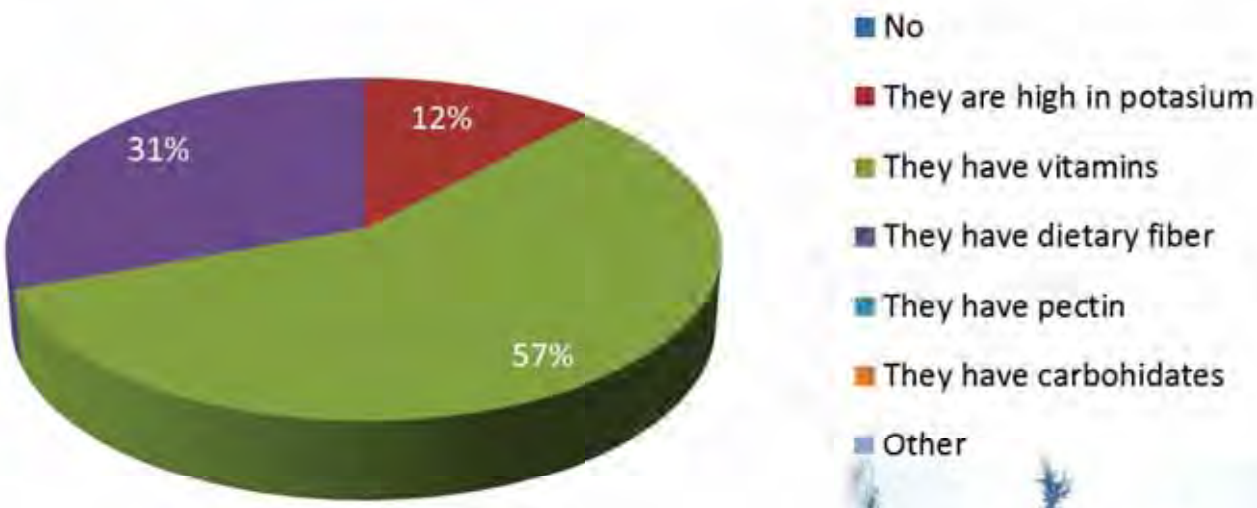
Survey

How many servings of fruit and vegetables do you eat per day?

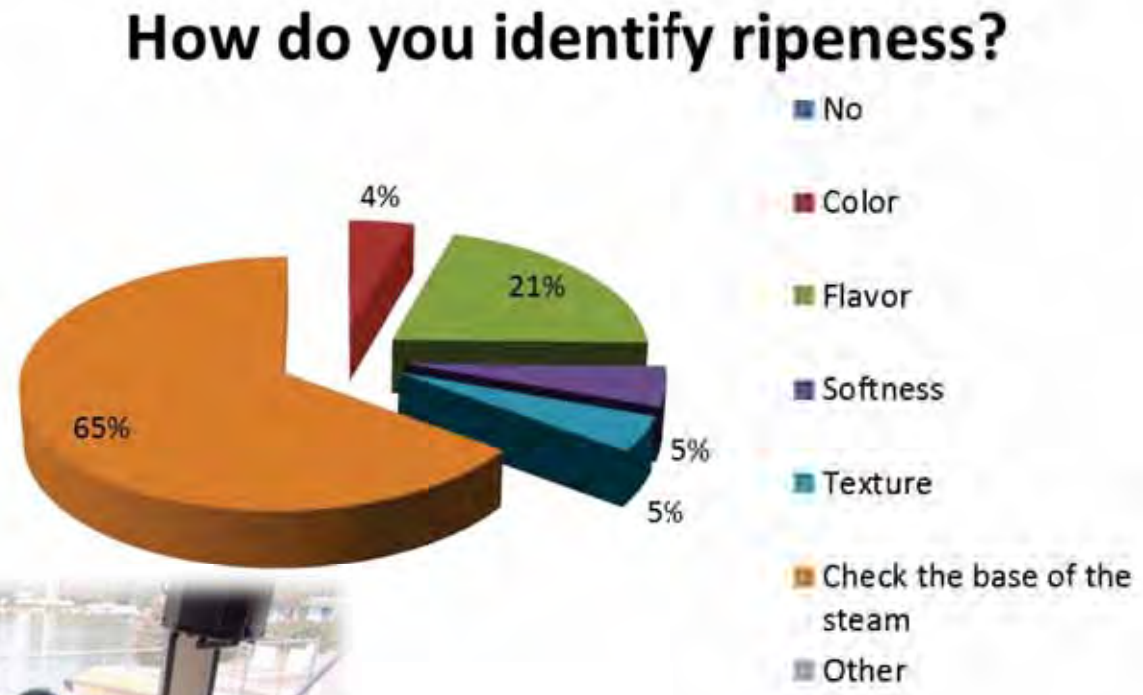


Survey

Do you know the nutritional values of USA Pears?

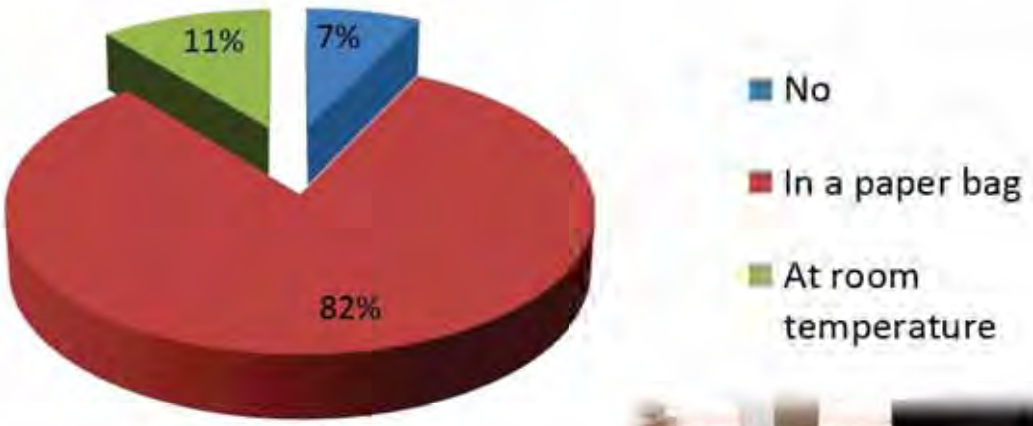


Survey


How do you identify ripeness?
4%
21%
65%
5%
5%
No
Color
Flavor
Softness
Texture
Check the base of the steam
Other

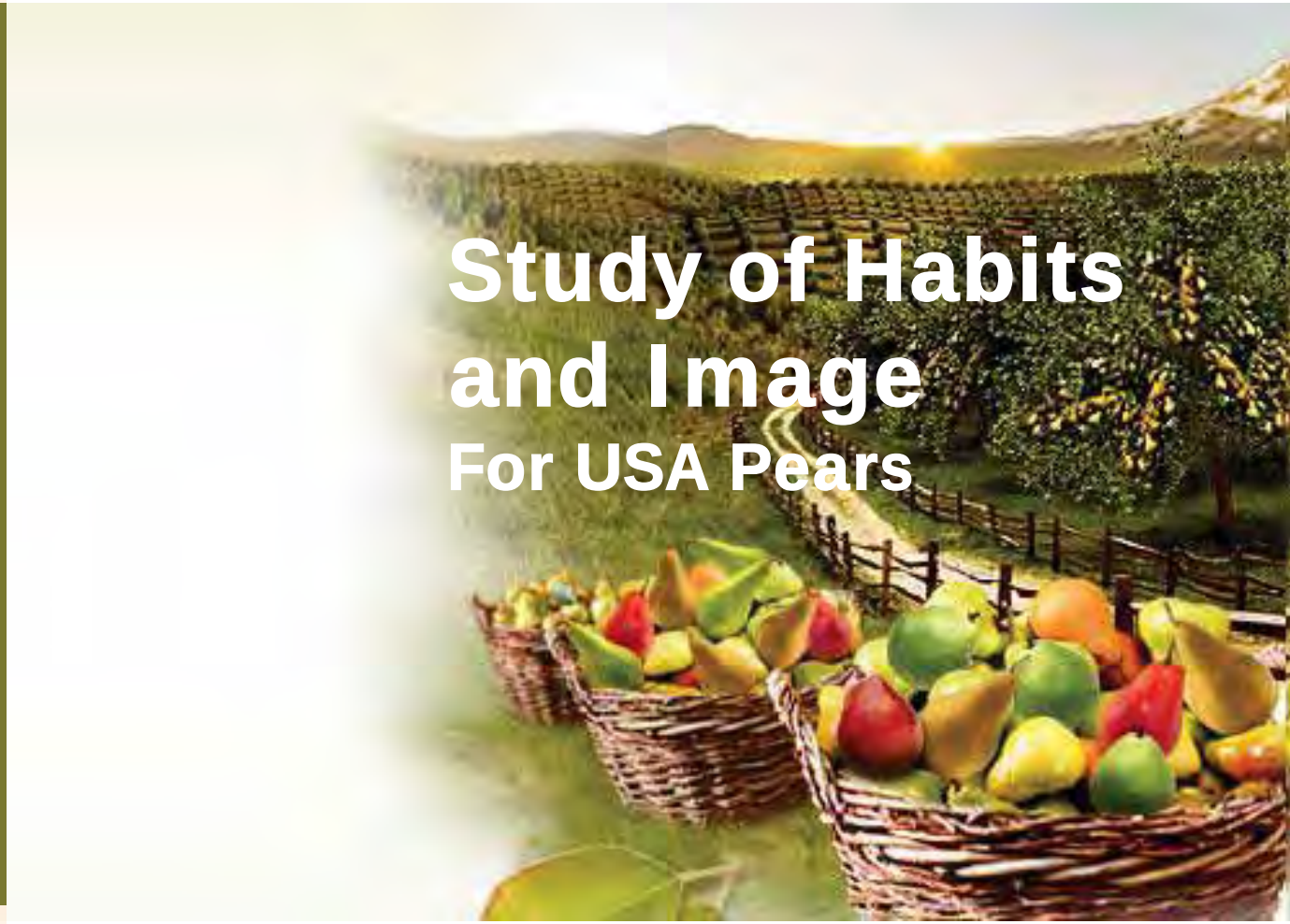
Survey

Do you know how to ripen a Pear?



Study of Habits and Image

For USA Pears



Prepared for:

USA Pears

August, 2011

WILSA
WILBERT SIERRA & ASOCIADOS, S.A.
ESTUDIOS DE MERCADOTECNIA Y OPINIÓN

Index

- Objectives and methodology
- Pears in the world of healthy products
- Consumption habits
- Purchasing habits
- Awareness and image of USA Pears
- Summary of findings

Objectives

OVERALL OBJECTIVE:

✓ Evaluate the ***Awareness, purchasing habits and nutritional perception of USA Pears***.

SPECIFIC OBJECTIVES:

The questionnaire used in this research was designed with the purpose of obtaining quantitative information addressing the following topics :

A) Pears in the world of healthy products:

- Importance of consuming healthy and nutritious products.
- Healthy and nutritious food
- More and less healthy fruits. Reasons to consider Pears less healthy.

B) Consumption habits:

- Ways in which Pears are prepared/ consumed
- Ways to become aware of their preparation / consumption

Objectives

- Ripening of Pears
- Moments in which they are consumed more frequently / Who consumes them.
- Nutritional properties perceived.
- Origin of the Pears

C) Purchasing Habits:

- Frequency and amount of purchase
- Places of purchase
- Reasons for purchase, by place of purchase.
- Willingness to purchase on the Internet.
- Factors in the purchase of Pears
- Barriers to the purchase of Pears
- Reasons to purchase Pears
- Performance of the kinds of Pears
- Reasons to purchase, by kind of Pear

Objectives

D) Awareness and Image of USA Pears

- Awareness and purchase of USA Pears
- Intention to purchase USA Pears
- Image of USA Pears
- Intention to purchase to the Concept
- Reasons of Intention to the Concept: Positive and Negative

Methodology

The study was conducted with ***HOUSEWIVES 25 to 45*** years old, in the Socioeconomic Levels ***(AB/C+ / C).***

The standard technique for Personal Interviews was used (face to face) through a structured questionnaire applied in diverse points of affluence in each city (CLT). The participants were selected randomly according to the socioeconomic level.

The rule AMAI 6X10 was used to determine the socioeconomic level, allowing the fast classification of the interviewed.

The interview lasted approximately 17 minutes.

Methodology

The end the total sample was **914 interviews** with the following distribution:

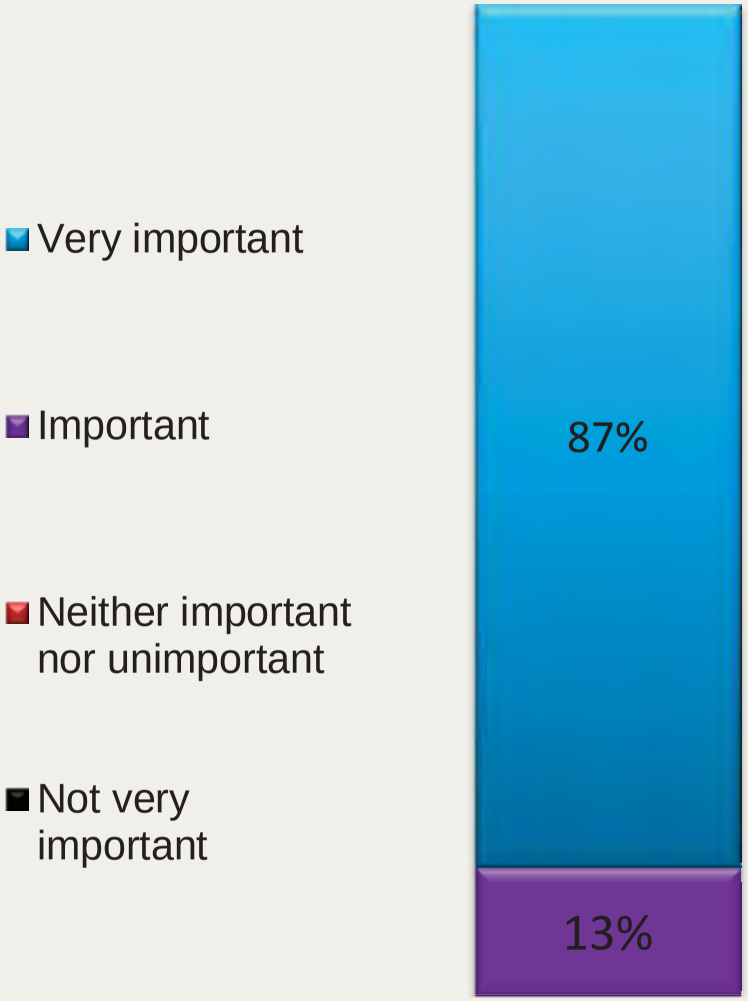
SITE	SAMPLE	UNIVERSE	SOCIO ECONOMIC LEVELS	AGE GROUPS
MEXICO CITY	313	HOUSEWIVES = 100%	A/B/C+ = 50%	25 -35 YEARS OLD = 50%
GUDALAJARA	214			
MONTERREY	218		C = 50%	36 - 45 YEARS OLD = 50%
TIJUANA	169			

Pears in the world of healthy products

Importance of consuming healthy and nutritious products

Nine out of every ten consider that the consumption of healthy and nutritious products is very important for the family.

Base: Total Interviews (914)



P0.4.-Using this card (SHOW CARD #0.2), how important is it for your family and you to consume healthy and nutritious products?

Important to consume healthy products: By demographics

Even when there is more conviction in Mexico, it is an issue as important in all the cities, levels and ages.

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Very important	87	87	86	86	87	92	79	85	89
						fg			f
Important	13	12	14	14	12	8	21	14	11
							egh	e	
Neither important nor unimportant	0	0	0	0	0	0	0	1	0
Not very important	0	0	0	0	0	0	0	1	0

P0.4.- Using this card (SHOW CARD #0.2), how important is it for your family and you to consume healthy and nutritious products?

Healthy and nutritious food

Spontaneously three out of every ten considers pears a healthy and nutritious food. Positioning itself spontaneously as the third more healthy fruit, just after apples and bananas.

Base: Total Interviews (957)

TOTAL	957
	%
VEGETABLES (NET)	**73**
Vegetables	67
FRUITS (NET)	**68**
Apples	44
Bananas	35
Pears	**28**
Orange	21
Papaya	17
Melon	17
Watermelon	15
Mango	14
Grapes	8
Strawberries	6
PIneapple	5
Guava	5
MEATS- RED/ CHICKEN (NET)	**63**
Beef	45
Chicken	23

TOTAL	957
	%
DAIRY PRODUCTS (NET)	**30**
Milk	21
Dairy products n/s	5
CEREALS (NET)	**18**
Cereals	17
GRAINS/ SEEDS (NET)	**7**
Beans	4
None	2
OTHER FOOD (NET)	**27**
Fish	14
Eggs	8
Soups	4

P.D. Talking about Healthy and Nutritious products, can you tell me which are the three most important that you feed your family? INTERVIEWER: IF MENTIONS FRUITS RECORD IT AND ASK: Which fruits are you specifically talking about?

HEALTHIER and LESS healthy fruits

When aided nine out of every ten considers Pears as a healthy fruit. Only 4% does not consider them that way. Watermelon stands out as one of the less healthy fruits.

Base: Total respondents (866)

P.1.-Of all the FRESH fruits you know, could you tell me which do you consider are the MOST healthy? Any other? Another?
P.2.- And which do you consider are the LESS healthy? ATTENTION INTERVIEWER: IF DOES NOT MENTION OEARS IN Q1 OR 2, ASK HOW THEY ARE CONSIDERED

HEALTHIER fruits: By demographics

There are no important differences by demographics

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total interviews	**866**	**412**	**454**	**431**	**435**	**290**	**218**	**211**	**147**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Pears	96	96	96	96	96	94	98	96	97
							e		
Apples	73	73	73	71	75	73	73	78	67
								h	
Banana	58	58	57	59	57	59	63	62	42
						h	h	h	
Orange	57	56	58	60	55	49	64	64	56
							e	e	
Papaya	52	54	51	51	54	57	56	50	41
						h	h		
Guava	37	42	33	35	40	43	39	45	12
		b				h	h	h	
Lemon	27	28	26	26	27	23	35	37	7
						h	eh	eh	
Pineapple	25	25	26	23	28	23	33	31	12
						h	eh	eh	
Melon	25	28	23	25	25	19	37	32	9
						h	eh	eh	
Strawberries	21	22	20	20	22	19	26	27	10
						h	eh	eh	

P.1.- Of all the FRESH fruits you know, could you tell me which do you consider are the MOST healthy? Any other? Another?

LESS healthy fruits: By demographics

There are no significant differences by demographics

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total interviews	**866**	**412**	**454**	**431**	**435**	**290**	**218**	**211**	**147**
	%	%	%	%	%	%	%	%	%
Watermelon	18	19	16	16	19	19	5	28	18
						f		efh	f
Kiwi	10	8	11	7	12	7	1	26	5
					c	f		efh	
Strawberries	9	10	9	10	9	7	5	18	8
								efh	
Grapes	9	10	8	10	9	7	5	18	6
								efh	
Plums	8	8	9	10	7	8	3	18	5
						f		efh	
Bananas	7	7	7	7	7	4	6	8	15
								e	efg
Melon	6	6	6	7	6	6	2	12	6
						f		ef	f
Guanábana	6	9	4	7	6	6	0	16	1
		b				fh		efh	
Peaches	5	6	5	6	4	3	1	14	3
								efh	
Pears	4	4	4	4	4	6	2	4	3
						f			

P.2.- .- And which do you consider are the LESS healthy?

Reasons for considering Pears LESS healthy

Those who do not consider it healthy emphasize the unawareness of its nutritional properties or vitamin content

Base: Mentioned Pear as one of the less healthy fruits.

TOTAL	33
	%
NUTRITIONAL CONTENT (NET)	**82**
I am unaware of its nutritional properties	33
I am unaware of the vitamins it contains	21
“It does not contain vitamin \"C\" "	18
It does not contain protein	12
It does not contain Fiber	6
TASTE (NET)	**18**
Its taste is too sweet, it is harmful	12

P.3.-Which are the reasons why you consider that Pears are LESS healthy? What else? Anything else? (PROBE AND INSIST)

Consumption habits

Ways in which Pears are prepared/ consumed

The main consumotion is "Fresh" (biting it or diced). However five out of every ten also consume it with something else, like in a fruit cocktail, with chili or in syrup.

Base: Total Interviews (914)

	ARE USED TO PREPARING THEM OR CONSUMING	CONSUME MORE FREQUENTLY
TOTAL	**914**	**914**
	%	**%**
FRESH (NETO)	**95**	**84**
Biting	89	74
Diced	17	6
Sliced	7	4
COMBINED (NET)	**51**	**16**
Fruit cocktail	14	4
With chili	11	4
Syrup (boiled with sugar and cinnamon)	10	1
With yoghurt, cereal	8	2
With lemon and salt	7	2
Blended with water for a drink	5	1
Salads (lettuce, carrots)	5	1

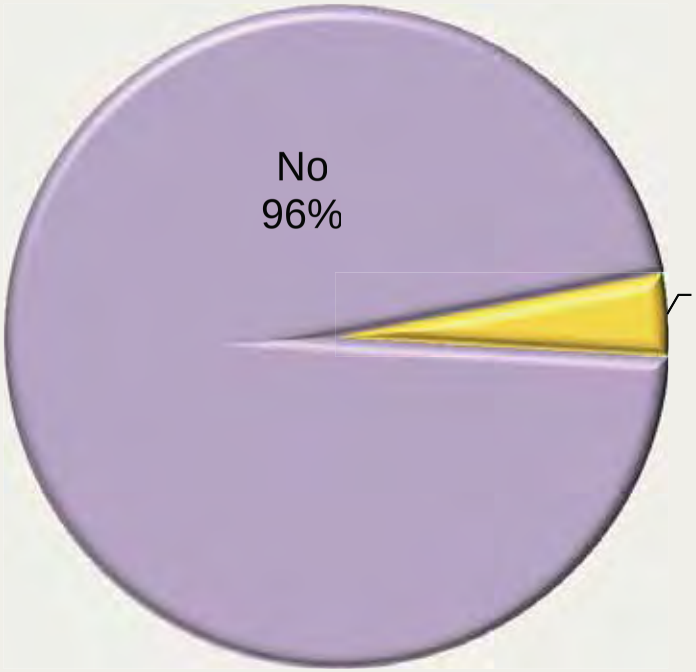
P.12.-Could you please tell me which are the ways in which you and your family usually prepare or consume Fresh Pears? Any others?
P.13.-And which of these ways do you consume more frequently?

Ways to become aware of preparation/ consumption

Onky 4% has learned about these ways in a communication media, and those who learned on the media it was mainly on TV.

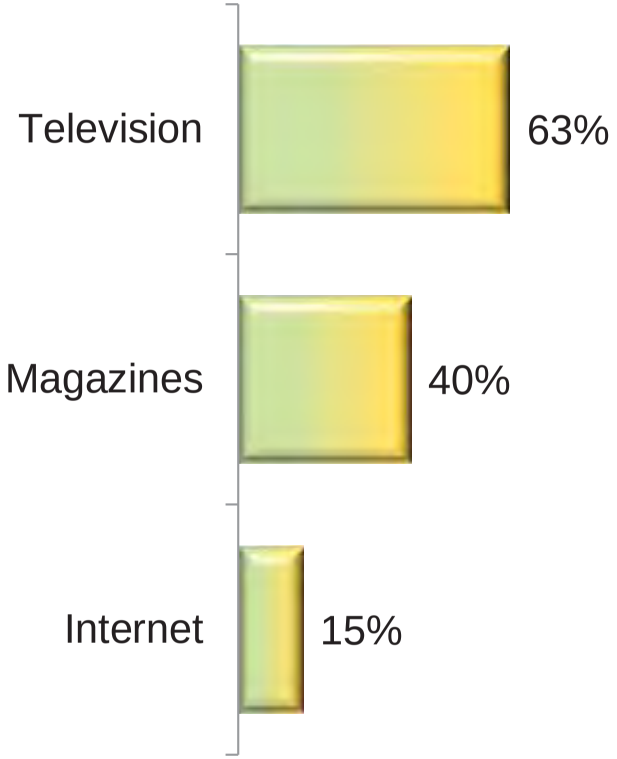
Base: Total Interviews (914)

Were these ways or recipes seen on any communication medium?



Where did you see them?

Base: Mentioned seeing it in any communication medium (40)



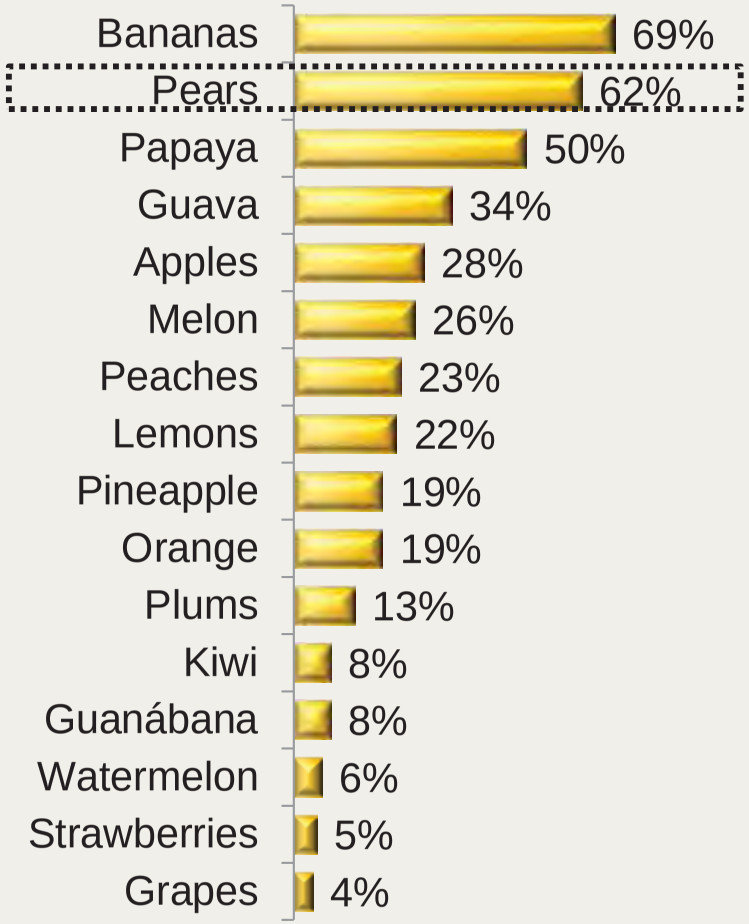
P13.1 You mentioned several ways of preparing or consuming fresh pears, were these ways or recipes seen on any communication medium?
P13.2 Where did you see them?

Ripening of Pears

Six out of every ten consider that they can ripen Pears at home, where the most known way is by "wrapping" them on paper.

Base: Total Intervierws (914)

Which can you ripen at home?



Ways known to achieve fruit ripening

Base :Mentioned they can ripen Pears at home:	566
	%
PAPER (NET)	**76**
Wrapping it in newspaper	53
Wrapping it in paper n/s	11
Leaving them in the paper they come in, green paper	5
Wtrapping in brown paper	4
ENVIRONMENT (NET)	**18**
Leaving them in open air	7
Keeping them where they get sun	5
Leaving them outside	4
OTHER PLACES (NET)	**39**
Inside the oven in the stove	10
Leaving them in the fruit bowl	8
Leaving them outside the refrigerator	8
In a plastic bag	6
In the refrigerator	4

P0.2.-From this list of fresh fruits (SHOW CARD #0.1), which do you consider can be ripened at home?
P0.3.-Talking specifically about Pears, which are all the ways you know to ripen Pears? Any other?

Fruits they consider they can ripen : *By demographic*

Tijuana stands out as a city where seven out of every ten consider they can ripen Pears at home.

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Bananas	69	69	69	71	67	65	66	73	76
								e	ef
Pears	62	66	58	63	61	71	70	65	31
		b				h	h	h	
Papaya	50	52	48	51	49	45	50	55	54
								e	e
Guava	34	32	36	35	33	42	21	35	34
						f		f	f
Apples	28	31	25	30	26	37	20	29	20
		b				fgh		f	
Melon	26	29	23	26	25	19	30	29	29
							e	e	e
Peaches	23	21	24	23	22	20	15	19	41
									efg
Lemons	22	23	22	23	22	23	23	25	18
Orange	19	21	18	22	17	23	18	23	10
						h	h	h	
Pineapple	19	18	21	21	18	13	15	22	34
								e	efg
Plum	13	12	14	13	13	12	12	12	18

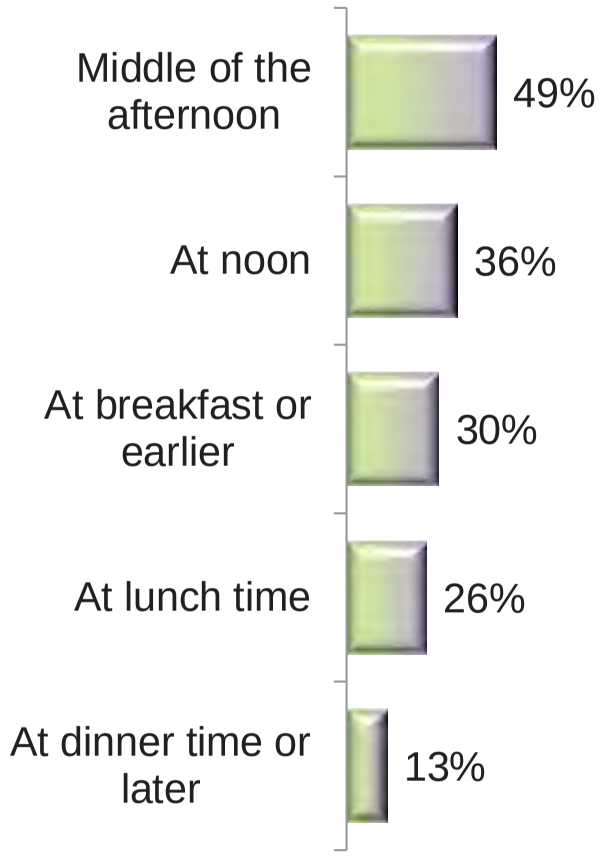
P0.2.- From this list of fresh fruits (SHOW CARD #0.1), which do you consider can be ripened at home?

More frequent consumption

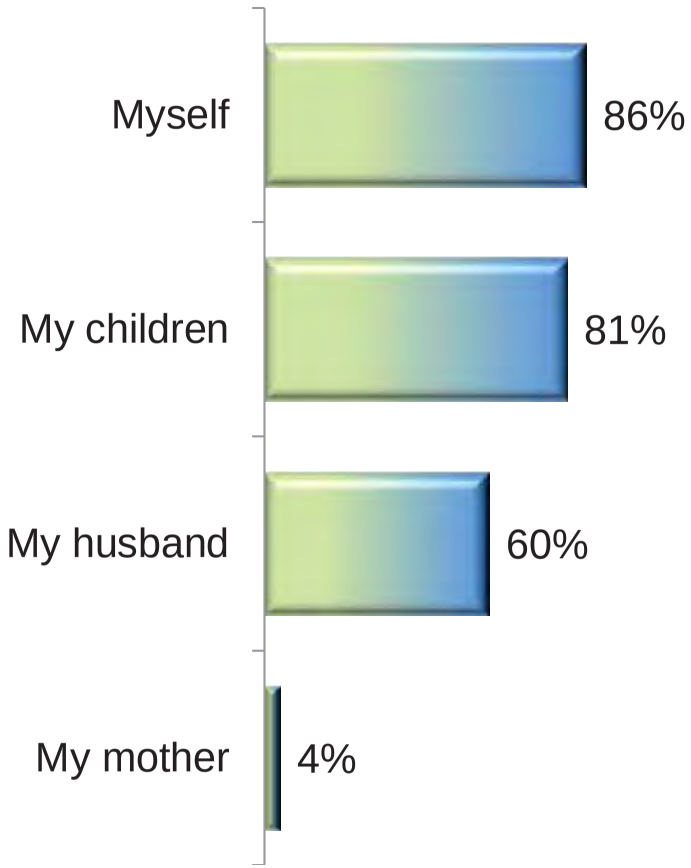
Between meals or at breakfast is the time of more frequent consumption, both by housewives and children . The habit is low at dinner time.

Base: Total Interviews (914)

At what time of day do you consume them more frequently?



Who consumes them?



At what time are they consumed?: By demographics

In Monterrey consumption in the afternoon is more incisive.

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
In the middle of the afternoon	49	51	47	48	50	48	59 egh	43	44
At noon	36	36	35	36	35	39 g	34	29	40 g
At breakfast or earlier	30	33	27	27	33	40 fgh	22	29	22
At lunch time	26	26	27	25	28	34 fgh	23	22	21
At dinner time or later	13	13	13	12	14	17 g	15 g	5	11 g

Mexico City stands out for being a city where consumption at breakfast or lunch time is much more important.

P.14.- Regardless of the ways in which pears are consumed in your family, based on this card (SHOW CARD #14), what time of day is when you or your family consume them more frequently?

Who consumes them?: By demographics

The older the age, the higher the consumption by children

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Myself	86	87	85	86	85	84	87	88	85
My children	81	82	81	75	87 c	82	84 g	75	85 g
My husband	60	59	61	58	62	57	65	61	57
My mother	4	4	4	5	3	7 fg	2	0	3

P.15 Who in your family living with you consumes the Pears you buy? Anyone else?

Nutritional properties perceived

Vitamins and fiber are what is most perceived in them

Base: Total Interviews (914)

	TOTAL
	914
	%
VITAMINS (NET)	**56**
Vitamin \"C\"	33
Vitamins N/S	18
Vitamin \"A\"	11
Complex \"B\"	5
MINERALS (NET)	**10**
Minerals N/S	4
Doesn't know	27
OTHER PROPERTIES (NET)	**38**
They have fiber	27
Antioxidants	5
Good for digestion	4

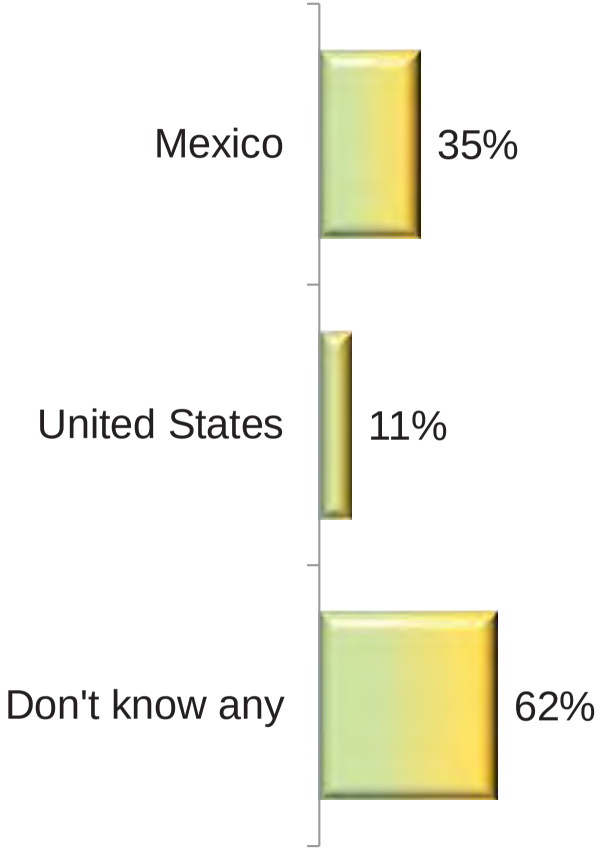
p.18.-Which do you consider are the nutritional properties in Pears?

Origin of Pears

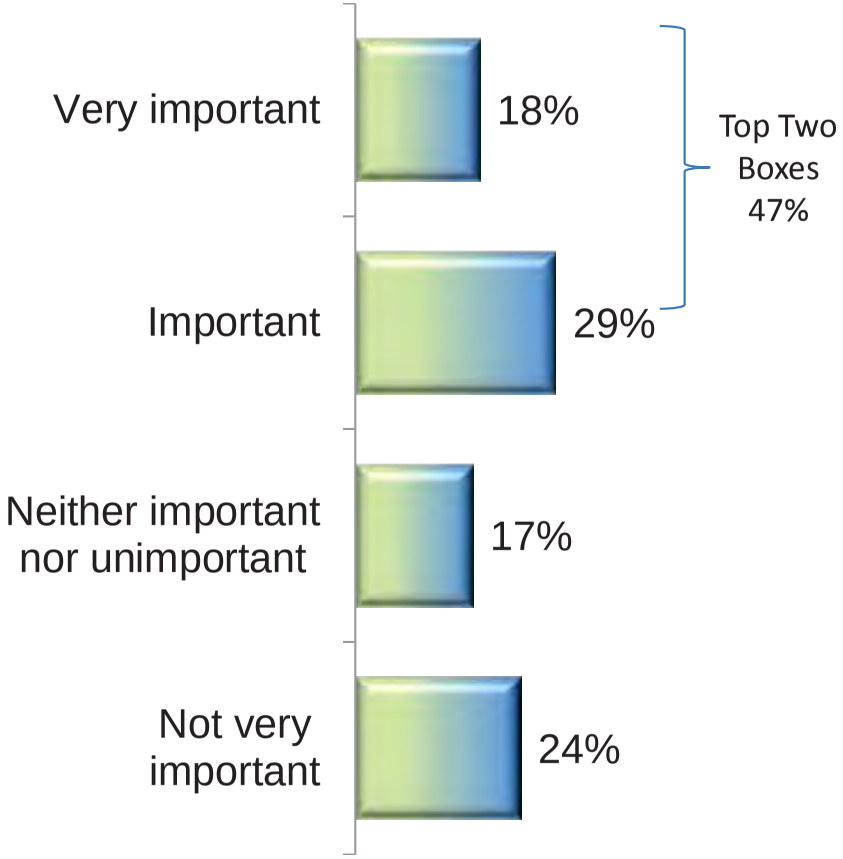
Three out of every ten perceive that Pears are originally from Mexico, however only two out of every ten consider that origin is very important.

Base: Total Interviews (914)

Could you tell me all the places where Pears come from?



How important is the origin of Pears?



P.18A. In general, could you tell me all the places where Pears come from? Any other? Any other?
P18B. Based on this scale (CARD #18B), how important is the origin of Pears to you?

Origin of Pears: By demographics

Could you tell me all the places where Pears come from?

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Mexico	35	37	32	35	34	48	33	35	11
						fgh	h	h	
United States	11	13	8	11	10	15	6	13	7
		b				fh		fh	
Don't know any	62	59	64	61	62	50	63	57	87
							e		efg

Mexico City is where the perception that Pears are from Mexico is stronger

P.18A. In general, could you tell me all the places where Pears come from? Any other? Any other?

Origin of Pears: By demographics

How important is the origin?

Even if there are some differences, these are not relevant between the different demographics

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Very important	18	15	21	17	20	21	20	16	14
			a			h			
Important	29	30	28	29	29	30	26	25	34
Neither important nor unimportant	17	18	16	18	16	15	22	19	12
							h		
Not very important	24	24	24	24	24	21	26	26	24
Not important at all	12	13	11	13	11	12	7	14	17
								f	f

P18B. Based on this scale (CARD #18B), how important is the origin of Pears to you?

Purchasing habits

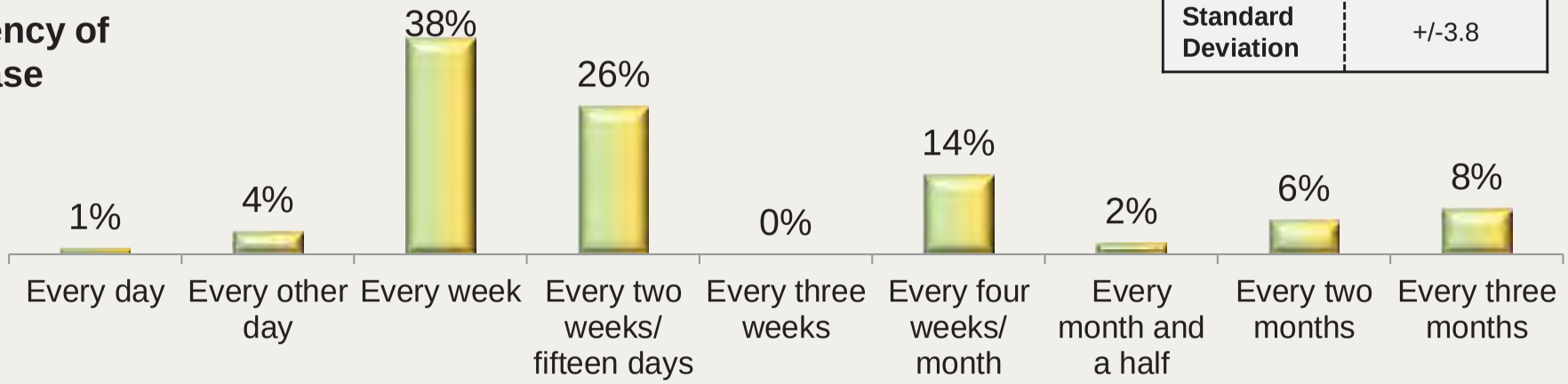
Frequency and amount of purchase

In average, the consumer buys Pears every week, buying between half and one kilo at a time.

Base: Total Interviews (914)

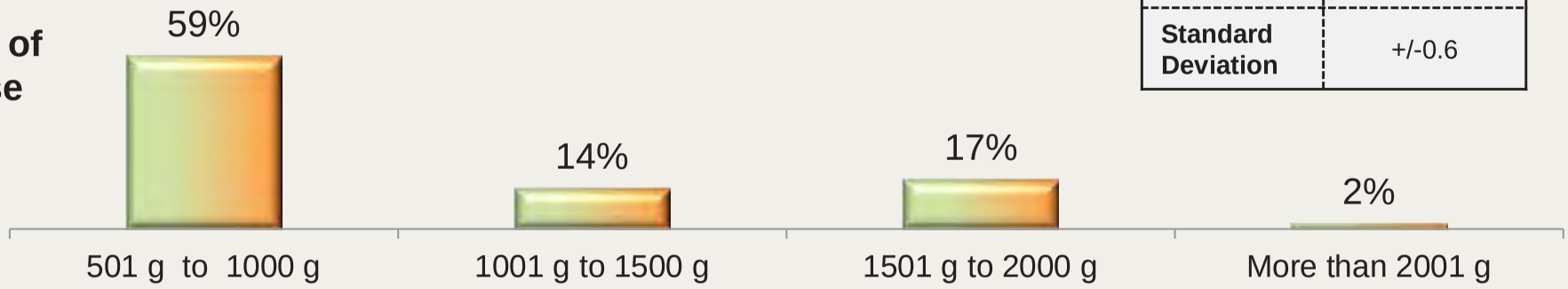
Average	3.2 times per month
Standard Deviation	+/-3.8

Frequency of purchase



Average	1.2 Kg
Standard Deviation	+/-0.6

Amount of purchase



P.4.-How often do you buy Pears?
P.5.-And how much do you buy every time?

Frequency and amount of purchase: By demographics

Only Monterrey stands out for having a smaller frequency (almost every fifteen days)

		TOTAL	S.E.L		AGE		CITY			
			ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
			a	b	c	d	e	f	g	h
Total		**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
Frequency		**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
	Average (times per month)	3.2	3.2	3.1	3.1	3.2	3.6	2.4	3.5	3.0
							f		f	
Amount	Averages (in kilos)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.1
									efh	

P.4.-How often do you buy Pears?
P.5.-And how much do you buy every time?

Places of purchase

The main place of purchase is supermarkets, followed by public markets and the Street Market. Specialized stores and Express Self Service stores have a low importance.

Base: Total Interviews (914)

P.6.-In what kind of establishments do you usually buy Pears?

Places of purchase: By demographics

The places of purchase are very different by site

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Tradtional supermarket	35	38	32	36	33	11	68 eg	14	61 eg
Public Market	24	24	24	21	27	41 fgh	10	27 fh	8
Street Market	23	20	26 a	23	22	37 fh	6	30 fh	9
Express self service stores or supermarkets	8	10	6	8	8	2	10 eg	2	23 efg
Specialized (Fruit shops)	8	6	9	9	6	7 h	4 h	18 efh	1

Markets and street markets are very relevant in Mexico City and Guadalajara for the purchase of Pears. In Monterrey and Tijuana supermarkets are much more important.

P.6.- In what kind of establishments do you usually buy Pears?

Reasons to purchase by places of purchase

For the Street Market and the Wholesale Food Market the location is not that important, however the freshness and the price become specially relevant. For the Supermarkets location is the most relevant.

Base: Total Interviews (914)

	TOTAL	Traditional Supermarkets or Self Service	Public Market	Street Market	Express Supermarkets or Self Service	Specialized (Fruit Shop)	Wholesale food market
TOTAL	**914**	**317**	**220**	**209**	**72**	**69**	**21**
	%	%	%	%	%	%	%
QUALITY OF THE FRUIT (NET)	**48**	**58**	**43**	**41**	**46**	**42**	**57**
Pears are fresher, not refrigerated	30	30	32	30	18	29	**52**
The pear is not damaged, bruised	9	15	4	3	15	6	5
Better quality fruit	8	14	3	2	8	9	5
They are cleaner, hygienic	7	12	2	0	17	4	0
You find them ripe	3	3	2	3	1	3	5
They last longer, they do not get spoiled	0	2	1	3	4	1	5
PRICE/ SALES (NET)	**40**	**31**	**40**	**62**	**24**	**32**	**67**
It is cheaper, lower price per kilo	36	22	40	**62**	19	29	**67**
They are on sale	5	12	1	0	4	3	0
LOCATION (NET)	**36**	**38**	**40**	**24**	**43**	**48**	**24**
It is close to home / work	36	38	40	24	43	48	24

6A - And why do you prefer to buy them there?

Reasons to purchase by places of purchase

Being able to choose between several retailers is also a relevant issue for the market and the street market. For the Supermarket, being also able to do all their grocery shopping is important.

Base: Total Interviews (914)

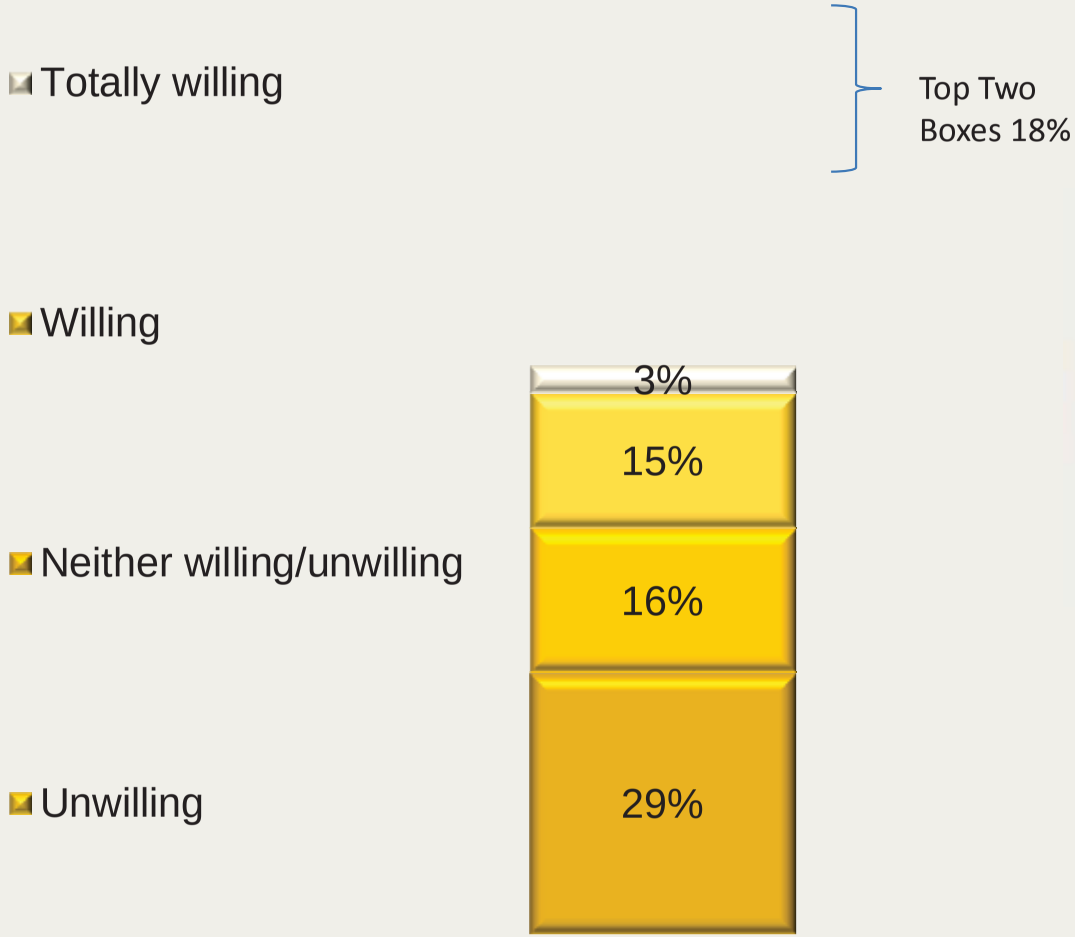
	TOTAL	Traditional Supermarkets or Self Service	Public Market	Street Market	Express Supermarkets or Self Service	Specialized (Fruit Shop)
TOTAL	**914**	**317**	**220**	**209**	**72**	**69**
	%	**%**	**%**	**%**	**%**	**%**
SERVICE (NET)	**16**	**8**	**24**	**22**	**8**	**19**
I can choose them between several retailers	8	4	12	11	3	7
They have a larger variety of pears	4	1	7	9	1	4
I always find them	2	1	3	0	3	4
HABIT (NET)	**15**	**22**	**12**	**11**	**17**	**9**
It is where I usually do my shopping, I buy all my groceries	11	18	6	5	17	0
As a habit, it is where I always go	5	4	5	6	0	9
ATTENTION (NET)	**1**	**1**	**0**	**0**	**0**	**1**
The staff is kind	1	1	0	0	0	1

6A.- And why do you prefer to buy them there?

Willingness to buy on the Internet

The intent to purchase on the Internet is low, where only two out of every ten are willing to do it.

Base: Total Interviews (914)



6B.- If you knew it were possible to buy pears on the supermarket's web pages on the Internet, based on this card (CARD #6B), how willing would you be to buy them through this medium?

Willingness to buy on the Internet: By demographics

There are no important differences by demographics.

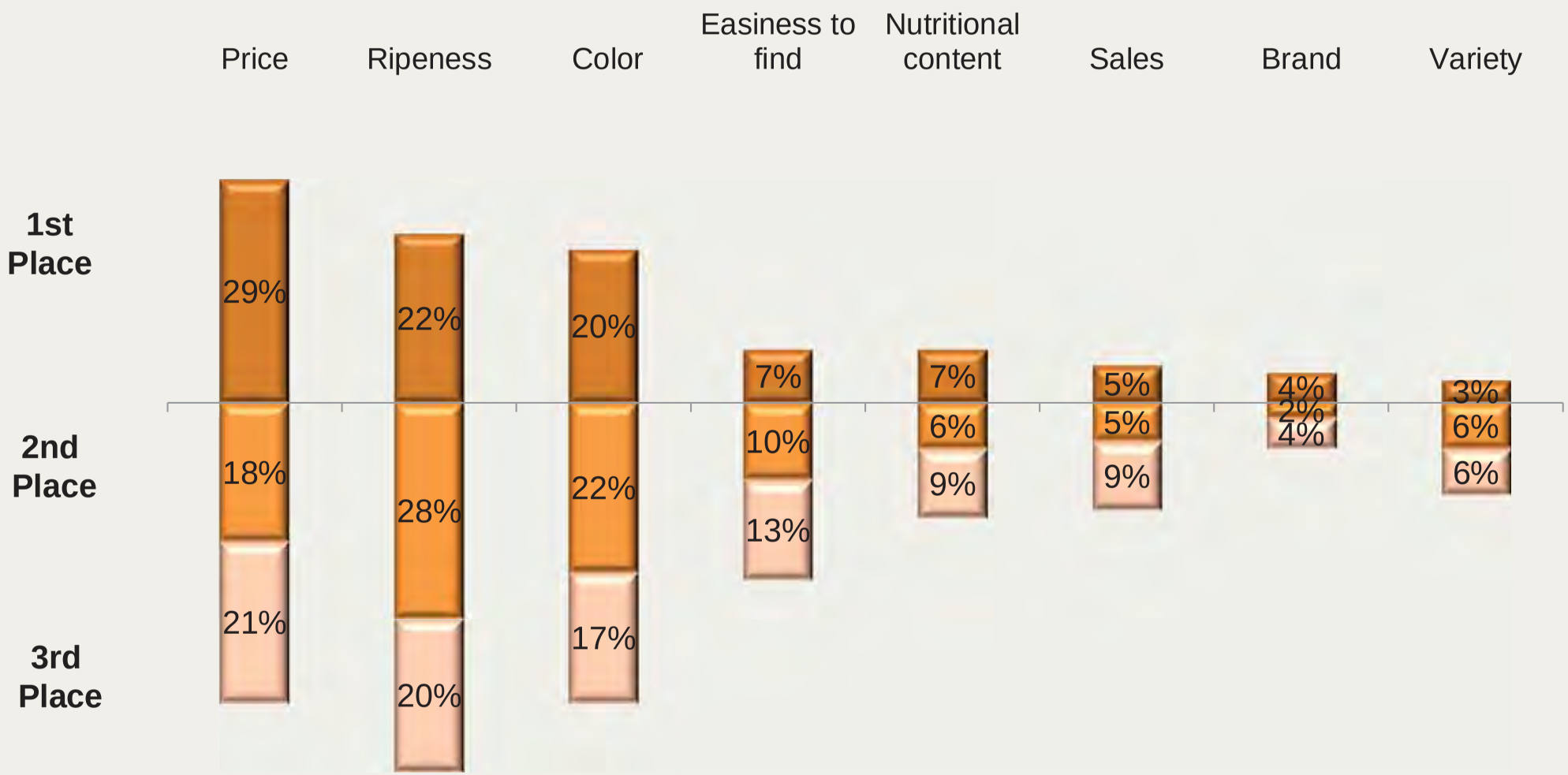
	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Totally willing	3	5	2	2	4	4	3	1	4
		b							
Willing	15	17	12	17	12	15	15	14	14
		b		d					
Neither willing/ unwilling	16	16	15	15	16	13	22	17	10
							eh	h	
Unwilling	29	28	30	31	27	27	29	25	38
									eg
Totally unwilling	38	35	41	34	42	42	31	42	34
					c	f		f	

6B.- If you knew it were possible to buy pears on the supermarket's web pages on the Internet, based on this card (CARD #6B), how willing would you be to buy them through this medium?

Factors considered

Price, ripeness and color are the most important factors (in that order). The rest of the factors are not very relevant.

Base: Total Interviews (914)



P.16.-From the following list (SHOW CARD #16), which are the three main factors you consider when buying Pears?

Factors considered: By demographics
1st Place

With the exception of Mexico City, price is important to all the rest of the segments. In Mexico City, ripeness tends to be more important

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Price	29	26	32	29	29	25	33 e	30	29
Ripeness	22	23	21	21	22	32 fgh	19	14	17
Color	20	20	20	23	18	21	17	23	18
Easiness to find	7	8	7	8	7	8	4	8 f	9 f
Nutritional Content	7	8	7	5	9 c	6	4	12 ef	7
Sales	5	5	5	6	4	1	13 eg	1	8 eg
Brand	4	5	4	4	4	3	4	3	8 e

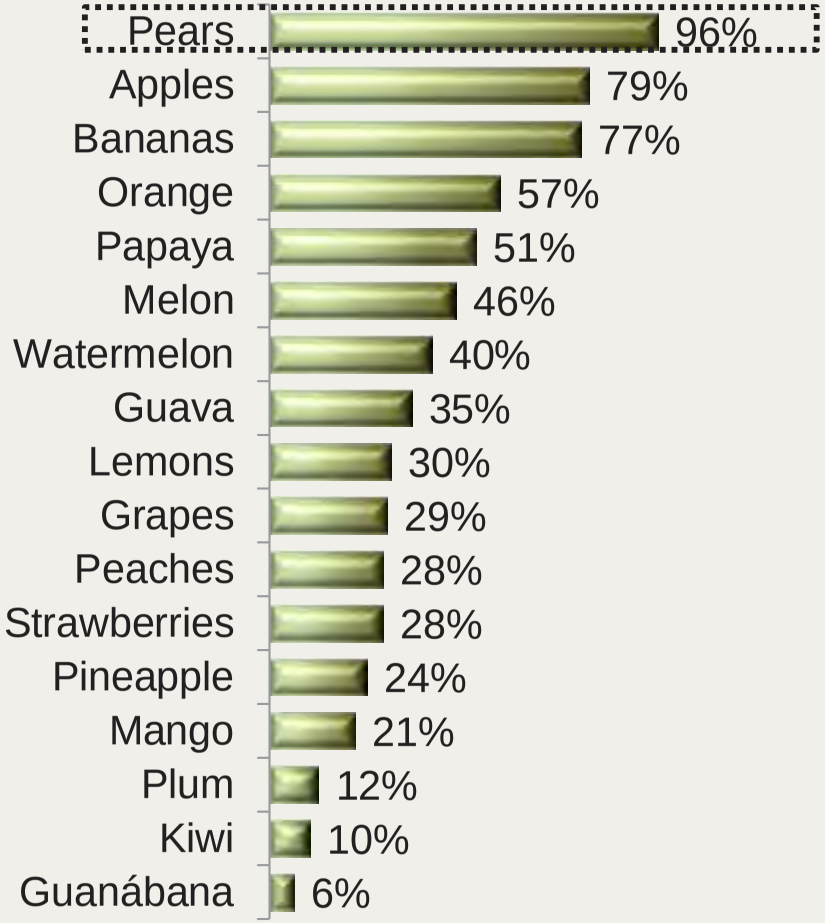
P.16.- From the following list (SHOW CARD #16), which are the three main factors you consider when buying Pears?

Barriers to the purchase of Pears

Very few are not used to buying Pears, and the reasons are its taste and the price.

Base: Total Interviews (957)

From the fruits you know, which are the ones you usually buy?



Reasons for not usually buying Pears (4%)

Base: Did not mention usually buying Pears

TOTAL	43
	%
Its taste is not pleasant	42
They are expensive	28
Its texture is like sand, grainy	9
It is difficult to find it ripe	9
It is too dry, not juicy	9
It is too hard	7
It is tasteless	5
It is too sour	5

P.E.- Of all the FRESH fruits you know, which ones do you usually buy?
P.F.- What are the reasons why you do not usually buy FRESH PEARS? What else? Anything else? (PROBE AND INSIST)

Fruits usually buys : By demographics

There are no relevant differences by demographics

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**957**	**460**	**497**	**477**	**480**	**332**	**221**	**218**	**186**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Pears	96	96	95	96	95	94	99	98	91
							eh	eh	
Apples	79	80	78	78	80	84	77	80	72
						fh			
Bananas	77	77	77	78	75	80	77	75	74
Orange	57	57	58	56	59	49	59	69	58
							e	efh	
Papaya	51	52	50	50	52	64	49	54	27
						fgh	h	h	
Melon	46	47	45	45	47	48	52	47	33
						h	h	h	
Watermelon	40	41	39	42	38	41	52	28	38
						g	egh		g
Guava	35	37	34	34	36	45	37	46	3
						h	h	fh	
Lemons	30	32	29	31	29	26	46	41	6
						h	eh	eh	
Grapes	29	28	29	29	28	34	33	26	18
						gh	h		
Strawberries	28	33	25	28	29	25	32	42	15
		b				h	h	efh	

P.E.- Of all the FRESH fruits you know, which ones do you usually buy?

Reasons for buying Pears

Sensorial benefits are the main reasons to purchase. Within these, the flavor and consistency are the most important. Freshness, fiber and being nutritious are also relevant

Base: Total Inteviews(914)

TOTAL	914
	%
SENSORIAL BENEFITS (NET)	**71**
FLAVOR (SUB NET)	**66**
Sweet taste	42
They are juicy	25
Pleasant taste to the palate	11
CONSISTENCY (SUB- NET)	**16**
Its texture is soft, they are soft	12
It is easy to bite	5
FUNCTIONAL BENEFITS (NET)	**53**
They are fresh, quench thirst	12
They contain fiber/ they are a source of fiber	11
They are nutritious	11
“They have vitamin \"C\" "	9
They are healthy	9
They have vitamins/ Contain vitamins N/S	7
An aid for a good digestion	7
OTHER BENEFITS (NET)	**15**
It is an inexpensive fruit	5

P0.1.What are the reasons for ehich you usually buy PEARS for you and your family? Any other reason? Any other?

Performance of the kinds of Pears

Green Anjou is the best known and more purchased, followed by Bartlett and Bosc

Base: Total Interviews (914)

	TOM	TOTAL SPONTANEOUS	TOTAL AWARENESS	LAST 3 MONTHS	MORE FREQUENT
TOTAL	**914**	**914**	**914**	**914**	**914**
	%	**%**	**%**	**%**	**%**
Anjou green	38	50	92	65	57
Bartlett	4	9	68	33	22
Bosc	8	11	50	21	14
Concorde	0	2	21	5	3
Mantequilla	16	19	19	0	0
Yellow	6	13	14	0	0
Anjou red	1	3	13	2	1
Pera de agua	5	10	10	0	0
Brown	3	10	10	0	0
Bartlett roja	0	2	10	1	1
Comice	0	3	9	1	1
Forelle	0	0	9	1	0
Pera de Leche	4	8	8	0	0
Seckel	0	0	8	1	1
Criolla	2	4	4	0	0
Other varieties	1	1	1	0	0
DK	10	12	13	0	0

Total Awareness: By demographics

By demographics, the Anjou is still the most important, however, the Bosc stands out in Tijuana as being an equally important kind.

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	%	%	%	%	%	%	%	%
Anjou verde	92	93	91	93	91	91 h	96 eh	97 eh	82
Bartlett	68	68	68	68	68	69 g	79 egh	58	66
Bosc	50	51	49	49	51	65 fg	37 g	16	82 efg
Concorde	21	22	20	19	22	20	18	17	31 efg
Mantequilla	19	19	19	16	21	42 fgh	9 h	8 h	1
Amarillas	14	15	12	14	13	7	28 egh	14 eh	6
Anjou roja	13	15	11	12	14	17 f	10	11	13
Café (Brown)	10	11	9	9	11	22 fgh	2	3	7 f
Pera de agua	10	9	11	8	11	1	38 egh	0	2
Bartlett roja	10	9	10	11	8	11 g	11 g	5	9

P8 Of the following kinds of Pears which one do you know?

Total Awareness: By demographics
(Continued …)

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Comise	9	8	10	9	9	16 fg	5	1	13 fg
Forelle	9	11	7	9	9	8	8	11	9
Seckel	8	9	8	8	9	11 fg	5	5	12 fg
Pera de Leche	8	8	8	7	9	0	34 egh	0	1
Criolla	4	4	3	4	4	8 fh	0	4 fh	0

P8 Of the following kinds of Pears which one do you know?

Penetration Last 3 Months: By demographics

Bosc also achieves important penetration in Tijuana

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Anjou verde	65	66	65	67	64	65	66	81	44
						h	h	efh	
Bartlett	33	33	33	31	35	37	38	22	33
						g	g		g
Bosc	21	19	24	20	23	22	8	6	58
						fg			efg
Concorde	5	5	5	4	7	5	3	7	6
					c				

P9 Of these varieties you know, which have you purchased in the last three months?

Purchases More Frequently: By demographics

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Anjou verde	57	57	57	61	54	58	61	75	29
						h	h	efh	
Bartlett	22	24	20	20	23	23	28	15	19
						g	gh		
Bosc	14	13	15	13	15	11	5	3	44
						fg			efg

P. 10.- And which are the Pear varieties you buy more frequently?

Reasons for purchase by kind of Pear

There are no important differences among the reasons to purchase by kind of Pear. The consistency and the taste are shared reasons for purchase.

Base: Total Interviews (914)

	TOTAL	ANJOU VERDE	BARTLETT	BOSC	CON CORDE
TOTAL	**914**	**525**	**198**	**127**	**28**
	%	%	%	%	%
CONSISTENCY (NET)	**58**	**58**	**63**	**49**	**61**
It is juicy	35	39	35	25	25
It is soft when eating, soft when biting on it	17	14	26	15	18
Its texture is somewhat harder	7	7	4	9	11
It does not have a thick skin, its skin is soft	6	4	11	4	4
It is fresh	4	6	4	1	4
TASTE (NET)	**51**	**48**	**49**	**65**	**43**
It is sweeter	39	35	39	54	36
More pleasant, delicous taste	10	9	10	13	7
It is sweet and sour	3	5	2	0	4
It is not cloying	3	4	1	1	4
SEASON (NET)	**21**	**23**	**20**	**14**	**21**
It is the one they sell/ have most	17	18	15	13	18
You find it all year round	4	4	5	1	4
PRICE/ OFFER (NET)	**7**	**7**	**5**	**13**	**7**
It is cheaper, accessible price	7	7	5	13	7
HEALTHY (NET)	**7**	**9**	**6**	**5**	**4**
They are healthier	4	4	4	3	0
OTHER ANSWERS (NET)	**5**	**6**	**4**	**2**	**14**
It is the one sold the most, find it anywhere	2	3	3	0	4
For its color, it is more appetizing	2	2	1	1	11

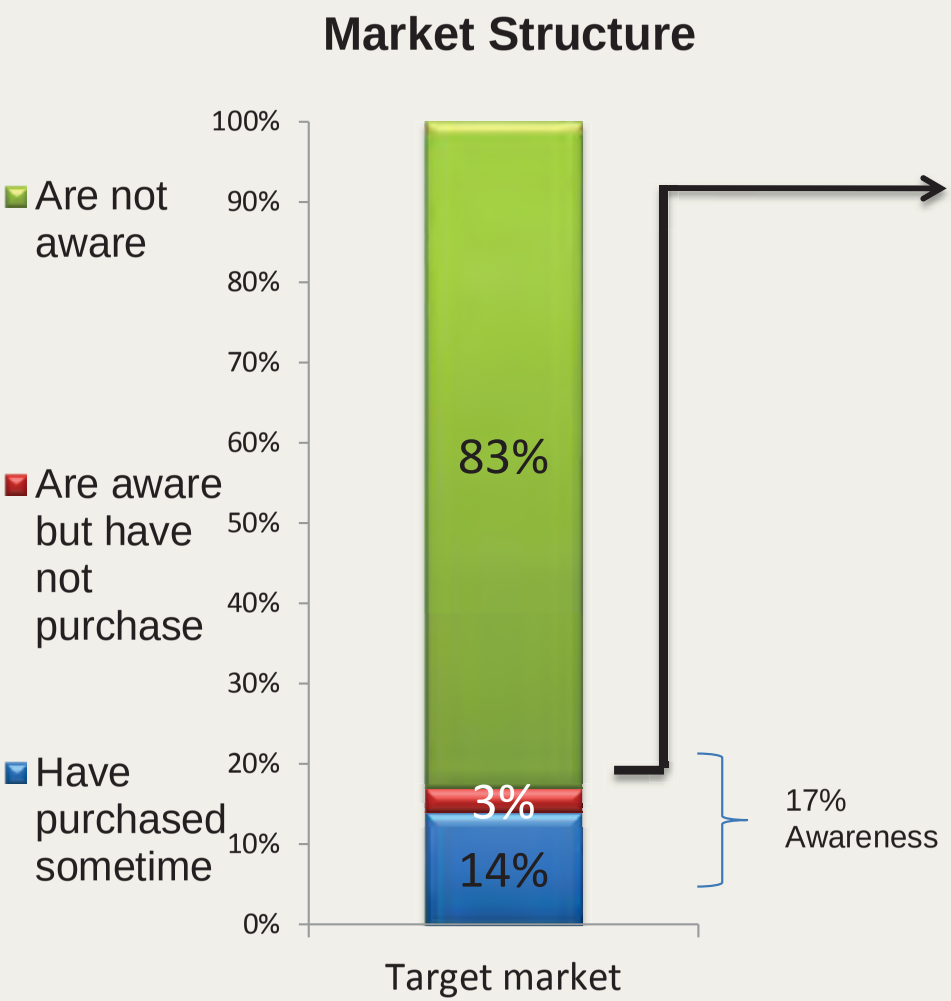
P.11.-You mentioned that the varieties of pears you buy more frequently are … (MENTION VARIETY IN Q. 10). Contrary to other varieties, what are the reasons that motivate you to buy that variety of Pear? What else? Anything else? (PROBE AND INSIST).

Awareness and image of USA Pears

Awareness and purchase of USA Pears

Only two out of every ten are aware of USA Pears; however, most of those who are aware have purchased them.

Base: Total Interviews (914)



Why don't you buy USA Pears?

Base: Mentioned they do not buy Pears USA (24)

	TOTAL
	24
	%
PRICE (NET)	**38**
They are more expensive	38
QUALITY (NET)	**25**
It is not a reliable fruit	17
It is hard, not soft	8
They are not fresh	4
AVAILABILITY: They are not available where I usually do my shopping	**21**
I DO NOY BUY PRODUCTS FROM THE UNITED STATES	**13**
THEY ARE GROWN WITH CHEMICALS	**8**

P.19. Are you aware of USA PEARS? / P.20. Have you purchased USA PEARS? P.21.- What are the reasons why you DO NOT BUY USA PEARS? What else? Anything else? (PROBE AND INSIST).

Awareness and purchase of USA Pears: By demographics

The highest awareness and purchase is in the highest levels and in Mexico City

Are you aware of USA PEARS?

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Yes	17	20	14	18	16	20	12	18	16
		b				f			

Have you bought USA PEARS?

	TOTAL	S.E.L.		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Yes	14	18	11	14	14	16	10	15	15
		b							

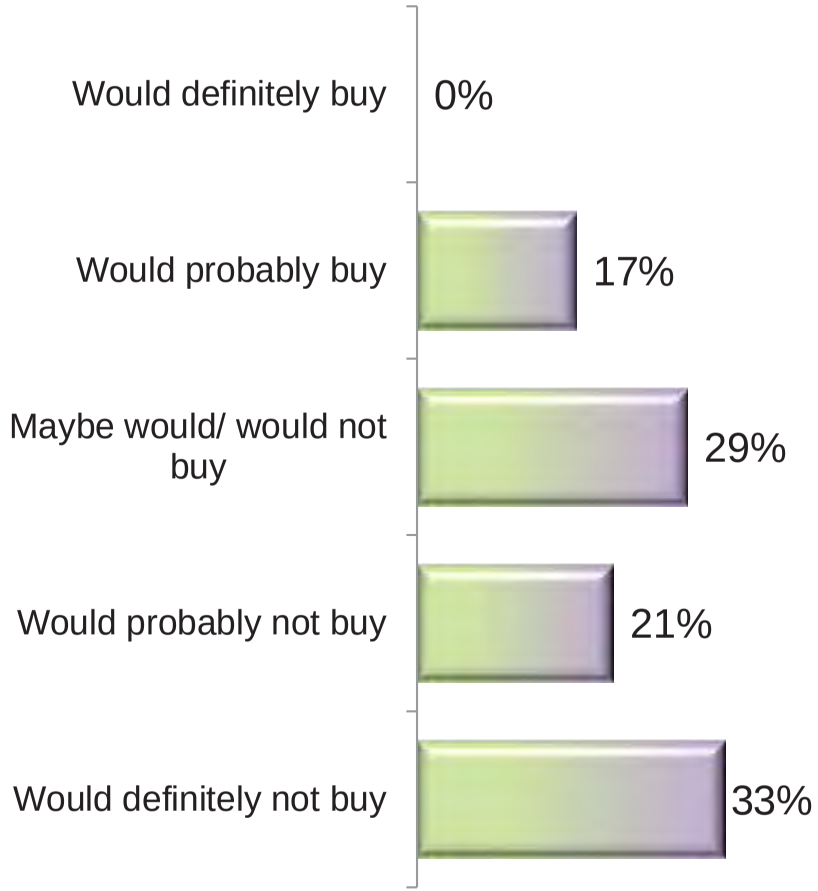
P.19. Are you aware of USA PEARS? / P.20. Have you purchased USA PEARS? P.21.- What are the reasons why you DO NOT BUY USA PEARS? What else? Anything else? (PROBE AND INSIST).

Intention to purchase USA Pears: Before the Concept

The intention to purchase is good among those who have purchased them sometime (four out of every ten are completely willing to buy them again).

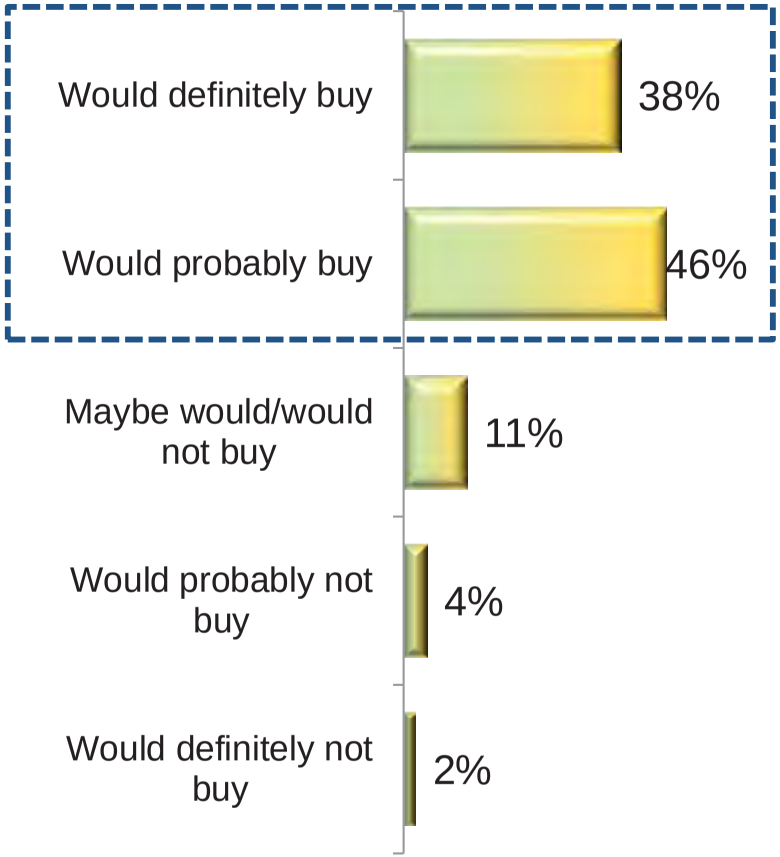
Are aware but have not purchased

Base: Mentioned they do not buy USA Pears (24)



Have bought sometime

Base: Mentioned buying USA Pears (130)



* This question was not asked to those who were not aware of Pears USA

P.22.-Based on the following scale, how willing would you be to buy USA PEARS next time you buy pears?

Intention to purchase Pears USA : Before the Concept
By demographics

Base: Mentioned buying USA Pears (130)

There are no significant differences by demographics

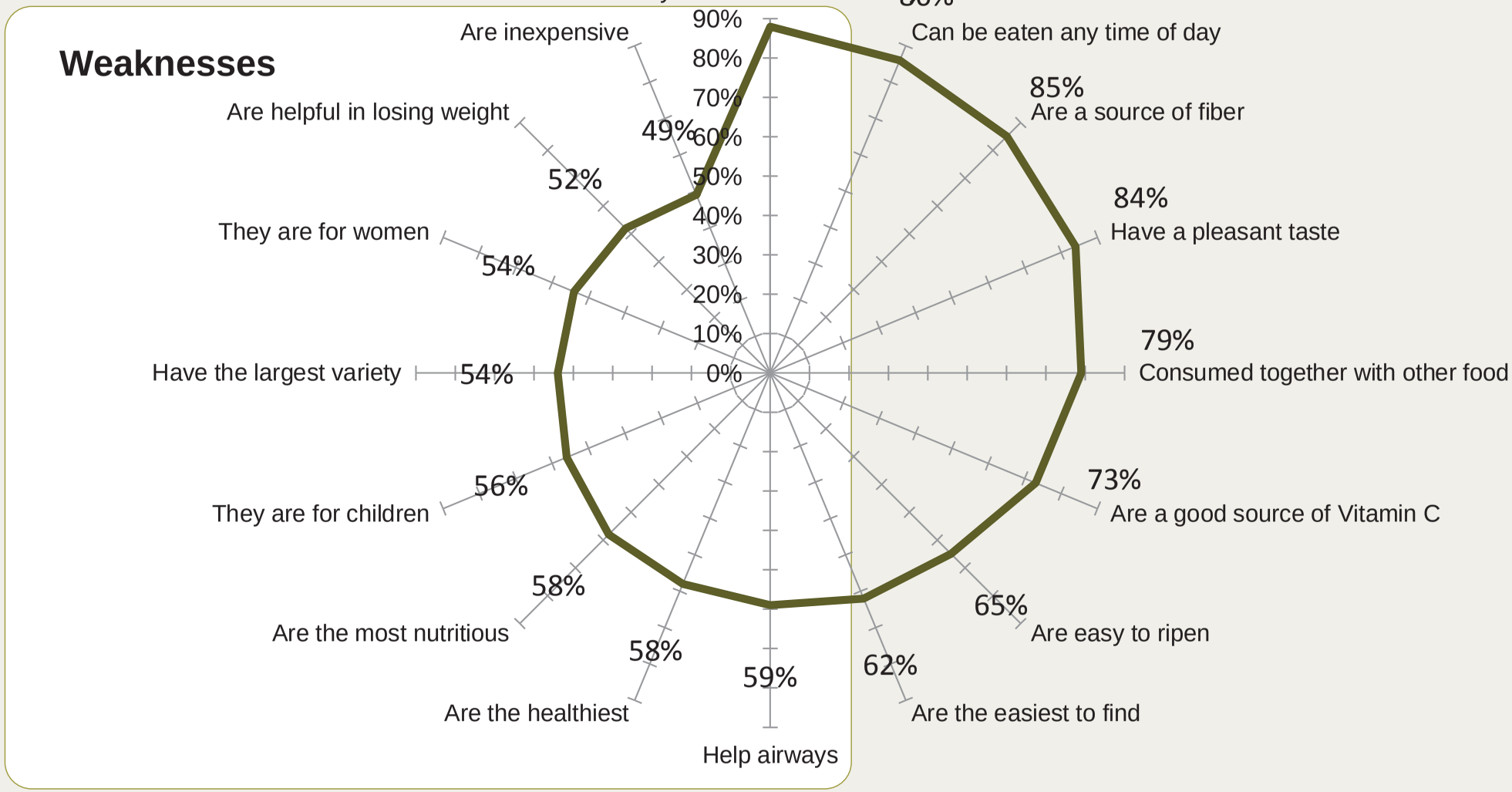
	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**130**	**78***	**52***	**65***	**65***	**50***	**22****	**33***	**25****
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Would definitely buy	38	40	35	32	43	36	59	33	28
Would probably buy	46	42	52	49	43	48	36	42	56
Maybe would/ would not buy	11	12	10	12	9	10	5	15	12
Would probably not buy	4	5	2	6	2	4	0	6	4
Would definitely not buy	2	1	2	0	3	2	0	3	0

P.22.- Based on the following scale, how willing would you be to buy USA PEARS next time you buy pears?

USA Pears Image: Top Two Boxes

USA Pears are mainly identified for being for the entire family, to eat any time of day and for being an important source of fiber. On the contrary they are perceived as being expensive, not so much to lose weight or for women and with having a small variety.

Base: Aware of USA Pears (154)



P.23.- Based on this opinions, where 5 is Completely agree and 1 is Completely disagree, how much do you agree or disagree that USA Pears... ?

CONCEPT EVALUATED

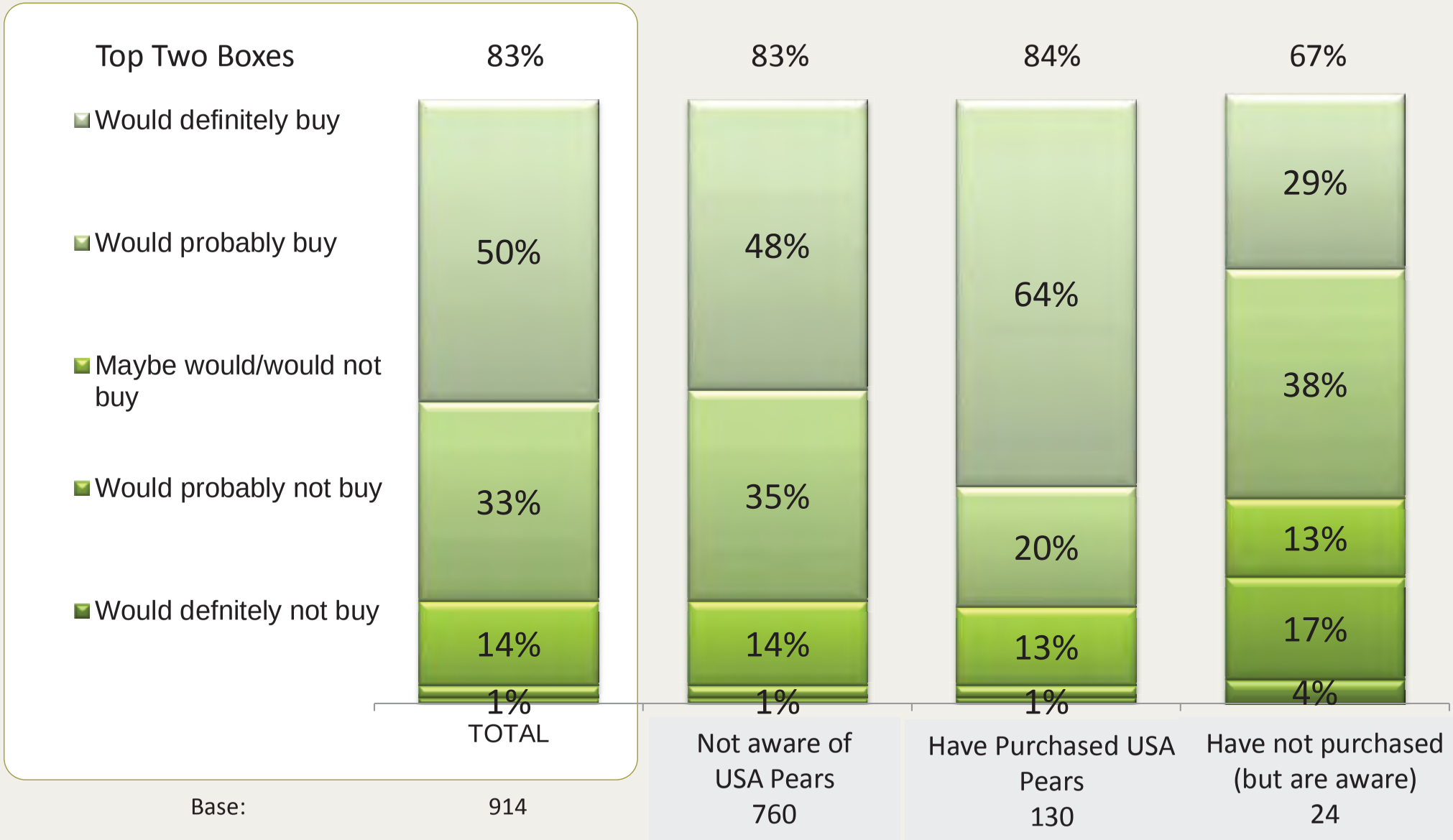
P.24.- I am now going to show you a description of USA PEARS. Please read it and I am going to ask you some questions.

USA Pears have been recognized as one of the 20 most popular fruits, and ¡this is not strange because! they are an excellent source of fiber and a good source of Vitamin C and only have 100 calories per portion. And they are free of sodium, fat and cholesterol. That is a lot of nutrition in a sweet and juicy package!

Intent to purchase to the Concept

Eight out of every ten have a good intent towards USA Pears, especially those who have purchased them sometime. Those who were not aware also achieve a good intent.

Base: Total Interviews (914)



P.25.-Now that you read the concept, if USA Pears were available in the places you shop, how willing would you be to buy them?

Intent to purchase to the Concept: By demographics

After the concept, the highest levels and the City of Monterrey have the best disposition towards the brand

	TOTAL	S.E.L		AGE		CITY			
		ABC+	C	25-35	36-55	Mex	Mty	Gdl	Tij
		a	b	c	d	e	f	g	h
Total	**914**	**442**	**472**	**456**	**458**	**313**	**218**	**214**	**169**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Would definitely buy	50	54	46	51	48	38	75	44	47
		b					egh		
Would probably buy	33	30	36	32	34	44	22	34	25
			a			fgh		f	
Maybe would/ would not buy	14	13	15	14	14	13	2	17	28
						f		f	efg
Would probably not buy	2	3	2	2	2	3	1	4	0
						h		fh	
Would definitely not buy	1	1	2	1	1	2	0	1	1

P.25.- Now that you read the concept, if USA Pears were available in the places you shop, how willing would you be to buy them?

Reasons for Intent to Concept: Positive

Vitamin C, fiber, low fat content and being free of cholesterol are the main reasons for intent. The origin is not that relevant spontaneously.

	TOTAL	Not aware of USA Pears	Have purchased	Have not purchased
Total	**755**	**630**	**109**	**16**
	%	%	%	%
FUNCTIONAL BENEFITS (NET)	**93**	**94**	**85**	**94**
They have vitamin C, protect airways	57	59	49	31
Fiber content, good digestion	39	39	35	63
Free of fat	22	24	12	13
Free of cholesterol, healthy heart	19	20	13	13
It is a Nutritious fruit	13	13	16	0
Provides 100 calories to control weight	12	13	7	13
Sodium free, helps circulation	10	10	8	19
Few calories	10	10	15	0
I would not get sick easily, prevents diseases	3	3	4	0
SENSORIAL BENEFITS (NET)	**13**	**12**	**18**	**19**
TASTE (SUB NET)	**13**	**12**	**18**	**19**
They are juicy	8	8	11	13
They are sweet	8	7	14	13
Know the quality of the fruit	1	1	3	6
ORIGIN (NET)	**3**	**3**	**9**	**0**
The are imported and high quality, they have a quality seal	3	3	8	0

P.25ª.-Why do you say that..... (MENTION ANSWER FROM Q.25)? What else? Anything else? (PROBE AND INSIST)

Reasons for Intent to Concept : Undecided/ Negative

The absence of tasting and being imported are their main barrier

	TOTAL	Not aware of Pears	Buys pears	Does not buy Pears
Total interviews	**159**	**130**	**21**	**8**
	%	**%**	**%**	**%**
NEGATIVE (SUPER-NET)	**63**	**62**	**57**	**88**
NUTRITIONAL PROPERTIES (NET)	**38**	**38**	**33**	**50**
I need to try them first, get to know them	30	32	24	25
Mexican pears have the same nutritional content	5	5	10	0
It is not credible that it does not have sodium	3	2	0	13
It is not special, it is like any other fruit	1	1	0	13
ORIGIN (NET)	**24**	**23**	**24**	**38**
They are imported, we have to consume Mexican products	9	9	5	13
I do not like American products	8	7	5	25
They are expensive for being imported	6	5	14	0
They use fertilizers, harmful	4	4	0	13
FRUIT (NET)	**3**	**2**	**10**	**0**
They are not very juicy	1	0	5	0
Their taste is bitter	1	0	5	0
They have a hard skin	1	0	5	0

P.25ª.- Why do you say that..... (MENTION ANSWER FROM Q.25)? What else? Anything else? (PROBE AND INSIST)

Reasons for Intent to Concept : Undecided/ Negative

… anyway they sense their main benefits.

	TOTAL	Not aware of Pears	Buys pears	Does not buy Pears
Total interviews	**159**	**130**	**21**	**8**
	%	**%**	**%**	**%**
POSITIVES (SUPER-NETO)	**37**	**40**	**29**	**13**
FUNCTIONAL BENEFITS (NET)	**27**	**29**	**19**	**13**
They have vitamin C, protect airways	12	13	5	13
Fiber content, good digestion	9	11	0	0
It is a Nutritious fruit	8	8	10	0
Few calories	3	4	0	0
Free of cholesterol, healthy heart	3	2	5	0
Sodium free, helps circulation	2	2	0	13
SENSORIAL BENEFITS (NET)	**12**	**13**	**10**	**0**
TASTE (SUB NET)	**12**	**13**	**10**	**0**
They are sweet	5	5	5	0
Know their flavor	4	5	0	0
They are juicy	3	4	0	0
Know the quality of the fruit	3	3	5	0
Nothing	13	10	33	0

P.25ª -Why do you say that..... (MENTION ANSWER FROM Q.25)? What else? Anything else? (PROBE AND INSIST)

Summary of findings

Summary of findings

- ✓ Nine out of every ten consider that the consumption of healthy and nutritious products is very important for the family.
- ✓ Spontaneously, three out of every ten consider Pears a healthy and nutritious product. It is spontaneously positioned as the third healthier fruit, just after apples and bananas.
- ✓ When aided, nine out of every ten consider Pears a healthy fruit. Only 4% do not consider them that way. Watermelon stands out as one of the less healthy fruits.
- ✓ Those who do not consider that Pears are healthy (4%) claim they ignore the nutritional properties or vitamin content
- ✓ “Biting it” is the main form of consumption. However five out of every ten also consume them combined, mainly in fruit cocktail, with chili or in syrup.
- ✓ Only 4% have learned this forms of consumption through a communication medium, mainly on TV.

Summary of findings

- ✓ Six out of every ten consider they can ripen Pears at home, where the most usual way is using paper, “wrapping” them. Tijuana stands out as a city where seven out of every ten do not consider that pears can ripen at home.
- ✓ The time of day when they are more consumed, both by housewives and children is between meals or at breakfast. The habit is low at dinner time. In Monterrey the consumption in the afternoon is much more incisive. Mexico stands out for being a city where the consumption at breakfast and at lunch time is much more important.
- ✓ The nutritional properties more perceived in pears are vitamins and fiber.
- ✓ Three out of every ten perceive that Pears are from Mexico, however only two out of every ten consider that the origin is very important. The perception that they are from Mexico is stronger in Mexico City.
- ✓ In average the consumer buys between half and one kilo of Pears every week. Only Monterrey stands out as having a lower frequency (almost every fifteen days)

Summary of findings

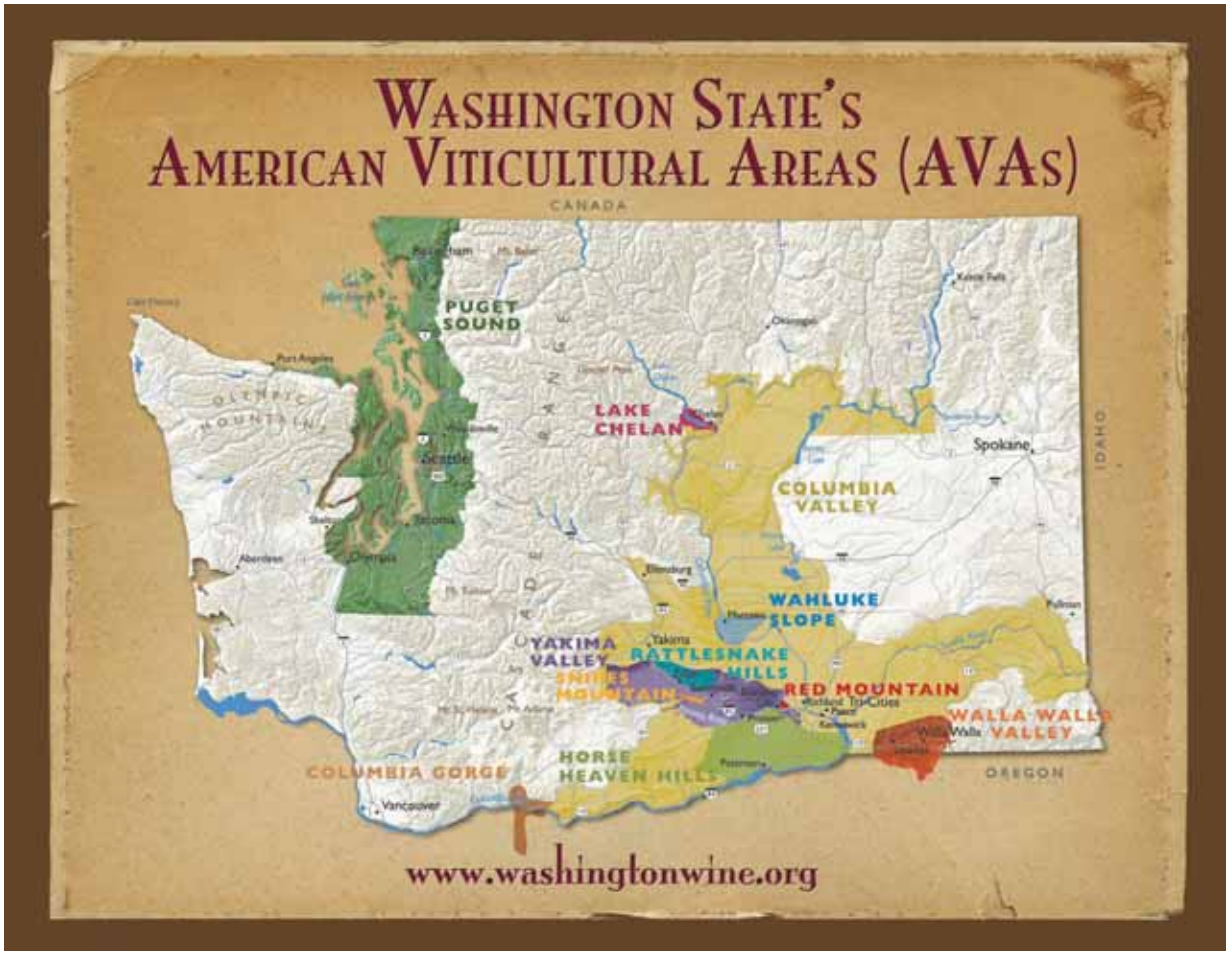
- ✓ The main place of purchase for Pears is the supermarket, followed by public market and street market. Specialized and Express self Service stores have a low importance. In Mexico City and Guadalajara markets and street markets are very relevant for the purchase of Pears. In Monterrey and Tijuana supermarkets are much more important.
- ✓ For the Street market and the Wholesale Food market the location is not very important, however, the freshness and the price become specially relevant. For the Supermarket and Public Market the location is more relevant.
- ✓ Being able to choose the Pears is also a relevant issue for the market and the street market. For the supermarket, being able to do all the grocery shopping at the same time is something important.
- ✓ The intent to buy on Internet is low, only two out of every ten are willing to do it.
- ✓ Price, ripeness and color are the most important factors (in that order) The rest of the factors are irrelevant. With the exception of Mexico, the price is very important to the rest of the segments. In Mexico, ripeness tends to be more important.

Summary of findings

- ✓ Very few (4%) are not used to buying Pears, and the reasons are its taste and the price.
- ✓ Sensorial benefits are the main reasons to purchase. Within these, the flavor and consistency are the most important. Freshness, fiber and being nutritious are also relevant.
- ✓ Green Anjou is the best known and more purchased, followed by Bartlett and Bosc. By demographics Anjou is still the most important, however Bosc stands out in Tijuana as equally important.
- ✓ There are no important differences among the reasons to purchase by kind of Pear. The consistency and the taste are shared reasons for purchase.
- ✓ Only two out of every ten are aware of USA Pears, however, most of those who are aware have purchased them. The highest awareness and purchase is in the highest levels and in Mexico City.
- ✓ The intent to purchase is good among those who have purchased them sometime (four out of every ten are completely willing to buy them again).

Summary of findings

- ✓ USA Pears are mainly identified for being for the entire family, to eat any time of day and for being an important source of fiber. On the contrary they are perceived as being expensive, not so much to lose weight or for women and with having a small variety.
- ✓ Eight out of every ten have a good intent towards USA Pears (after the concept) especially those who have purchased them sometime. Those who were not aware also achieve a good intent.
- ✓ Vitamin C, fiber, low fat content and being free of cholesterol are the main reasons for intent. The origin is not that relevant spontaneously.
- ✓ The absence of tasting and being imported are in some way the main barrier to USA Pears.


WASHINGTON STATE'S
AMERICAN VITICULTURAL AREAS (AVAs)
CANADA
PUGET SOUND
LAKE CHELAN
COLUMBIA VALLEY
WAHLUKE SLOPE
YAKIMA VALLEY
RATTLESNAKE HILLS
SNIPES MOUNTAIN
RED MOUNTAIN
WALLA WALLA VALLEY
HORSE HEAVEN HILLS
COLUMBIA GORGE
OLYMPIC MOUNTAINS
Spokane
IDAHO
OREGON
www.washingtonwine.org

Washington State Department of Agriculture

News Release: June 23, 2011
Contact: Jason Kelly (360) 902-1815

WSDA resumes trapping to detect European grapevine moth

OLYMPIA – The Washington State Department of Agriculture (WSDA) announced today it will continue a program looking for a destructive moth with the potential to damage the state's grape and wine industry.

Up to 1,500 grapevine moth traps will be placed around the state by mid-July, according to Mike Klaus, WSDA's pest survey coordinator for Eastern Washington. Traps will be placed in each of the 11 major wine grape growing regions. Klaus said the traps will be checked every two-to-four weeks during the summer and then taken down in September. A similar WSDA survey in 2010 yielded no detections of the pest.

The European grapevine moth was found for the first time in the U.S. in September 2009 in California's Napa Valley. Klaus emphasized the grapevine moth has not been detected in Washington.

"The goal of the survey is to protect Washington's grape industry by preventing the establishment of this invasive species," Klaus said. "We want to detect it as early as possible if it does arrive. If the grapevine moth were to become established here, it could pose a serious threat to our grape and wine industries."

If grapevine moths are found, state agriculture officials will place more traps in the area in an attempt to find the center of the infestation. Officials say they would also consult immediately with state and federal agencies to determine the best course of action, as well as reach out to industry stakeholders.

"We greatly appreciate the focus on European grapevine moth from WSDA," said Vicky Scharlau, executive director, Washington Association of Wine Grape Growers. "The damage potential from this pest, and all pests and diseases, is a huge concern to us and we have to stay vigilant or pay the price."

Washington is the second-largest grape-growing state in the U.S. and number two producer of wines with 700 licensed wineries.

Washington's 11 primarily grape regions are the Yakima Valley, Walla Walla Valley, Columbia Valley, Puget Sound, Red Mountain near Benton City, Columbia Gorge south of Goldendale, Horse Heaven Hills near Prosser, Wahluke Slope near Mattawa, Rattlesnake Hills near Zillah, Snipes Mountain near Sunnyside, and Lake Chelan.

WSDA's trap and pest detection programs include gypsy moth, apple maggot, sudden oak death, spartina, Mediterranean snail and Japanese beetle. For more information on the European grapevine moth, go to: http://www.aphis.usda.gov/plant_health/plant_pest_info/eg_moth/index.shtml#ca. In addition, a wealth of information about pests that threaten the environment and the agricultural industry is available on the U.S. Department of Agriculture Animal and Plant Health Inspection Service website at www.hungrypests.com

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Ag officals employ preventive pest control

by Ross Courtney
Yakima Herald-Republic

ANDY SAWYER/Yakima Herald-Republic
Nichole Halvorson with the Washington State Department of Agriculture hangs a trap to catch European grapevine moths in a vineyard outside Sunnyside, Wash. Thursday, June 23, 2011.

SUNNYSIDE, Wash. -- State agricultural technicians began looking Thursday for a new European wine import.

They hope they don't find it.

Trappers with the Department of Agriculture began placing vineyard traps for the European grapevine moth, an invasive species whose larvae eat grape buds and fruit clusters, exposing them to diseases that could kill the vines.

The moth hasn't reached the state yet, as far as they know.

"Which is good news of course," said Mike Klaus, the department's pest survey coordinator for Eastern Washington.

The moth was first spotted in the United States in 2009 in California's Napa Valley after most likely hitchhiking from Europe, Klaus said.

A YouTube video posted last year by California researchers shows the air above vines thick with flying bugs. Entire vineyards ended up with fungal problems.

The moth has not shown up here yet because of containment efforts, cold winters, arid climates and lack of wild host plants, Klaus said.

Last year, agency employees set traps for four different species of pests, including the European moth.

They didn't catch anything.

Just to be on high alert, however, the trappers are focusing their efforts this summer on the European moth and are placing 1,500 traps throughout the state's vineyards, nurseries and even some backyards. The Yakima Valley is a key area with vast acreage of vineyards.

Vicky Scharlau, executive director of Washington Association of Wine Grape Growers, welcomed the effort.

"The damage potential from this pest, and all pests and diseases, is a huge concern to us and we have to stay vigilant or pay the price," Scharlau said in a news release.

Technicians will check the traps every two to four weeks and take them down in September.

Klaus said researchers and industry officials haven't discussed what to do if they find the pests, though some have had luck with mating disruption programs in California.

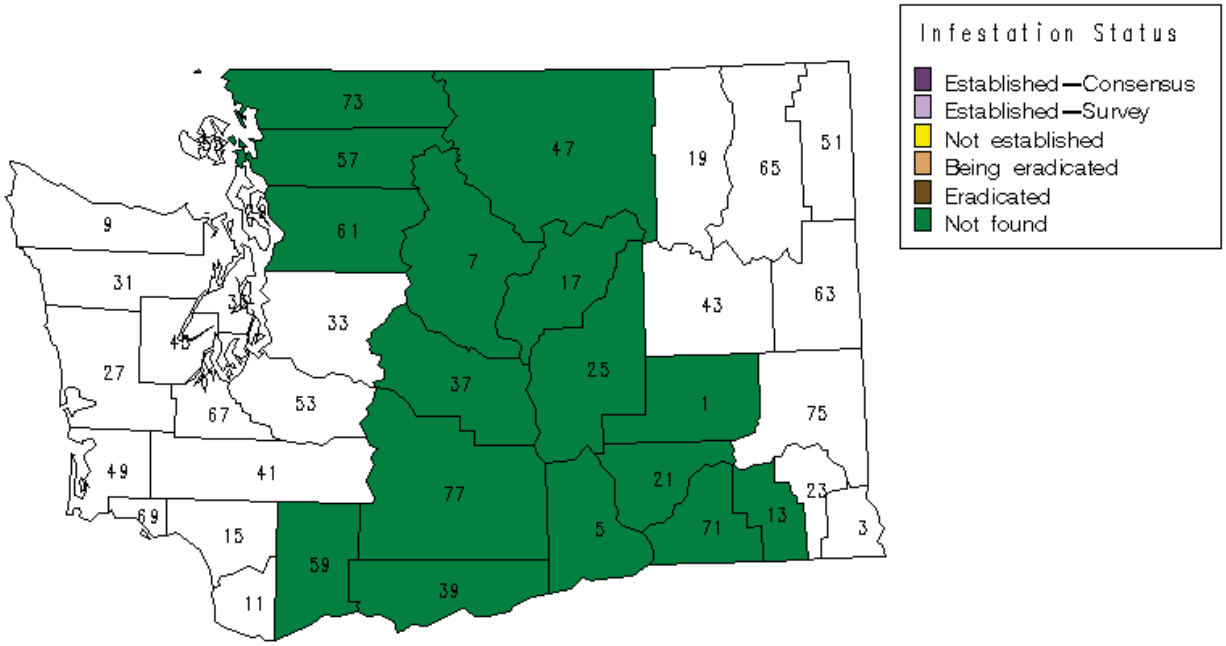
"It's too early for that, to worry about that," he said.

Reported Status of

European Grapevine Moth , Lobesia botrana

in Washington (01/01/2011—12/07/2011)

Data retrieved from National Agricultural Pest Information System on 12/07/2011



The Center for Environmental and Regulatory Information Systems does not certify the accuracy or completeness of the map.
Negative data spans over last 3 years only.

EASTERN WASHINGTON UNIVERSITY

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Institute for Public Policy & Economic Analysis

The Economic Impact of the Washington Tree Fruit Industry

By:

David Bunting, Ph.D.
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Mark Wagner, MA

October, 2011

The Economic Impact of the Washington Tree Fruit Industry on Washington State & on Seven Washington Counties

A Report Prepared for the Washington State Horticulture Association

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October, 2011

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We thank the Washington State Horticultural Association for the opportunity to provide this analysis.

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Executive Summary

This study calculates the economic effects of the Washington State tree fruit industry on both the state and the eight most important tree fruit-producing counties in the state. The tree fruit industry is the largest single component of Washington State's large agricultural production sector. Direct production of all agricultural products amounted to approximately 1.5% of Washington's economy in 2008. Over recent years, tree fruit sales have amounted to approximately 30% of total agricultural product sales in the state. Apples dominate the mix, with over 72% of the value of tree fruit production in 2009. Cherries run second, with 13.7% share in 2009, with pears third, at 10% share of all tree fruit in 2009.

This study gives an analytical snapshot of the full effects of the industry in the most recent calendar years for which detailed data are available. These are 2007 through 2009. Initial descriptive statistics for both the state and relevant counties include an estimate of the size of the economy, the relative size of agriculture in that economy and the role of tree fruit in the agricultural sector. The eight counties considered are: Benton, Chelan, Douglas, Franklin, Grant, Okanogan, Walla Walla and Yakima. Data at the county level are from 2007, since that is the most recent year for which USDA-provided information is available. The industry analyzed consists solely of the growers themselves.

The analysis uses an input-output framework, specifically, the state and county models and data sets provided by the Minnesota IMPLAN Group. An input-output model adds the effects of additional rounds of spending to the known levels of an initial or *direct* activity. These effects include industry-to-industry (indirect) spending as well rounds of consumer (induced) spending. The results are expressed as *total* levels. Multipliers are the ratio of total to direct effects.

Model results include measurements of total jobs, labor income, output (sales) and value added. The last measure sums, over each stage of the production process, the difference between the selling price and the cost of all inputs. Value added serves as the basis of national accounting, such as gross domestic product (GDP), and is the preferred measure of economic effect in the study. By definition, it is less than output (sales) and greater than labor income. Job results contain both full- and part-time jobs. In addition, the study presents the estimated total taxes raised by the industry to the state and county jurisdictions. Finally, for each county and for the state, a list of industries most affected by tree fruit production is presented.

The study did not rely on the IMPLAN data set for agricultural data. Instead, they came from two primary sources, the USDA and the Labor Markets Economic Analysis division of the Washington state department of Employment Security (LMEA). Considerable time was spent isolating the effect of tree fruit from all fruit farming to arrive at series for final sales, job and total wages that reflect only activities in Washington state orchards.

Due to the high variability in tree fruit markets for the three study years, **Washington State results** are presented as an average. Individual

year results are available in Appendix C. For the three years, initial value added contributed to the Washington economy by the industry amounted to $1.1 billion, on average. This led to a total effect of nearly $1.95B in value added per year, on average, to the state economy. The total effect of the industry implies a share of about 0.6% of the state GDP in the years 2007 through 2009.

The average number of state-wide jobs associated with the industry were over 43,300 directly and 59,400 total. Depending on the measure, implied multipliers fall in the range of 1.37-1.88. Average annual state and local taxes raised by the industry state-wide amount to approximately $114.4M. Over half of this sum consists of sales taxes and about a quarter of the sum is made up by property taxes. As measured by value added, the top industries most affected by tree fruit production state-wide were: support activities for agriculture, real estate establishments, the imputed value of owner-occupied dwellings, wholesale trade, banks/credit unions and the offices of physicians, dentists and other ambulatory health care providers. Support activities for agriculture in this context consists of firms offering pre-harvest services, such as spraying and pruning, as well as those providing post-harvest activities, such as pre-cooling, sorting, grading, and packing.

Tree fruit farming in **Benton County** ranked as the eleventh-largest among all private industries of the county economy. As a share of the value of agricultural output, tree fruit in the county amounted to 26% in 2007. Direct value added by tree fruit was about $82M, while calculated total value added was approximately $114M, or 1.8% of Benton County GDP of that year. Nearly 2,100 county jobs were directly tied to the tree fruit industry, with over 3,000 attributable to the industry once the total effects of the model were included. Total state and local taxes raised by the tree fruit industry were slightly more than $5.69M in 2007. The top five industries in the county affected by the tree fruit industry were identical to those for the state-wide analysis. This was the case for all the counties considered.

Chelan County's fruit industry placed sixth among all private industries in the county by value added in 2007. In contrast to Benton County, nearly all Chelan County's agricultural sector is attributable to the tree fruit industry. Tree fruit production contributed approximately $122M directly, and via the model calculations, nearly $194M by total value added, or about 7.3% of Chelan County GDP in that year. Over 7,200 county jobs were directly tied to the tree fruit industry, with nearly 9,100 attributable to the industry once the total effects of the model were included. Total state and local taxes raised by the tree fruit industry were nearly $10.8M. The top industries affected by the tree fruit industry were the same as the state, with the addition of the locally-owned electric utility.

In **Douglas County**, fruit farming ranked first among all private industries in 2007. Tree fruit production makes up the entire category of fruit farming. Indeed, tree fruit production has consistently composed 75% of the market value of all agriculture output in the county over the past 15 years. The industry tallied over $87M in direct value added and via model calculation, nearly $118M in total value added in 2007. This represented over 18% of Douglas County's GDP in that year. Nearly 2,700 jobs were directly attributable in the industry, while 3,600 were tied to the industry, in total, for 2007. Total state and local taxes attributable to the tree

fruit industry were about $6.0M. County industries most affected by the tree fruit industry were the same as in Chelan County.

Tree fruit farming in **Franklin County** came in fifth among all private industries in 2007, by value added. Due to the county's diversified agricultural sector, tree fruit production was 22% of the total market value of agriculture in that year. Tree fruit production, nonetheless, has increased several-fold over the past 15 years in the county. In 2007, direct value added from tree fruit production amounted to about $61M, while total value added was calculated at approximately $85M, or about 4.7% of county GDP. The number of direct jobs in tree fruit farming was nearly 3,000, while the calculated total number tied to the industry was about 3,550. Total state and local taxes attributable to the tree fruit industry were slightly less than $4.6M. The industries most affected by tree fruit production were the same in Franklin as they were in other counties.

Grant County's fruit farming industry was the largest among all private industries in 2007 in the county, by value added. Between 1992 and 2007, tree fruit production rose by over 200% and represented 28% of the market value of agricultural production in the county in the latter year. In 2007, direct value added created by the tree fruit industry was nearly $202M while total value added was calculated at approximately $255M, or 10.7% of county GDP. In that year, the number of jobs directly associated with Grant County fruit production was nearly 5,300 while the total number of jobs associated with the industry in the county was over 6,600. Total state and local taxes attributable to the tree fruit industry were $12.9M in 2007. The list of industries most affected by tree fruit production was the same as in the state, with the exception of a high ranking of wholesale trade, likely influenced by tree fruit and vegetable production in the county.

As in Grant County, fruit farming was the largest single private industry in **Okanogan County** in 2007, by value added. Tree fruit represented all fruit farming in the county. Tree fruit also led the agricultural sector, with a share of market value in 2007 equal to 22%. Over the 15 years covered by the most recent USDA Censuses of Agriculture, the market value of tree fruit production increased, in nominal terms, by about 50%. In 2007, the tree fruit industry directly gave rise to $105M in value added, and the total effects of this activity meant about $153M in value added. This represented 14.1% of the county's GDP. The number of direct jobs associated with Okanogan tree fruit growing was nearly 5,200 in 2007, while the total number of jobs attributable to the industry was calculated at nearly 6,800. Total state and local taxes raised by tree fruit growing were estimated at approximately $8.5M. The list of most affected industries was similar to those in Grant County.

Tree fruit production in **Walla Walla County** has grown rapidly over the past decade. Because of rapid change, no comparisons can be made between 2007 and prior agricultural censuses. For 2007, the value of tree fruit production was nearly 30% of all agricultural production in the county. As measured by direct value added, tree fruit production was the sixth-largest industry in the county of that year. Direct value added of nearly $60M led to total effect of nearly $85M. Jobs directly engaged in tree fruit production were over 2,250 while total jobs associated with the industry were nearly 2,850. Total state and local taxes raised from industry

activities were approximately $4.5M in 2007. The list of top industries affected by tree fruit production was the same as in the other counties, with the addition of electrical transmission and distribution companies.

Yakima County is the county with the highest tree fruit production in the state. Among all private sector industries, fruit farming ranked third in the county economy in 2007. Tree fruit farming represented over 90% of all fruit farming in that year. Tree fruit production has consistently claimed slightly over 40% of the value of all agricultural sales over the span of 15 years considered. Over that same period, the nominal value of the industry in the county has gone up over 80%. In 2007, Yakima County tree fruit created about $314M in value added; when total effects are calculated, the industry made up $488M in value added, or 7.7% of county GDP. Similarly, nearly 12,500 jobs were directly tied to tree fruit growing in 2007, and about 17,000 jobs attributable to the industry in all. Total state and local taxes arising from the industry's activities were estimated at $27.1M. Top affected industries by the tree fruit industry were similar to those in other counties, with the addition of private hospitals.

Clearly, tree fruit production is a dominant industry in these counties and in Washington State's agricultural economy. By total value added, its share of the economy in the eight largest producing counties ranges from 1.8% (Benton) to 18.4% (Douglas). It has also been a growth industry, with sales nearly doubling between 2000 and 2008 to about $2.5B in nominal terms before falling to $1.8B in 2009.

The usual caveats to input-output modeling apply to this study. First, the model calculations represent only one or three years, and thus are snapshots of the Washington tree fruit industry. Second, the model does not allow for input substitutions that may occur over time, say machinery for labor. Third, the interpretation of total effects must be taken with care; their size is dependent on the assumption that only the tree fruit industry experiences growth, whereas in reality in any regional economy industries are all growing at some rate. Given the dynamism of the industry, a subsequent study would be highly informative, once the 2012 USDA Census of Agriculture is available.

1. Methods and Data

1.1 Methods

1.1.1 The Input-output Framework

The term "economic impact" is commonly used to describe changes in economic activity in some geographically defined study area, such as a county or metropolitan statistical area (MSA), that are caused by some sort of productive activity. Economic impacts are estimated using input-output analysis, a basic method of quantitative economics that portrays the production process in terms of the inputs of materials and services which are processed to produce outputs of finished or semi-finished goods and services.

Depending on circumstances, economic impacts can be of three different types: (1) direct impacts arising from the expenditures and employment of the activity itself; (2) indirect impacts arising from jobs created and incomes earned by businesses and their employees that supply or support the activity; and (3) induced impacts arising from the spending of incomes paid to employees who directly or indirectly support the activity.

Input-output analysis is most associated with the work of Wassily Leontief (1906-1999) who was awarded the 1973 Nobel Prize in Economics for his pioneering efforts. Leontief once explained input-output analysis as follows: "When you make bread, you need eggs, flour, and milk. And if you want more bread, you must use more eggs, flour and milk. There are cooking recipes for all the industries in the economy. And hence, one industry's output is another's input, and the chain continues." During the 1940s Leontief developed a table for the US showing the inter-industry relations of 50 sectors, later expanded to 200 sectors [King, nd].

Input-output (I-O) accounts have become an important analysis tool because they show interactions among producers as well as between producers and final users in the economy. These accounts have been used to estimate the direct and indirect effects … "of a strike or a natural disaster, or, supplemented with additional information, to estimate the effects of an increase in US exports on employment" [Bureau of Economic Analysis, 2010]. The great attraction of I-O analysis is "its versatility and strong grounding in empirical evidence. ... Unlike some areas of economics, input-output analysis does not come with a great deal of theoretical baggage that is hard to prove in real life. While susceptible to distortions from measurement error or inaccurate modeling, its underlying strength lies in being driven by real data" [King, nd].

Currently I-O accounts and tables for the US are maintained by the US Bureau of Economic Analysis (BEA). Two sets of tables are prepared. Annual tables include information on 65 industries while benchmark tables, prepared once every 5 years and covering more than 425 industries, are based on detailed data from the Economic Census conducted by the US Census Bureau. The most current benchmark table, for 2002, was released in October 2007 [BEA, 2009].

The US input-output accounts have been augmented and expanded by various academic and private research groups to conduct specialized studies, usually involving county level analysis. For this study, economic impacts are estimated using the IMPLAN system. According to the developers of the system,

IMPLAN Group (MIG), the "IMPLAN (IMpact Analysis for PLANing) program was originally developed by the US Department of Agriculture (USDA) Forest Service in cooperation with the Federal Emergency Management Agency and the USDA Bureau of Land Management to assist in land and resource management planning" [MIG, 2000]. In 1993 MIG was formed to privatize the development of IMPLAN data and software. Its software performs the necessary calculations to create models and to provide an interface to study changes in a region's economic conditions, create impact scenarios and to introduce local changes. IMPLAN data and accounts closely follow BEA conventions used to develop the US I-O model as well as formats recommended by the United Nations [MIG, 2000].

1.1.2 Measure of Economic Effects: Economic Impact vs. Contribution

Economic impact is measured by the effects of some activity on overall indicators of economic activity such as employment or labor income. Following the example of Leontief, suppose a grower spends $1 on water, fertilizers, insecticides and related items to produce a variety of tree fruit which is sold to a processor for $1.50. The processor converts the tree fruit into pie filling which is sold to a baker for $2.50. The baker adds the filling to other ingredients to bake a pie which is sold to a consumer for $3.25. The consumer takes the pie home and eats it. At each production stage there are input costs and a selling price, the difference of which represents the value added to the inputs. These are summarized in the following table:

Table 1.1: Illustration of value added calculation

Production Stage	Cost	Selling Price	Value Added
Grower	1.00	1.50	0.50
Processor	1.50	2.50	1.00
Baker	2.50	3.25	0.75
Totals	5.00	7.25	2.25

Total economic activity can be measured by adding up all costs, all selling prices or all value added. However, both total costs and total sales are gross figures and are larger than the amount paid by the final consumer. They both involve double counting and therefore overstate total economic activity.

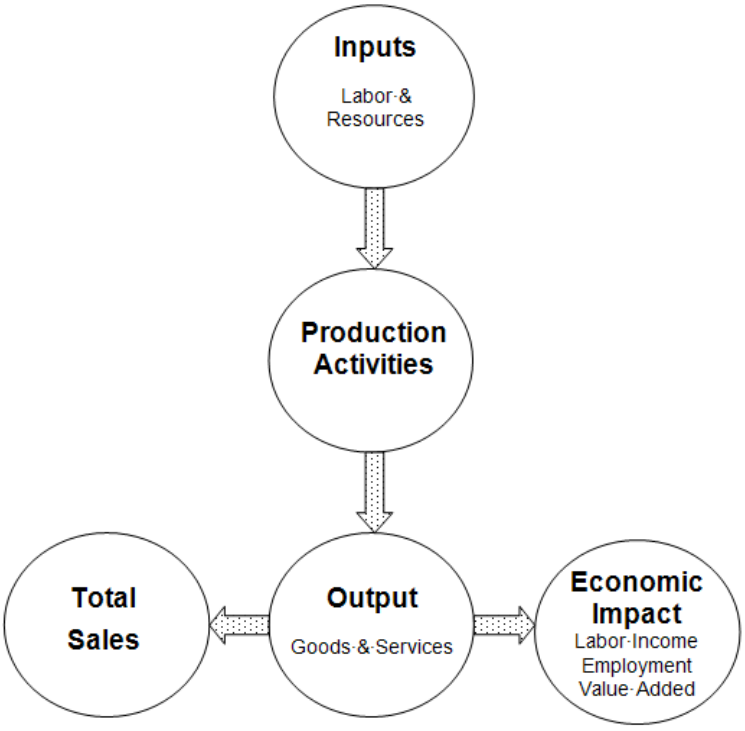
Value added, as a net figure, avoids this double counting problem. The grower spends $1 to produce something that is sold for $1.50. The 50 cent difference represents the value added to the inputs, which could be payments to labor, equipment costs, depreciation, rents, interest and profits. At the next stage, production is repeated in the same manner. The processor pays $1.50 for inputs, adds value of $1.00 which represents payments for labor, plant and equipment as well as profit. The baker then pays $2.50 for its inputs, adds value, and sells its product for $3.25. The value added

proceeds are again used to pay various contributors to the production process, including the baker. Both production and the creation of monetarily measureable value added ends when the output of one stage ceases to be an input for the next, or in this case, when the purchaser consumes the pie rather than selling it.

At each production stage, the difference between cost and selling price represents the value added or a payment to undertake some production activity. For the entire United States, employee compensation such as wages and benefits constitute about 80 percent of value added, with the remainder consisting of proprietor income and other property income such as rents and royalties. In the example, total value added is $2.25 which would largely represent payments for labor and proprietor services. It should be noted that total sales of $7.25 and costs of $5.00 have little economic significance because they simply represent the cascading effects of successive purchases and re-sales or are incorporated in various selling prices.

Figure 1.1 is a schematic depiction of the process whereby some production activity converts inputs into outputs with resulting measureable economic impacts. These impacts can be measured in terms of total sales, employment or various components of value added such as labor income, employee compensation, proprietor income or other property income. The most meaningful measures are employment and value added in some form, because employment represents changes in the number working while value added represents actual income increases.

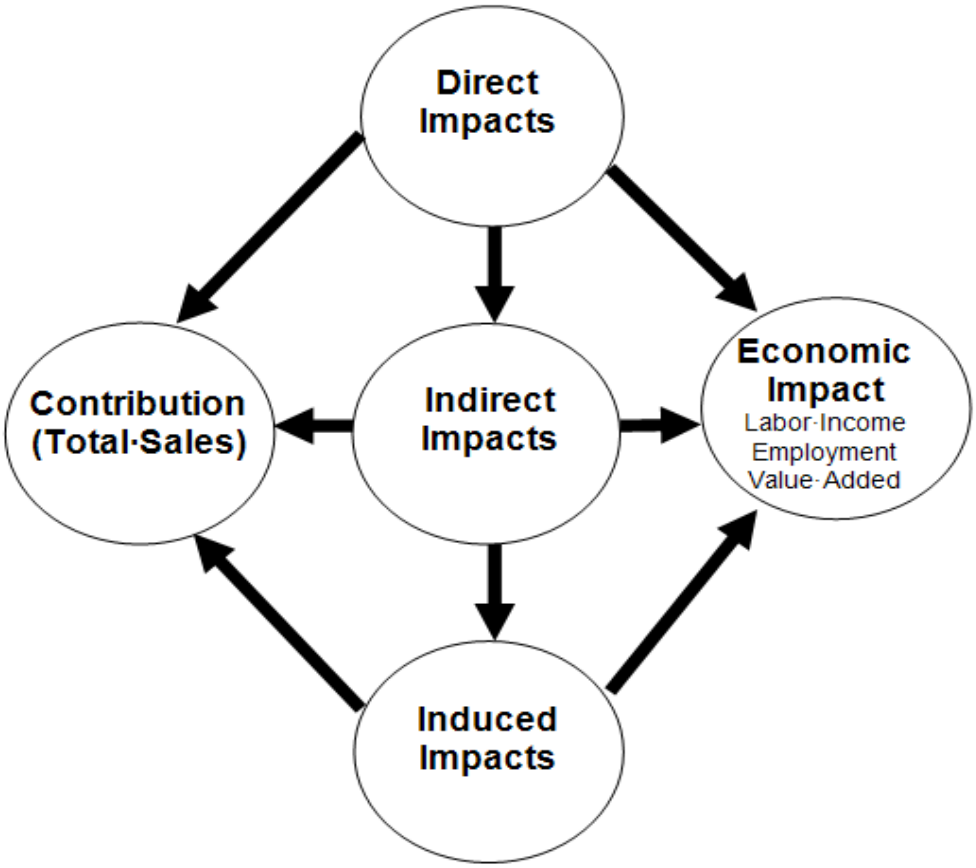
Figure 1.1: Simplified view of the input-output production process



As indicated, economic *impacts* can directly arise from some activity but also result indirectly or from spending of incomes generated by the original activity. However, these impacts are often confused with the total *economic contribution* of some activity. Economic contribution represents total sales while economic impact represents total value added. Since, as shown in the example above, the final selling price includes a number of previous sales to arrive at a final price, its meaning in terms of income or profits generated is ambiguous. For example, a car sale of $30,000 does not represent a $30,000 increase in local incomes or profits because much of the purchase price will flow to producers located in other states or even other nations. Instead, the local impact of the sale is measured by the fees, commissions and changes in employment created at the point of sale.

In terms of contributions and impacts, purchase of the car increases total contributions by $30,000 but economic impacts are much less. The expenses and profits of the local dealer represent the direct impact of the sale. Indirect impacts arise from purchases to support the sale such as fees earned by the local banker to finance the sale or salaries paid to the local carwash to clean the car. Induced impacts arise as the banker and the car washers spend their incomes earned as a consequence of the car sale in the local economy. The inter-relationships of these impacts are shown in Figure 1.2.

Figure 1.2: Components of economic impact calculations



1.2 Data

Besides a model of technical relationships between industries, consumers, and government, IMPLAN also provides data sets, in this case for the state of Washington and the top tree fruit producing counties. Its data sets were applied in the input-output analysis, with the significant exception of the Washington tree fruit industry itself.

No specific sector exists in IMPLAN for the tree fruit industry, only "fruit farming." Consequently, the study team developed its own data set for tree fruit production, using information from the Washington state office of the USDA, general USDA data, and the Washington State Department of Employment Security, specifically from their Labor Market Economic Analysis (LMEA) division. State USDA sources supplied the "cash receipts" series for the relevant years for each type of fruit. When summed over all varieties, the series became the "output," or final sales in the state model.

Analogous values of production were not available for tree fruit at the county level, only for fruit. Consequently, for the 2007 county-level analysis, the study team developed a method of approximating these values. A short description of the method can be found in Appendix A.

IMPLAN's numbers of jobs for the sector "fruit farming" at the state level were far below the approximate equivalent from LMEA. Since the former is based on national relationships of output to labor while the latter is based state unemployment records and surveys, the study team placed greater confidence in LMEA's data. Due the episodic nature of work in the tree fruit industry, the annual number of jobs will be greater than an annual average of employment.

Annual employment in tree fruit industry for all counties came from unpublished LMEA sources. These numbers converted to job tree fruit jobs by a process described in Appendix A. The state total of tree fruit jobs was simply a summation of all the county calculations.

Sources other than IMPLAN provided direct labor income, equal to wages and salaries plus proprietors' income. LMEA provided annual wage and salary data by county for the tree fruit industries. Proprietors' income was approximated by first deriving a share its share of total output from the IMPLAN model, then applying this share to the USDA-supplied sum of cash receipts.

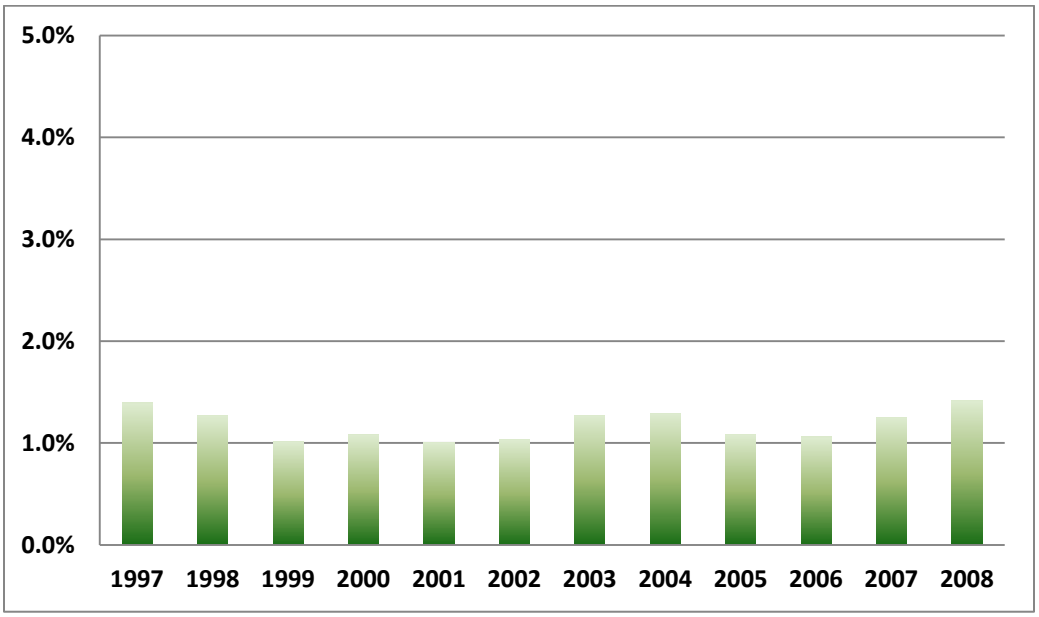
For the individual county analysis, values for calendar year 2007 were used, since these correspond to the most recent USDA data at that level, the 2007 Census of Agriculture. For the state-wide analysis, values for calendar years 2007, 2008 and 2009 were all considered. It is important to note that the analysis takes place at the tree fruit grower level. This focus is a consequence of both data availability and the decision to examine the industry at the most fundament level, that for growers.[i]

Descriptive data about the size of the county economies came both from IMPLAN and the BEA. Export data were courtesy of the WISERTrade. USDA data from the *Agricultural Yearbook* of various years were used to create the charts in chapter 2 covering Washington State's shares of US production of selected fruit varieties.

2. Tree Fruit in the Washington State Economy

While undisputedly a large industry and one with a high export profile, agriculture in Washington State nonetheless makes up a small part of the total economy. According to the 2008 data from the US Bureau of Economic Analysis (BEA), agriculture composed slightly less than 1.5% of state GDP. As Figure 2.1 portrays, this share has been relatively constant over the decade measured. The BEA reported that 2008 crop and animal production amounted to approximately $4.8 billion in value added in Washington State.

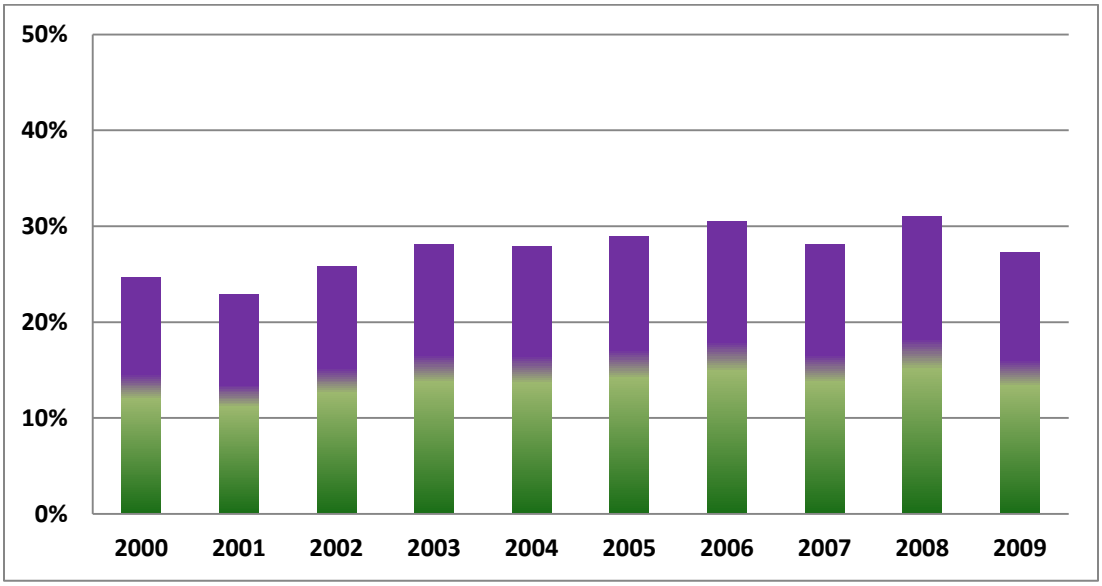
Figure 2.1: Crop and animal production GDP as a share of total Washington State GDP



Source: US Bureau of Economic Analysis

Within the state agricultural economy, tree fruit output clearly dominates. In 2009, the share of sales of tree fruit amounted to slightly more than 27% of the agricultural total, down a bit from the 2006 high, where the share was 30%. By sales in 2009, the second largest agricultural industry was milk, at 9.7%; the third was potatoes, at 9.1%; the fourth, wheat, at 8.4%; and the fifth, beef cattle, at 6.7%.[2] In dollar terms, the value of tree fruit sales in 2009 was $1.8B, down from an all-time high of $2.5B in the prior year. Figure 2.2 shows the relative importance of tree fruit sales to Washington agriculture over the past decade.

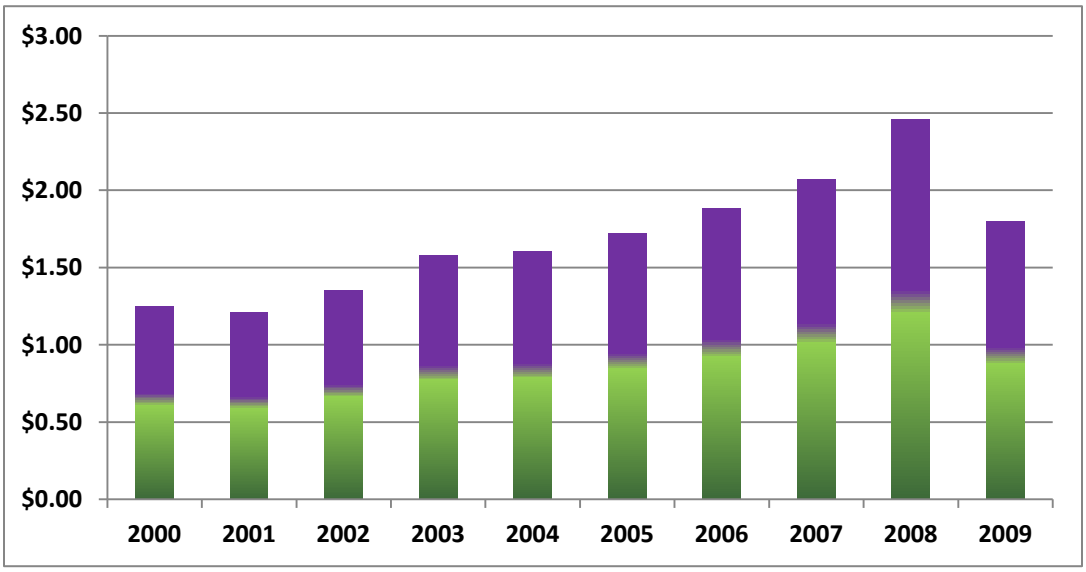
Figure 2.2: Total tree fruit sales as a share of total agriculture sales in Washington State



Source: USDA, NASS (2010)

In dollar terms, Washington tree fruit sales registered a steady increase over the most recent decade, culminating with total sales of approximately $2.5 billion in 2008. The following year brought a sharp drop in sales, as the total amounted to approximately $1.8 billion. Nonetheless, sales have increased by approximately $0.55 billion over the decade ending in 2009, or a 44% increase.[3] Figure 2.3 displays this growth.

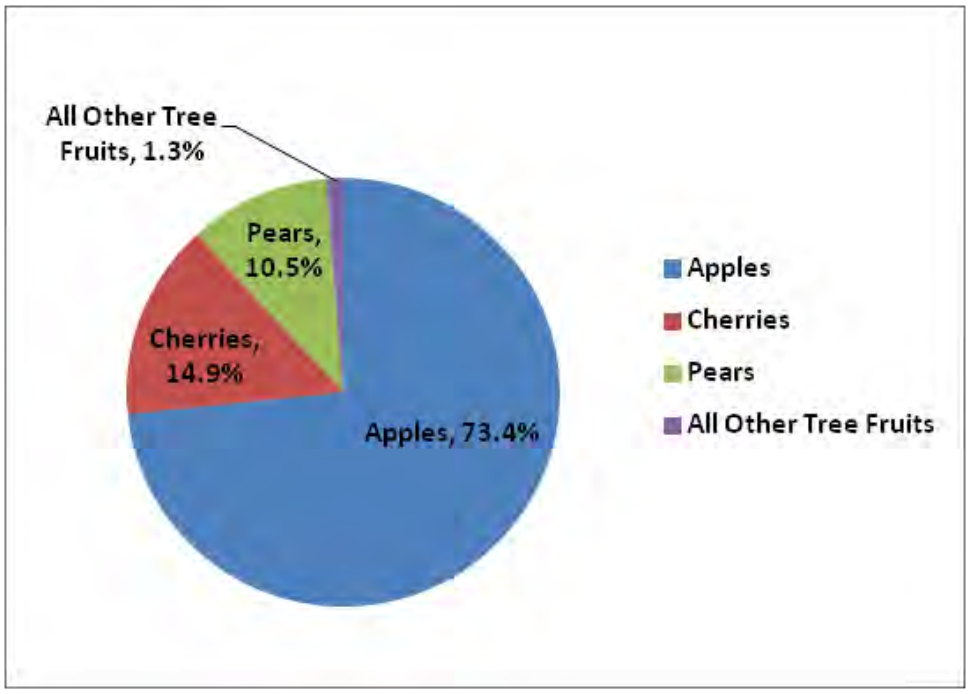
Figure 2.3: Total tree fruit sales in Washington State *(billions)*



Source: USDA, NASS (2010)

The rate of growth of tree fruit sales from 2000 to 2008 outstripped the growth rate of all of agriculture in Washington and indeed the growth rate of the entire state economy.[4] By value, tree fruit production in Washington is dominated by three crops: apples, cherries and pears, in that order. Figure 2.4 offers the breakdown by the most recent year for which data are available.

Figure 2.4: Shares of tree fruit value of production in Washington State in 2009

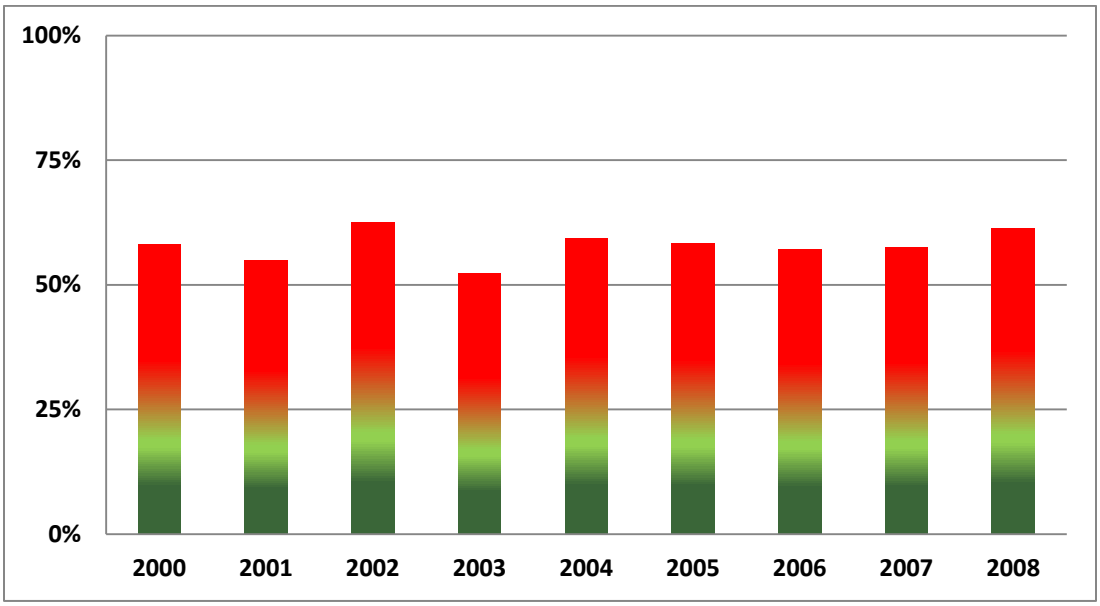


Source: USDA,NASS (2010)

In particular, the total value farmgate sales of apples amounted to $1.14B in calendar year 2009. This represented a dramatic decline of approximate 36% over 2008 and one of about 17% from 2007. The vast majority of the crop was fresh consumption. For 2009, processed apple products (canned and juice) claimed slightly more than 4% of the value of the crop.[v] The farmgate value of cherry production was $230.9M in calendar year 2009, a drop of about 22% from 2008 and a decline of 29% from 2007. Similar to apples, the bulk of the crop went to fresh consumption, with only 15% allocated to canning, brining or other uses.[vi] The value of pear production in calendar year 2009 was $163.2M, nearly a 7% decrease from 2008 and an approximate 4% decrease from 2007. As Figure 2.4 makes clear, the value of the other tree fruit in the state in 2009 was rather small, at less than 2%.

Apples not only dominate the mix of Washington state tree fruit, they also occupy the pre-eminent spot among all the 50 states. Figure 2.5 displays the recent share of Washington apple production to the US total.

Figure 2.5: Washington State share of US apple production, by volume

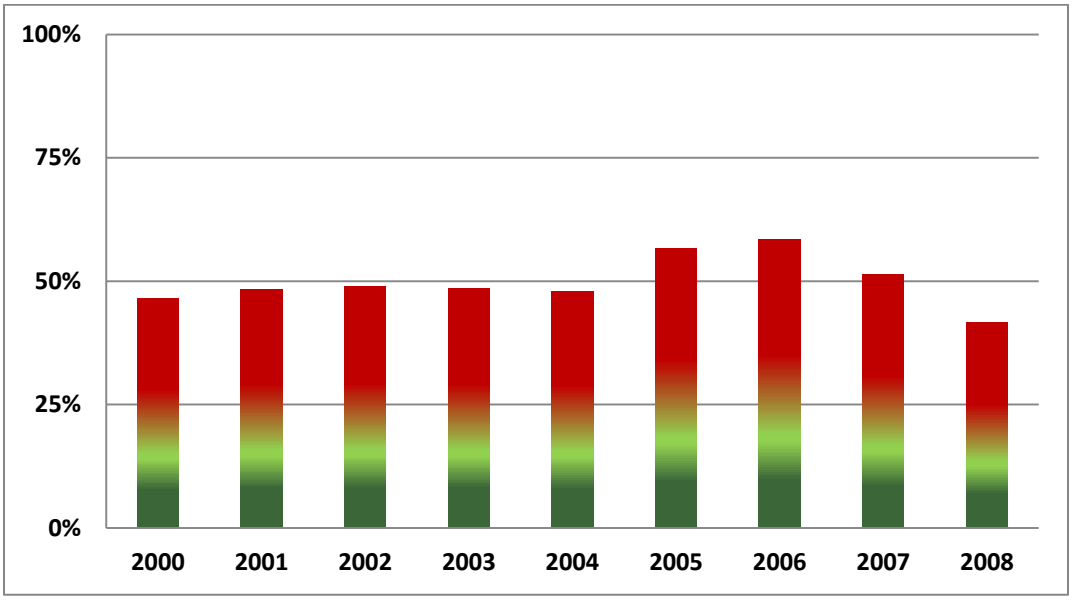


Source: Calculated from USDA (2009), Table 5.3

With a share of national production at nearly 63%, 2002 represented the most dominant year for Washington apples, followed by 2008. Measured by production, however, 2004 was the largest year for Washington apples, with 6.15 billion pounds.[7] The second most important apple-producing state has been New York, followed by Michigan.

Washington also dominates the production of sweet cherries although the margin is not as large as for apples. For 2008, Washington's crop yielded 100,000 tons, down from a recent high of 168,000 tons in 2006. The 2008 crop represented about 42% of all US production. Figure 2.6 displays Washington's share of sweet cherries production over the past decade.

Figure 2.6: Washington State share of US sweet cherry production, by volume

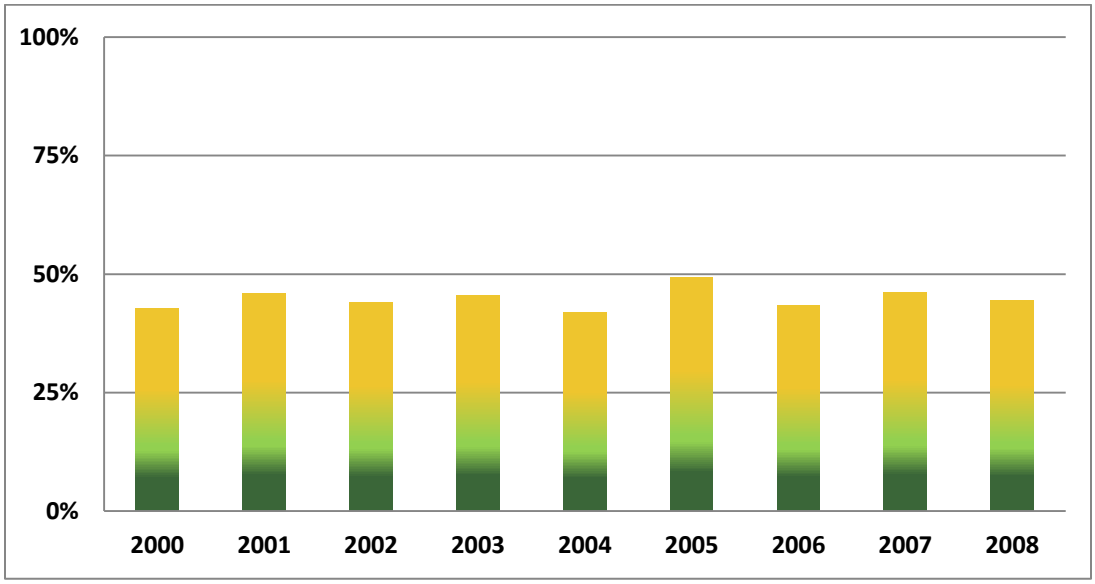


Source: Calculated from USDA (2009), Table 5.22

Second among sweet cherry producing states is California; in 2008 its production was 82,800 tons and has climbed rapidly over the past few years. Oregon is typically the state with the third highest production totals.[8]

Pears also show a similar leading role for Washington State among all US producing areas. In 2008, Washington growers produced a total crop of 363,000 tons; this was down considerably from the recent peak year of 2001 when 443,000 tons were harvested. As the following figure depicts, the 2008 total still yielded a share of over 44% of the US total, in line with the distribution of national production throughout the decade. Second to Washington in pear production has been California, followed by Oregon.

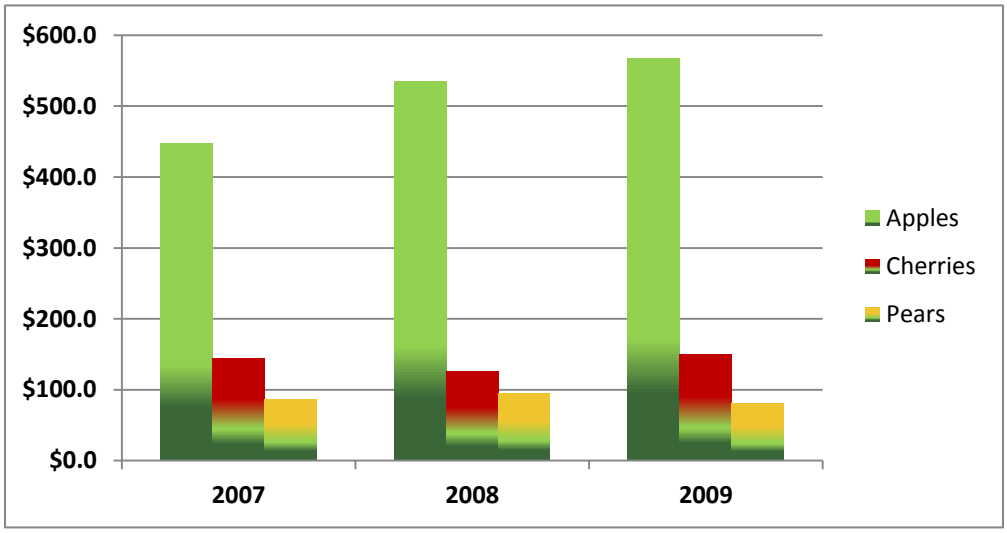
Figure 2.7: Washington State share of US pear production, by volume



Source: Calculated from USDA (2009), Table 5.58

Tree fruit exports mirror the dominance of the three crops. From 2007 through 2009 calendar years, the value of total exports from fresh apples, cherries and pears from Washington State climbed from $784.1M to $898.2M. These totals represented 86-89% of all fruit exported from the state. Figure 2.8 displays the composition of exports among these three types of fruit for the three years. Over the three years, the value of apple exports continued to climb, from $446.7M to $562.2M. Shipments abroad of cherries, however, fluctuated between $125.4M and $150.2M. Movements abroad of pears declined slightly, from $85.9M to $80.4M.

Figure 2.8: Value of Washington State exports of apples, cherries and pears (*millions)*

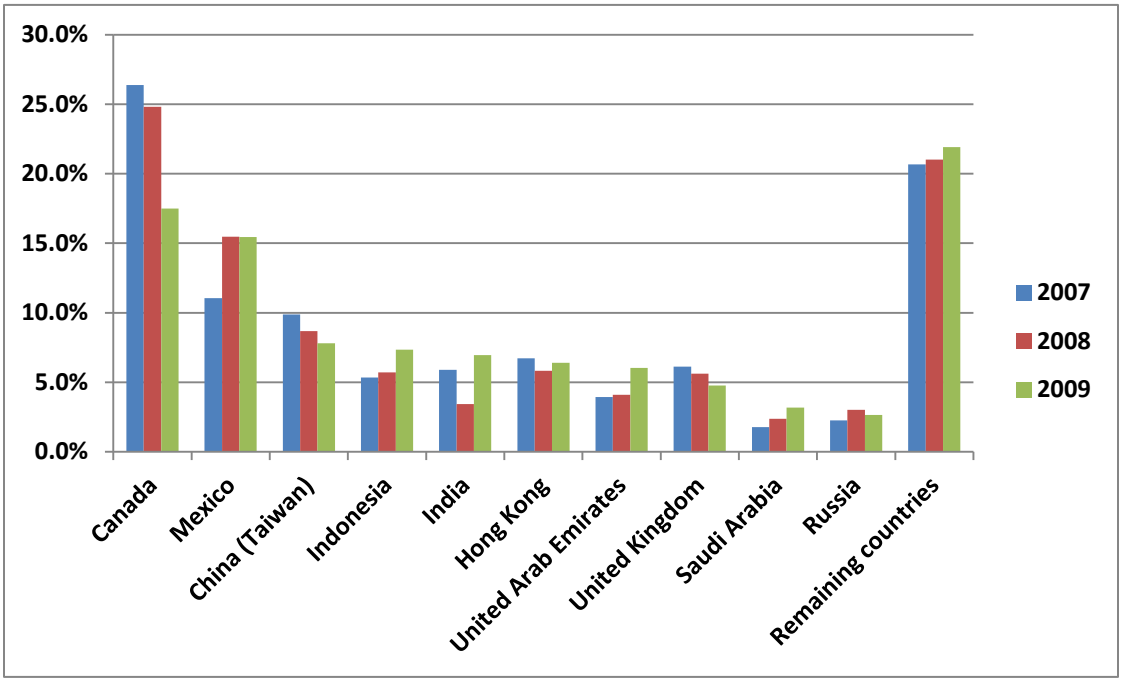


Source: WISERTrade

Total exports originating from Washington amounted to about $51.9B in calendar year 2009. Total tree fruit exports were approximately $822.6M[9]; consequently, about 1.6% of the value of all exports originating in Washington state that year came from the tree fruit industry.

The most important markets for tree fruit continued to be in North America. As the chart below demonstrates, however, the mix of countries shifted significantly over the three years for apples. Canada, the dominant importer of Washington apples, took considerably fewer shipments in 2009 than in 2007, while Mexico increased its share. Similarly, the third largest market, Taiwan, saw its share slip, while Indonesia and India took in larger shares of the crop. Two Middle Eastern countries, United Arab Emirates and Saudi Arabia, purchased ever larger amounts of Washington apples, while the traditional market of the United Kingdom took in fewer amounts. In general, the mix of importing countries became slightly more diversified, as the top ten markets absorbed 78% of the crop in 2009 versus 80% in 2007.

Figure 2.9: Shares of export markets for Washington State apples, by value



Source: WISERTrade

3. Model Results for Washington State

This section considers the economic effects of the Washington tree fruit industry on the state economy. These effects include Washington residents' consumption of Washington tree fruit. As appendix B shows, the share of Washington production taken up by Washington consumers is relatively small, however, in percentage terms. It ranges from approximately 3 percent for fresh apples to 5 percent for fresh cherries. The overwhelming majority of Washington tree fruit supplies are destined to be exports, either to the other 49 states or abroad.

Due to strong variation in revenues experienced by the Washington tree fruit industry, three calendar years are considered: 2007, 2008 and 2009. Final sales of Washington state tree fruit hit a high of $2.26B in 2008 but fell rather dramatically the following year to $1.59B. The results for 2007 lay between the two. Since it is difficult to determine which year is "typical," data sets and models for all three years were put constructed and then analyzed. A consideration the industry at the state level for 2007 has the advantage of tying the results to the year for which county level analysis was conducted. The IMPLAN model is not available for 2010, so analysis of this year was not feasible.

The results provide a range of outcomes that are the most current. To simplify discussion about the size of the effects of the industry, we present the results in this section as three-year, un-weighted average. The results for the individual years are found in Appendix C.

As table 3.1 demonstrates, direct output (sales) from Washington state tree fruit growers in over the three years was, on average, about $1.92B and was associated with an average of over 43,000 direct jobs at the production level. Of total sales, about $1.09B represented average value added over the three years, of which an average $673 million flowed to labor payments (payroll and proprietor income).

This average level of output had indirect and induced impacts. An additional $650 million in sales resulted from transactions of support to tree fruit production. These could include any support activity from cold storage facilities, tractor sales or specialized insect control services. These indirect, business-to-business activities resulted, on average, in an additional 9,770 jobs, $329M in labor income and $381M in total value added. Finally, the consumer (induced) effects resulted in an additional approximate $832 million in sales, on average and nearly 6,300 jobs on average, as these incomes were spent across the state.

Consequently, the total, average impact of the industry over the three years was nearly $3.4B in sales, more than 59,400 jobs, $1.27B in labor income and $1.95B in valued added. Multipliers summarize the total impact of tree fruit production. A standard way of expressing these results is in terms of final sales, or output. As Table 3.1 shows, every $1 million of sales was associated with 31 jobs, $700,000 of personal income, and $1 million of value added to the Washington state economy. The average Washington State gross domestic product (GDP) over the 2007-2009, as measured by total value added, was $330.4B; so the industry's total impact implied a share of about 0.6% of the state economy during this period.

Average multiplier values are, for the most part, above 1.75. For example an increase in $100 in labor income (wage and proprietor) in the tree fruit industry led to another $88 in personal income throughout the state. Only the employment measure produces a multiplier less than 1.75, here 1.37.

Table 3.1: Summary of average tree fruit industry economic impacts on Washington in 2007 – 2009

Impact Type	Employment	Labor Income*(M)*	Value Added *(M)*	Output *(M)*
Direct	43,361	$673	$1,092	$1,915
Indirect	9,770	$329	$381	$650
Induced	6,286	$266	$482	$832
Total Impacts	**59,416**	**$1,268.5**	**$1,954.9**	**$3,397.2**
Per $M Output	**31**	**$0.7**	**$1.0**	**$1.0**
Multipliers	***1.37***	***1.88***	***1.79***	***1.77***

Total state and local taxes paid by the industry over the three year period were, on average, slightly over $114M. Due to the tax structure in Washington State, sales taxes made up by far the largest category, followed by property taxes. These two categories accounted for 81% of all the taxes generated by the industry over 2007-2009. The bulk of sales taxes flowed to Olympia, while the majority of property taxes stayed with the local governments in the counties in which they were generated. The third most important category, "other business taxes," contains business and occupation taxes, business licenses fees, and public utility taxes, divided between the state and the local governments of tree fruit-producing counties.

Table 3.2 shows the detail for the three year average. The results for the individual years can also be found in Appendix C.

Table 3.2: Summary of the Washington State Tree Fruit Industry Average Tax Impacts on Washington State 2007-2009

Tax Effects	Total *$(1,000)*
Sales Tax	62,993.1
Property Tax	29,842.1
Motor Vehicle Licenses	2,066.4
Severance Tax	302.7
Other Taxes	9,046.6
State & Local Non-Taxes	4,380.0
Fees & fines	4,735.1
Personal Property Taxes	505.9
Other Personal Taxes	482.0
Total State and Local Tax Raised	**114,354.0**

Table 3.3 takes up the results of the top 20 industries in Washington State affected by the total impact of the Washington tree fruit industry. The ranking is via value added, and the associated total job affects are given as well. In contrast to the tables directly above, only the results for 2009 are presented here. Generally, the composition of the top 20 does not change much from year to year. In fact, the top 10 are identical for the three years of the study. Results for calendar years 2007 and 2008 can be found in Appendix C.

Not surprisingly, the sector most affected by tree fruit production in 2009 consisted of "support activities for agriculture." This is a sector that, according to the North American Industrial Classification System (NAICS), generally consists of contract pre- and post-harvest activities. In the context of the tree fruit industry, the pre-harvest services are cover dusting or spraying, cultivation services, insect control, pruning and thinning, among others. Post-harvest activities consist of firms that offer pre-cool, sort, grade, pack, and cool fruit. Since support activities do not consist of any further processing, and no separate processing industry emerged among the most affected industries, this implies largely fresh consumption of Washington tree fruit.

Real estate and the imputed value of homeownership are the next most important industries linked to the Washington tree fruit industry. Their presence is obviously not a result of inter-industry but of the consumer (induced) effects, largely due to housing's rank as the largest expenditure for most households. The high rank of banks and credit unions reflects their role as financial intermediaries for both businesses and households. Ambulatory medical care provided by physicians and other health care providers, as well as the high ranking of hospitals, is the result of the importance of healthcare spending in consumer budgets. The rest of the top 20 industries affected state-wide by the tree fruit industry are a mix of further consumer affects and businesses catering serving directly or indirectly the tree fruit industry local economies.

Table 3.3: Washington State industries most affected by Washington's tree fruit industry in 2009, by Total Impact

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	5,381	163.9	141.9
Real estate establishments	824	11.3	84.8
Imputed rental activity for owner-occupied dwellings	0	0.0	76.3
Wholesale trade businesses	497	37.7	65.0
Banks & credit unions	231	23.4	49.3
Offices of physicians, dentists, and other health practitioners	427	30.2	32.2
Food services and drinking places	787	17.7	25.3
Insurance carriers	101	7.8	20.9
Private hospitals	235	18.0	19.2
Telecommunications	61	5.5	17.2
Non-depository credit intermediation and related activities	61	6.7	16.4
Legal services	120	7.5	13.4
Retail Stores - Food and beverage	216	7.7	12.5
Retail Stores - General merchandise	220	7.1	11.5
State and local government electric utilities	64	6.4	10.9
Petroleum refineries	10	2.0	10.8
Management of companies and enterprises	78	8.4	10.2
Transport by truck	159	7.8	10.0
Retail Stores - Motor vehicle and parts	148	7.7	9.3
Other state and local government enterprises	113	8.2	9.3

4. The Tree Fruit Industry in Benton County and Model Results

4.1 Tree fruit in the Benton County economy

Benton County enjoys a broadly diversified set of industries in which agriculture plays a significant role. Table 4.1 ranks the top twelve private industries by value added in 2007; it also gives the top 12 private industries by employment of the same year. Clearly, the activities around the Hanford clean-up and Pacific Northwest National Laboratory dominated the economy. Tree fruit farming landed at the 11th spot for value added and at 8th by the number employed. It was the most important agricultural activity in the county. Support activities for agriculture and forestry came in 12th. That industry captures the downstream activities of fruit growing, covering the pre-cooling, sorting, grading, packing and drying of fruits and vegetables.

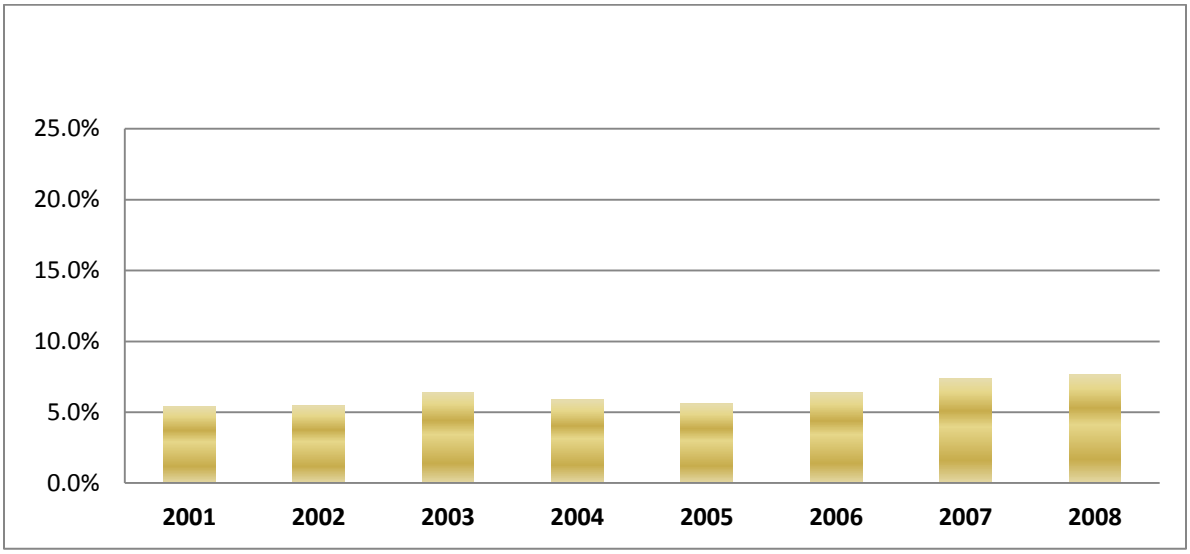
Table 4.1: Top private industries in Benton County in 2007 & their share of the county economy

	Value Added		Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Waste management and remediation services	1,056.8	19.8%	6,186	8.0%
Scientific research and development services	376.4	7.1%	4,567	5.9%
Architectural, engineering & related services	352.1	6.6%	3,800	4.9%
Imputed rental activity for owner-occupied dwellings	305.2	5.7%	0	0.0%
Real estate establishments	199.9	3.7%	1,767	2.3%
Offices of physicians, dentists, other healthcare providers	183.0	3.4%	3,009	3.9%
Food services and drinking places	137.0	2.6%	5,189	6.7%
Construction of new non-residential buildings	123.0	2.3%	2,030	2.6%
Construction of new residential permanent sites	108.5	2.0%	1,422	1.8%
Retail Stores - General merchandise	100.5	1.9%	2,423	3.1%
Tree fruit farming	81.9	1.5%	2,095	2.7%
Support activities for agriculture and forestry	44.4	0.8%	2,104	2.7%
All Other	2,267.5	42.5%	42,561	55.2%
Non-Government Total	**5,336.1**	**100.0%**	**77,153**	**100.0%**
Government	**892.4**		**12,714**	

Source: IMPLAN

Figure 4.1 displays the recent trend of agriculture's share of the regional metropolitan statistical area (MSA). The Kennewick-Pasco-Richland MSA is composed of both Benton and Franklin Counties. Over the years for which metro GDP is available, the value added from all agriculture in the Tri Cities metro area has more than doubled, growing from $325M in 2001 to $712M in 2008, in nominal terms. Agriculture has grown, in fact, slightly faster than the robust overall economy of the Tri Cities. As Figure 4.1 reveals, agriculture's share of metro GDP in 2008 was nearly eight percent (7.7%), compared with slightly over five percent (5.4%) in 2001.

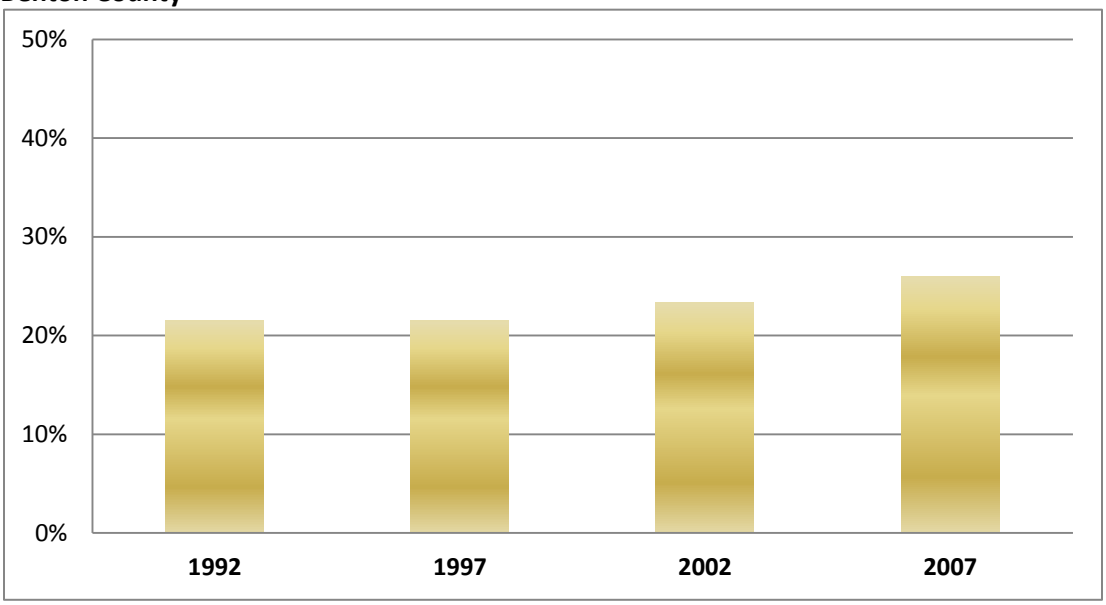
Figure 4.1: Crop and animal production as a share of metro GDP in the Tri-Cities MSA



Source: Bureau of Economic Analysis

Figure 4.2 displays the path of tree fruit farming's share of all Benton agriculture over the most recent 15 years for which detailed data are available. That share has steadily grown, registering 26% in 2007. Compared to the share of the value of tree fruit among all agricultural products in the state (Figure 2.2), tree fruit production is slightly less prominent in the Benton County agricultural economy, however.

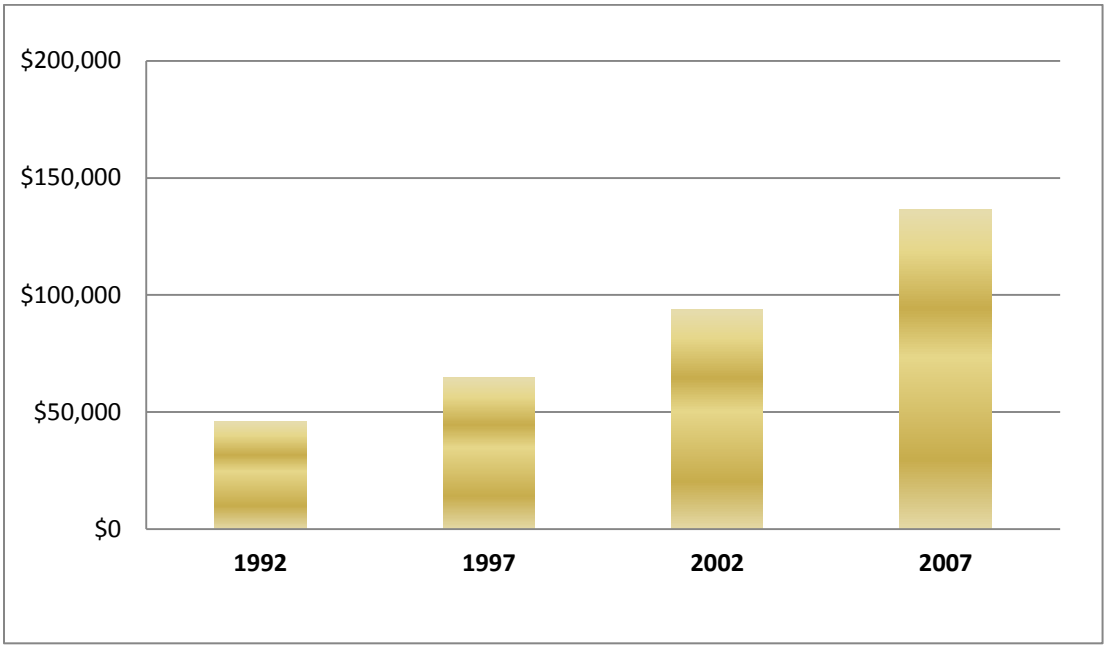
Figure 4.2: Share of tree fruit market value of the total market value of agricultural production in Benton County



Sources: USDA, Census of Agriculture

Figure 4.3 displays the market value of tree fruit production over the same time period. As one can observe, dollar output nearly tripled, from approximately $46M to $136M. These sums are not adjusted for inflation, however. Its 2007 results placed Benton County sixth among all tree fruit producing counties, by market value.

Figure 4.3: Market Value of Tree Fruit Production in Benton County *($1,000)*



Sources: USDA, Census of Agriculture

4.2 Model results for Benton County

As noted above, tree fruit production in Benton County created about $82M in direct value added to the county economy in 2007. Once the business-to-business and consumer repercussions (indirect and induced effects) of this activity played out, the total impact, by valued added, was about $114M. In a county economy of over $6.3B, this translates into a share of 1.8%. This is the lowest share among the eight study counties, undoubtedly a reflection of a large, diversified economy.

The number of direct jobs engaged in tree fruit production was estimated to be nearly 2,100 in 2007. This led to a total of slightly over 3,000. As a share of the county total, this total effect of the industry was considerably higher, at 3.4%. The total impact of the industry on incomes, however, is about one third less, at 1.2%. Multipliers for jobs and value added were about 1.4 while that of labor income was nearly two.

A common way of expressing the input-output results is in terms of a given increase in final sales, or output. Table 4.2 offers these calculations. For example, one $million in final sales of tree fruit led to approximately 22 jobs created in Benton County. Similarly, one $million of final sales of tree fruit led to approximately $400,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 4.2: Summary of tree fruit industry economic Impacts on Benton County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	2,095	$27.5	$81.9	$136.5
Indirect	742	$19.9	$20.7	$28.4
Induced	190	$6.2	$11.3	$18.9
Total Impacts	**3,027**	**$53.6**	**$113.9**	**$183.7**
Per $M Output	**22**	**$0.4**	**$0.8**	**$1.0**
Multipliers	*1.44*	*1.95*	*1.39*	*1.35*
County totals	89,867	4,440.3	6,228.5	11,089.2
Shares	***3.4%***	***1.2%***	***1.8%***	***1.7%***

Total state and local taxes raised by the tree fruit industry's activities in Benton County in 2007 amounted to nearly $5.7M. As was the case for the state, the majority of the taxes, here about 82%, came from two sources: sales and property. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue while Benton County local taxing districts took in most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 4.3: Summary of Benton County tree fruit industry tax effects on Washington State and Benton County, 2007

Tax Effects	Total *$(1,000)*
Sales Tax	3,193.1
Property Tax	1,475.5
Motor Vehicle Licenses	87.5
Severance Tax	13.1
Other Taxes	485.6
State & Local Non-Taxes	212.6
Fees & fines	178.8
Personal Property Taxes	20.5
Other Personal Taxes	19.2
Total State and Local Tax Raised	**5,685.9**

The list of Benton County industries affected by its tree fruit industry is nearly identical to the state-wide results shown in Table 3.3. As ranked by value added, agricultural support companies, the real estate sector, banks or credit unions, and ambulatory healthcare providers make the up the economic sectors touched most by the tree fruit industry. The various agriculture support industries compose, by far, the most significant complementary set of economic activity. See section 3.1 for a description of the sector.

Table 4.4: Benton County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	636	15.7	13.4
Real estate establishments	19	0.4	2.1
Imputed rental activity for owner-occupied dwellings	0	0.0	2.1
Banks & credit unions	18	1.0	1.2
Offices of physicians, dentists & other healthcare providers	16	0.8	0.9
Wholesale trade businesses	10	0.5	0.9
State & local government electric utilities	6	0.6	0.9
Food services and drinking places	27	0.5	0.7
Private hospitals	10	0.6	0.6
Electric power generation, transmission & distribution	1	0.2	0.6
Other state and local government enterprises	6	0.4	0.5
Maintenance & repair of nonresidential structures	8	0.4	0.4
Retail Stores - Motor vehicle and parts	6	0.3	0.4
Warehousing and storage	6	0.3	0.4
Retail Stores - General merchandise	8	0.2	0.3
Retail Stores - Food and beverage	7	0.2	0.3
Medical/diagnostic labs & other ambulatory outpatient services	3	0.2	0.3
Telecommunications	1	0.1	0.2
Retail Stores - Building material and garden	4	0.1	0.2
Retail Stores - Clothing and clothing accessories	5	0.1	0.2

5. The Tree Fruit Industry in Chelan County and Model Results

5.1 Tree fruit in the Chelan County economy

Agriculture's place in Chelan County has consistently been large. Table 5.1 ranks the top twelve private industries by value added in 2007, and also lists the employment of these industries. Clearly, real estate is important to the county, as was health care. Two agricultural industries are in the top twelve: support activities for agriculture and tree fruit farming. Agricultural support activities cover the downstream activities from fruit growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables. Wholesale trade, the fifth-largest industry in the county that year, also undoubted is based on tree fruit-related activities.

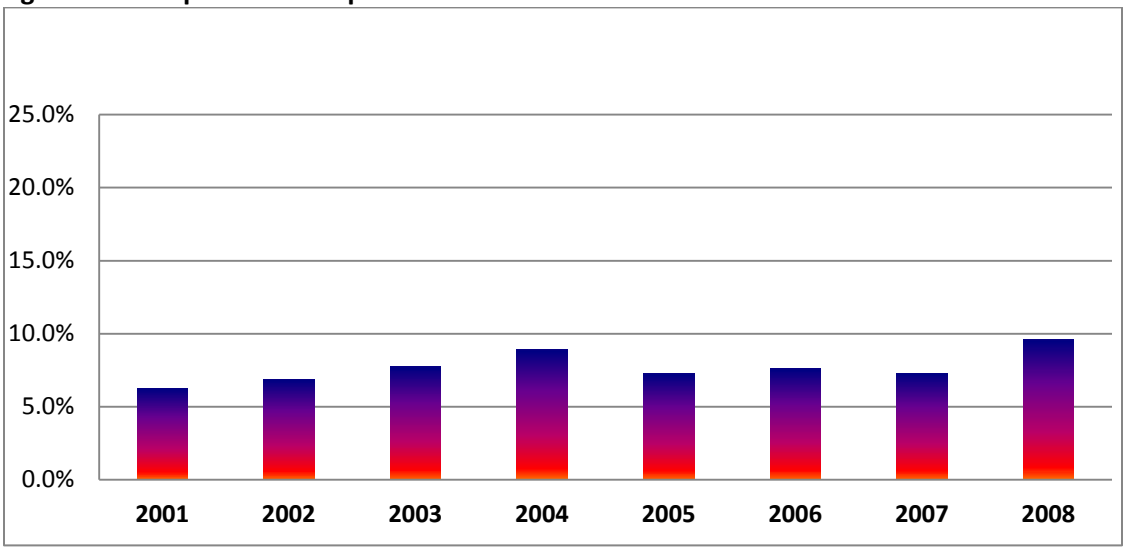
Table 5.1: Top private industries in Chelan County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Real estate establishments	209.9	9.4%	2,249	4.5%
Offices of physicians, dentists, other healthcare providers	148.6	6.7%	1,607	3.2%
Support activities for agriculture and forestry	146.4	6.6%	6,415	12.7%
Imputed rental activity for owner-occupied dwellings	136.2	6.1%	0	0.0%
Wholesale trade businesses	135.8	6.1%	1,611	3.2%
Tree fruit farming	121.8	5.5%	7,215	14.3%
Private hospitals	90.4	4.1%	1,341	2.7%
Alumina refining and primary aluminum products	89.5	4.0%	427	0.8%
Food services and drinking places	72.5	3.3%	2,783	5.5%
Construction of new non-residential buildings	51.4	2.3%	1,031	2.0%
Individual and family services	13.2	0.6%	1,545	3.1%
Private household operations	10.2	0.5%	1,413	2.8%
All Other	995.4	44.8%	22,790	45.2%
Non-Government Total	**2,221.1**	**100.0%**	**50,427**	**100.0%**
Government	**419.8**		**6,863**	

Source: IMPLAN

Agriculture in the Wenatchee-area MSA (Chelan and Douglas counties) has typically claimed a slightly higher share of the economy than in the Tri-Cities. At $349M for the most recent year (2008), agriculture in the two counties represented nearly 10% of Metro GDP. In absolute terms, this represents more than a doubling of the sector's level in 2001 and an increase of about 50% in terms of agriculture's share of the two counties' economies.

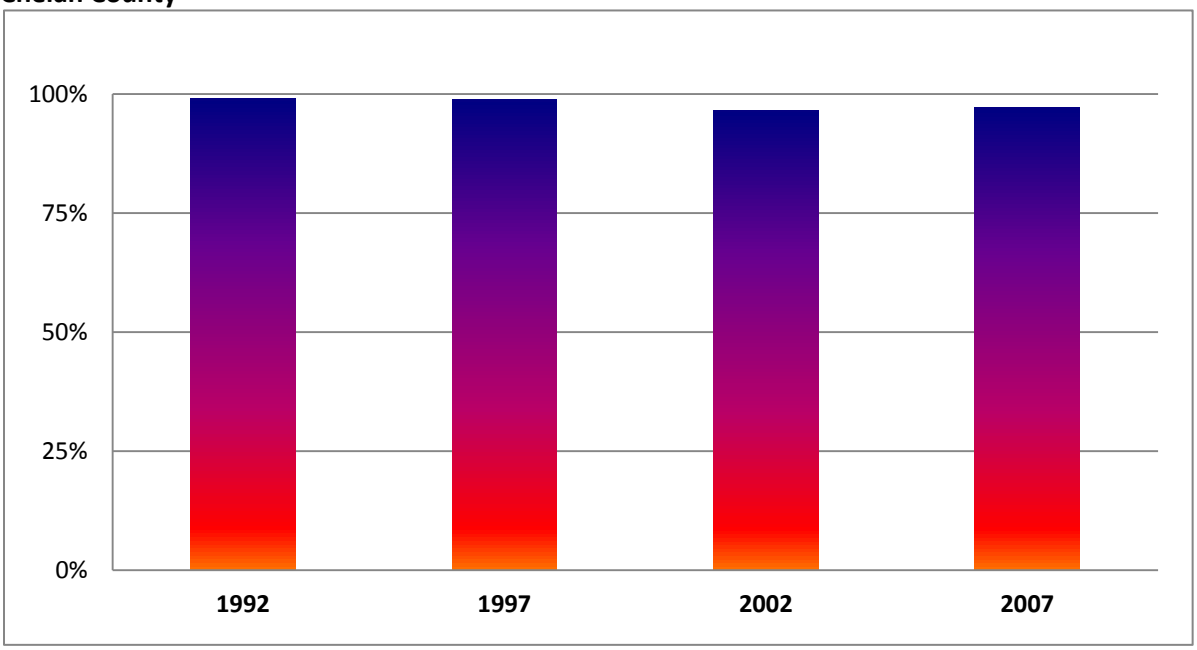
Figure 5.1: Crop and animal production as a share of total Metro GDP in the Wenatchee MSA



Source: Bureau of Economic Analysis

Unique among all the counties considered for this study, Chelan County's agricultural sector shows a near total dependence on tree fruit. Figure 5.2 reveals that for 2007, this industry accounted for about 97% of the value of agricultural output in the county. This actually represents a slight decline from 1992.

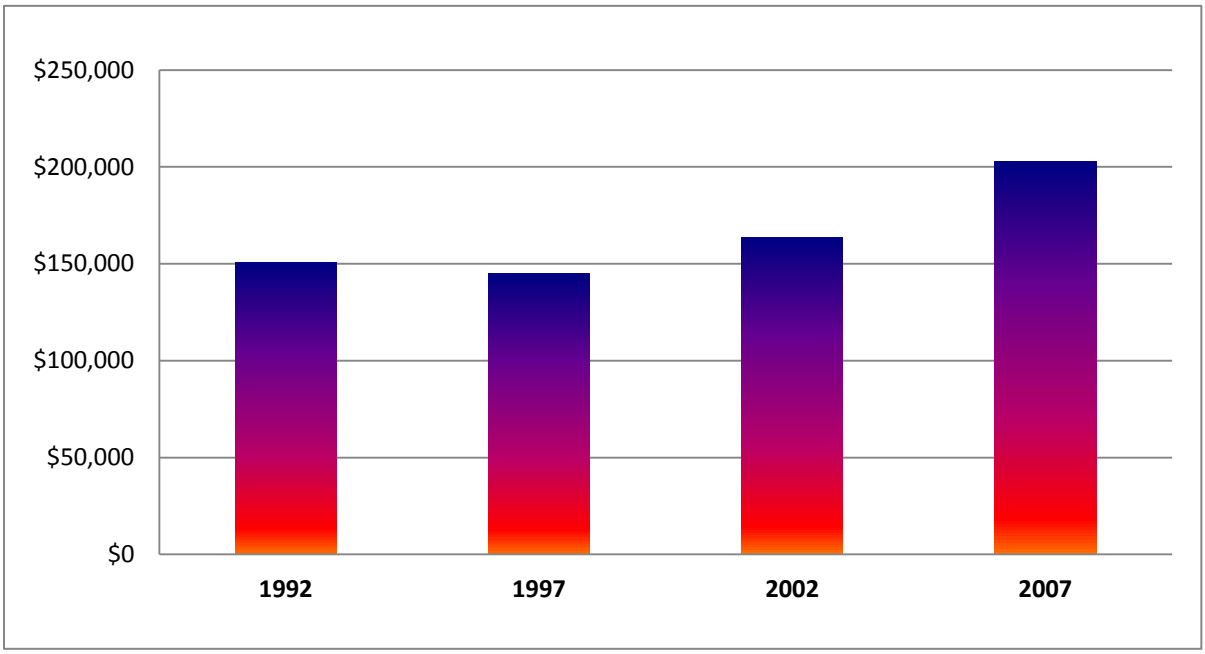
Figure 5.2: Share of tree fruit market value of the total market value of agricultural production in Chelan County



Source: USDA Census of Agriculture

Over these 15 years, the nominal value of tree fruit production in the County first stagnated then increased by approximately 33%, as Figure 5.3 depicts. By 2007, the value of production in the county stood at about $203M.

Figure 5.3: Market value of tree fruit production in Chelan County *($1,000)*



Source: USDA, Census of Agriculture

As of 2007, Chelan County was the third-largest fruit producing county in the state, by market value.

5.2 Model results for Chelan County

In 2007, tree fruit production in Chelan County yielded about $130M in direct value added to the county economy. Once the business-to-business and consumer repercussions (indirect and induced effects) of this activity are accounted for, the total impact, by valued added, was about $210M. In a county economy of over $2.65B, this translates into a share of 7.9%. This share places the county at fifth of the study counties. The impact of the industry on the county employment is much higher, at 13.7%, and the impact of the industry on Chelan County incomes is also higher, at 10.6%. The industry's multiplier for value added was 1.61, and multipliers for employment and income, at 1.36 and 1.52, respectively, were much lower.

As described in Table 5.1, tree fruit production in Chelan County made up about $122M in direct value added to the county economy in 2007. After business-to-business and consumer repeated spending (indirect and induced effects) from this activity is accounted for, the total impact, by valued added, was nearly $194M. In a county economy of over $2.64B, this translates into a share of 7.3%. This place Chelan County fifth among the eight counties analyzed.

The number of direct jobs engaged in tree fruit production was estimated to be over 7,200 in 2007. This led to a total of nearly 9,100 after

the business-to-business and consumer effects are tallied. As share of the county total, this implies nearly one sixth of jobs can be traced to the tree fruit industry. As in the other counties and state-wide, the total impact of the industry on incomes, is about considerably less, at 8.4%. Multipliers for the three measures were around the 1.5 mark, with the exception of jobs, which was around 1.25

A common way of expressing the input-output results is in terms of a given increase in final sales, or output. Table 5.2 gives these ratios. One $million in final sales of tree fruit in Chelan County led to approximately a total 45 jobs in the county. Similarly, one $million of final sales of tree fruit led to approximately $800,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 5.2: Summary of tree fruit industry economic impacts on Chelan County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	7,215	$97.8	$121.8	$203.0
Indirect	1,234	$35.5	$36.7	$49.4
Induced	635	$20.1	$35.3	$59.0
Total Impacts	**9,083**	**$153.3**	**$193.8**	**$311.4**
Per $M Output	**45**	**$0.8**	**$1.0**	**$1.0**
Multipliers	*1.26*	*1.57*	*1.59*	*1.53*
County totals	57,290	1,833.3	2,640.9	4,778.6
Shares	***15.9%***	***8.4%***	***7.3%***	***6.5%***

Total state and local taxes generated by the tree fruit industry's activities in Chelan County in 2007 summed to slightly more than $10.8M. About 81% came from sales and property. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue while Chelan County local taxing districts took in most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at slightly over $0.9M, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 5.3: Summary of Chelan County tree fruit industry tax impacts on Washington State and Chelan County, 2007

Tax Effects	Total *$(1,000)*
Sales Tax	5,960.6
Property Tax	2,754.3
Motor Vehicle Licenses	200.8
Severance Tax	24.5
Other Taxes	906.4
State & Local Non-Taxes	396.9
Fees & fines	460.9
Personal Property Taxes	56.1
Other Personal Taxes	47.5
Total State and Local Tax Raised	**10,808.0**

The list of Chelan County industries affected its tree fruit industry are similar but not identical to the state-wide results shown in Table 3.3 and to the findings from all other counties. As ranked by value added, agricultural support companies, the real estate sector, wholesale trade and the public electric utility district are the five sectors affected most by the tree fruit industry. The various agriculture support industries compose, by far, the most significant complementary set of economic activity.

Table 5.4: Chelan County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	982	26.2	22.4
Real estate establishments	62	1.1	5.8
Imputed rental activity for owner-occupied dwellings	0	0.0	5.5
Wholesale trade businesses	58	2.9	4.9
State & local government electric utilities	23	2.2	3.1
Banks and credit unions	39	2.4	2.9
Offices of physicians, dentists & other healthcare providers	31	2.5	2.8
Private hospitals	36	2.3	2.4
Food services and drinking places	73	1.3	1.9
Legal services	18	0.8	1.1
Retail Stores - Motor vehicle and parts	18	0.8	1.0
Retail Stores - Food and beverage	23	0.6	0.9
Retail Stores - General merchandise	22	0.6	0.8
Medical/diagnostic labs & other ambulatory outpatient services	8	0.5	0.8
Telecommunications	3	0.2	0.7
Maintenance & repair of nonresidential structures	15	0.6	0.6
Other state and local government enterprises	8	0.4	0.6
Retail Stores - Building material and garden	10	0.4	0.6
Wood container and pallet manufacturing	10	0.5	0.6
Warehousing and storage	19	0.4	0.5

6. The Tree Fruit Industry in Douglas and Model Results

6.1 Tree fruit in the Douglas County economy

Agriculture looms large in Douglas County, as Table 6.1 details. The table lists the top twelve private industries by value added and by employment in 2007. Three agricultural industries on the list – tree fruit farming, support activities for agriculture and graining farming -- took up over one fifth of the value added in the county that year. Tree fruit farming is clearly the most important industry in the county, by both value added and employment. Wholesale trade, the third largest industry, is undoubtedly influenced by tree fruit products. Agricultural support activities cover the downstream activities from fruit growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables.

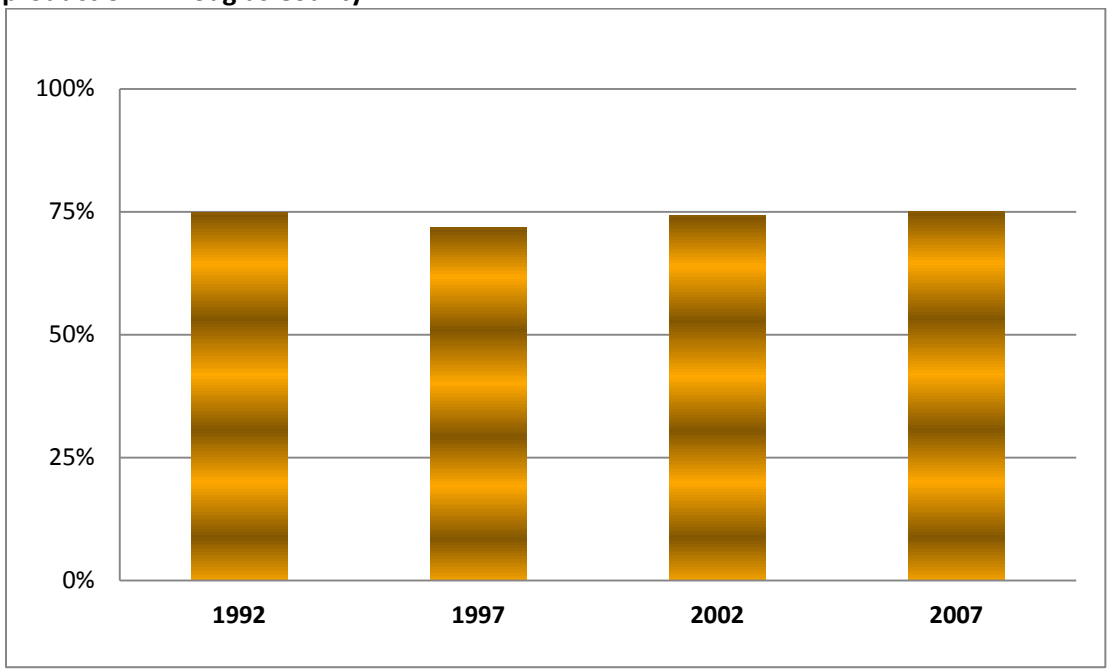
Table 6.1: Top private industries in Douglas County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Tree fruit farming	87.2	17.4%	2,689	20.1%
Imputed rental activity for owner-occupied dwellings	52.2	10.4%	0	0.0%
Wholesale trade businesses	27.2	5.4%	390	2.9%
Retail Stores - General merchandise	25.2	5.0%	501	3.7%
Aircraft manufacturing	18.1	3.6%	20	0.1%
Food services and drinking places	16.8	3.4%	755	5.6%
Support activities for agriculture and forestry	15.9	3.2%	692	5.2%
Construction of new non-residential buildings	14.3	2.8%	307	2.3%
Grain farming	14.2	2.8%	2,345	17.5%
Offices of physicians, dentists, other healthcare providers	14.2	2.8%	240	1.8%
Individual and family services	2.6	0.5%	362	2.7%
Retail Stores - Food and beverage	12.9	2.6%	296	2.2%
All Other	201.1	40.1%	4,793	35.8%
Non-Government Total	**502.1**	**100.0%**	**13,390**	**100.0%**
Government	**138.9**		**2,252**	

Source: IMPLAN

The role of agriculture in the total economy of the two counties of Chelan and Douglas has been described in Chapter 5. As in Chelan County, tree fruit production dominates the agricultural sector of Douglas County. Figure 6.1 reveals that over the 15 years covered by the data of the USDA Agriculture Census, the share that tree fruit has contributed to total agriculture sales in the county has been a consistent 75%.

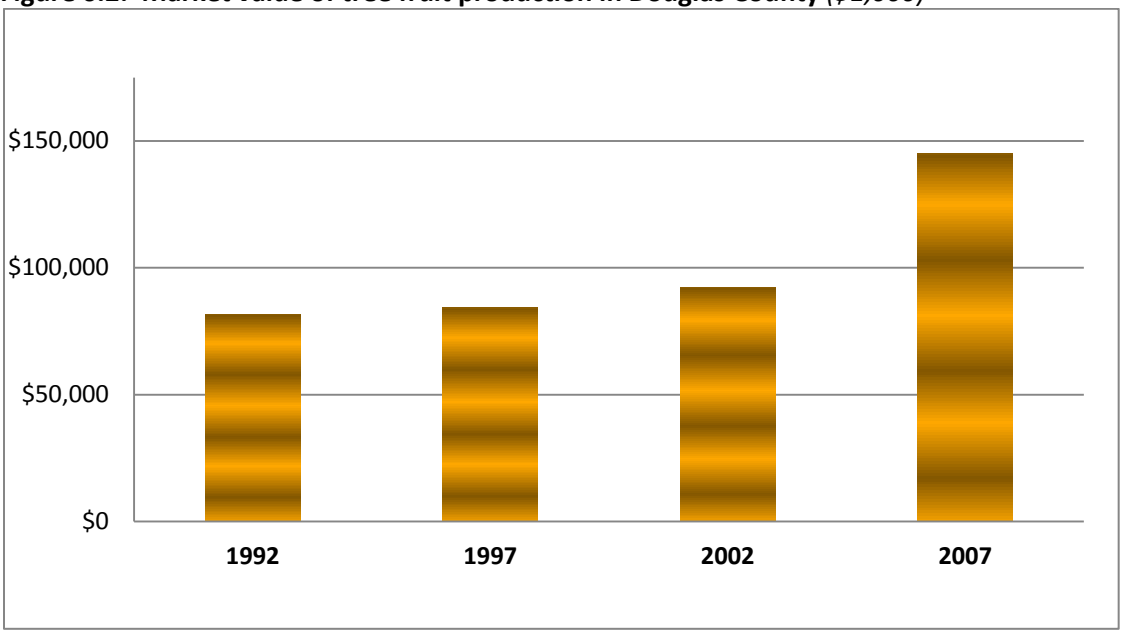
Figure 6.1: Share of tree fruit market value of total market value of agricultural production in Douglas County



Source: USDA Census of Agriculture

The value of tree fruit production in the county in 2007 was estimated to slightly more than $145M. In nominal dollars, that represents a 78% increase from 1992. Its 2007 results placed Douglas County fifth among all tree fruit producing counties, by market value.

Figure 6.2: Market value of tree fruit production in Douglas County *($1,000)*



Source: USDA Census of Agriculture

6.3 Model results for Douglas County

In 2007, tree fruit production in Douglas County created about $87M in value added to the county economy. Once the indirect and induced effects of this activity are considered, the industry's total impact, by valued added, was nearly $118M. In a county economy of about $641M in 2007, this translated into a share of 18.4%, highest among all the study counties. Clearly, Douglas County's economy is very much linked to the fate of the tree fruit industry. The total impact of the industry on county employment is even higher, at 23.1%. The total impact on labor income (wage and proprietor) came to a lower, but still significant share of 14.5% in 2007. With the exception of Okanogan County, these are the highest among all the study counties. The industry's value added multiplier was 1.35, in the general range of all the eight counties, as were the multipliers for the industry's effects on employment and income.

A common way of expressing the input-output results is in terms of a given increase in final sales, or output. These ratios are given in Table 6.2. One $million in final sales of tree fruit in Douglas County led to approximately a total 25 jobs in the county. Similarly, one $million of final sales of tree fruit led to approximately $400,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 6.2: Summary of tree fruit industry economic impacts on Douglas County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	2,689	$34.8	$87.2	$145.2
Indirect	746	$20.3	$21.2	$29.7
Induced	177	$4.9	$9.4	$15.6
Total Impacts	**3,613**	**$60.0**	**$117.8**	**$190.5**
Per $M Output	**25**	**$0.4**	**$0.8**	**$1.0**
Multipliers	*1.34*	*1.73*	*1.35*	*1.31*
County totals	15,642	413.5	641.0	1,076.2
Shares	***23.1%***	***14.5%***	***18.4%***	***17.7%***

In 2007, estimated total state and local taxes attributable to the tree fruit industry's activities in Douglas County amounted to slightly more than $6M. The lion's share stemmed from sales and property taxes. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue while Douglas County local taxing districts received most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at nearly $512,000, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 6.3: Summary of Douglas County tree fruit industry tax impacts on Washington State and Douglas County, 2007

Tax Effects	Total *$(1,000)*
Sales Tax	3,366.6
Property Tax	1,555.6
Motor Vehicle Licenses	97.3
Severance Tax	13.9
Other Taxes	512.0
State & Local Non-Taxes	224.2
Fees & fines	206.6
Personal Property Taxes	24.9
Other Personal Taxes	20.7
Total State and Local Tax Raised	**6,021.8**

The ranking of Douglas County industries affected by its tree fruit industry is the same as the state-wide results shown in Table 3.3 and as the findings from all other counties. Ranked by value added, agricultural support companies, the real estate sector, wholesale trade, the public utility district and banks are those sectors most connected to the tree fruit industry. The various agriculture support industries are, not surprisingly, those most bound to the fortune of the tree fruit industry.

Table 6.4: Douglas County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	557	15.0	12.8
Imputed rental activity for owner-occupied dwellings	0	0.0	2.2
Wholesale trade businesses	27	1.1	1.9
State & local government electric utilities	13	1.1	1.6
Banks & credit unions	17	0.8	1.0
Real estate establishments	6	0.2	0.8
Food services and drinking places	29	0.5	0.6
Electric power generation, transmission & distribution	2	0.2	0.6
Offices of physicians, dentists & other healthcare providers	10	0.5	0.6
Other state and local government enterprises	6	0.3	0.5
Maintenance & repair of nonresidential structures	10	0.4	0.4
Retail Stores - Motor vehicle and parts	5	0.3	0.4
Warehousing and storage	9	0.3	0.4
Transport by truck	5	0.3	0.4
Retail Stores - Food and beverage	8	0.2	0.4
Retail Stores - General merchandise	7	0.2	0.3
Other Federal Government enterprises	2	0.3	0.3
Accounting, tax preparation, bookkeeping & payroll services	4	0.3	0.3
Grain farming	43	0.1	0.3
Wood container and pallet manufacturing	9	0.2	0.3

7. The Tree Fruit Industry in Franklin County and Model Results

7.1 Tree fruit in the Franklin County economy

With its access to irrigated water, relatively low electricity prices and fertile land, agriculture is king in Franklin County, as Table 7.1 details. By value added in 2007, six agricultural industries were among the top twelve private industries, including fruit farming. Although ranked six by value added, tree fruit production is the largest industry by employment. The largest industry by value added, wholesale trade, is likely dominated by agricultural products. Support activities for agriculture in this county cover the downstream activities from fruit growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables. Due to agriculture's diversity in the county, support activities cannot be solely linked to the tree fruit industry.

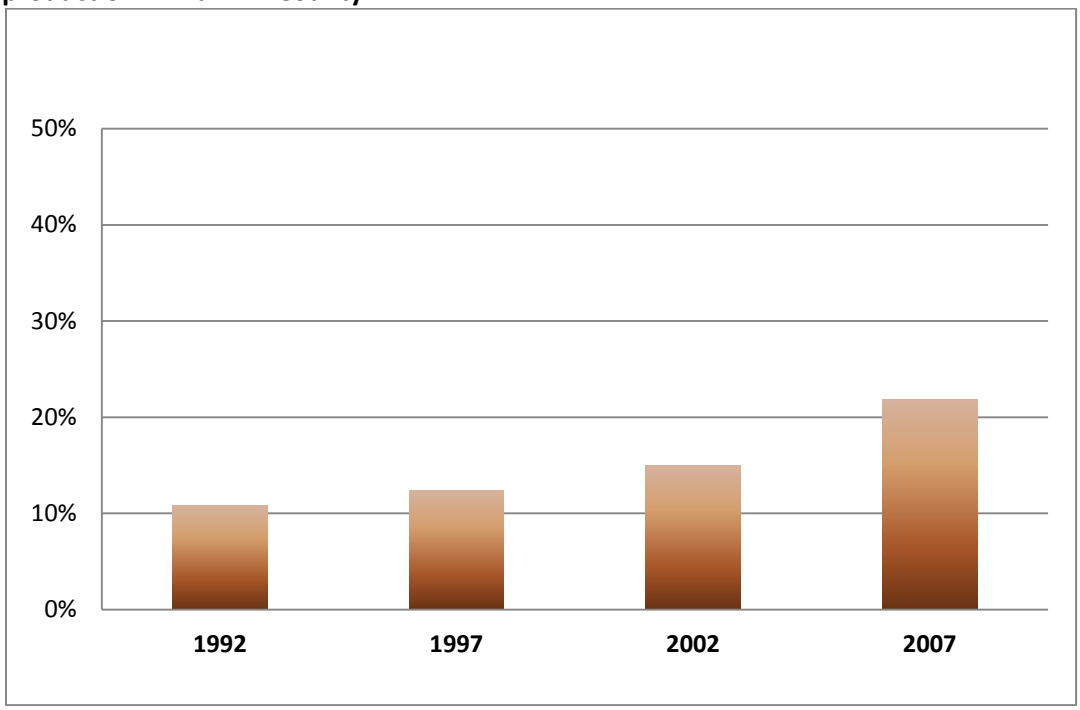
Table 7.1: Top private industries in Franklin County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Wholesale trade businesses	145.3	9.7%	1,659	5.8%
Vegetable and melon farming	103.5	6.9%	1,443	5.0%
Imputed rental activity for owner-occupied dwellings	88.6	5.9%	0	0.0%
All other crop farming	74.7	5.0%	1,535	5.3%
Tree fruit farming	61.3	4.1%	2,984	10.4%
Transport by rail	53.8	3.6%	358	1.2%
Frozen food manufacturing	50.6	3.4%	1,140	4.0%
Retail Stores - Motor vehicle and parts	47.0	3.1%	759	2.6%
Support activities for agriculture and forestry	35.7	2.4%	1,533	5.3%
Construction of new non-residential buildings	34.9	2.3%	594	2.1%
Food services and drinking places	33.4	2.2%	1,329	4.6%
Grain farming	9.9	0.7%	1,044	3.6%
All Other	757.9	50.6%	14,339	49.9%
Non-Government Total	**1,496.7**	**100.0%**	**28,717**	**100.0%**
Government	**293.2**		**4,972**	

Source: IMPLAN

The relative size of the agricultural economy in the Benton-Franklin MSA has already been described in chapter 4. Compared to Benton, tree fruit production in Franklin County is slightly more important to the value of total output but slightly less important to all agriculture. As Figure 7.1 depicts, tree fruit farming's share of all agriculture is about 22%. The trend, nonetheless, has been steadily positive and the 2007 results represent a doubling of its share from 1992.

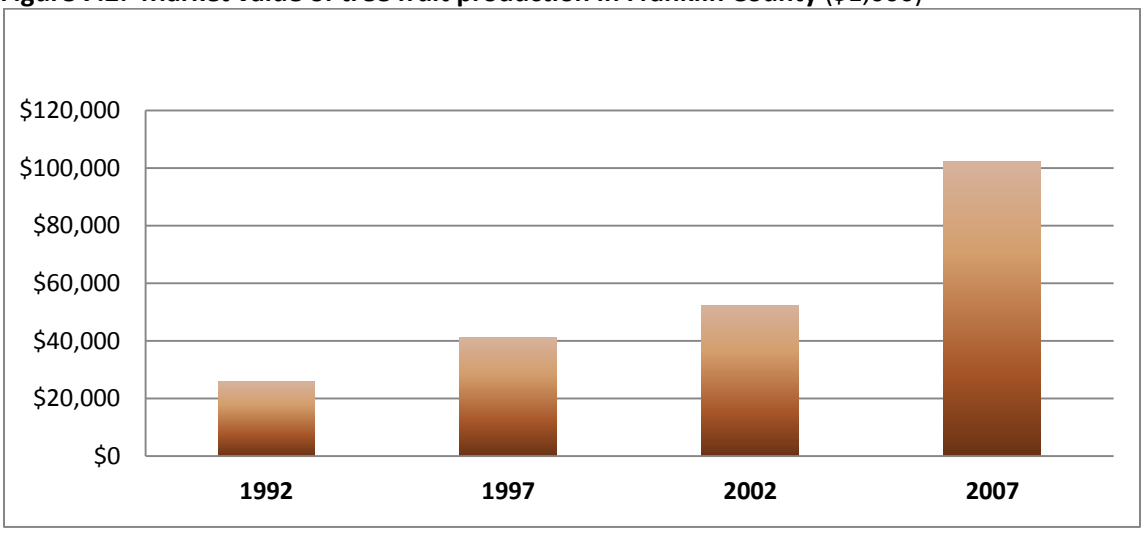
Figure 7.1: Share of tree fruit market value of total market value of agricultural production in Franklin County



Source: USDA Census of Agriculture

Figure 7.2 depicts the growth in tree fruit production in nominal dollar terms. In 2007, the value of production was slightly over $102M. That represented an approximate quadrupling of value over the 15 year period. Among the largest tree fruit producing counties in the state, Franklin County placed seventh in 2007, by market value.

Figure 7.2: Market value of tree fruit production in Franklin County ($1,000)



Source: USDA Census of Agriculture

7.2 Model results for Franklin County

The tree fruit industry made up about $61M in direct value added of the county economy in 2007. Once the indirect and induced effects of this activity are accounted for, the total impact, by valued added, was about $85M. In a county economy of about $1.79B in 2007, this implied a share of 4.7%, second lowest among all the study counties. The total impact of the industry on county employment is much higher, at 10.5%, while that of labor income is a little shy of 5%. The industry's value added multiplier in Franklin County was 1.38, a little below the typical value in the eight counties while the multiplier for the industry's effects on employment was the lowest among the counties.

A common way of expressing input-output results is in terms of a given increase in final sales, or output. The can be found in Table 7.2. One $million in final sales of tree fruit in Franklin County led to approximately a total 35 jobs in the county. Similarly, one $million of final sales of tree fruit led to approximately $600,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 7.2: Summary of tree fruit industry economic impacts on Franklin County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	2,984	$40.5	$61.3	$102.2
Indirect	375	$11.2	$12.1	$17.7
Induced	194	$6.4	$11.3	$19.3
Total Impacts	**3,552**	**$58.2**	**$84.8**	**$139.2**
Per $M Output	**35**	**$0.6**	**$0.8**	**$1.0**
Multipliers	*1.19*	*1.44*	*1.38*	*1.36*
County totals	33,689	1,192.5	1,789.8	3,502.5
Shares	***10.5%***	***4.9%***	***4.7%***	***4.0%***

Estimated total state and local taxes traceable to the tree fruit industry's activities in 2007 in Franklin County came to nearly $4.6M. As in the other counties, sales and property taxes made up approximately 81% of the total. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue, with Franklin County local taxing districts receiving most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at nearly $386,000, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 7.3: Summary of Franklin County tree fruit industry tax impacts on Washington State and Franklin County, 2007

Tax Effects	Total *$(1,000)*
Sales Tax	2,535.5
Property Tax	1,171.6
Motor Vehicle Licenses	82.2
Severance Tax	10.4
Other Taxes	385.6
State & Local Non-Taxes	168.8
Fees & fines	185.4
Personal Property Taxes	22.3
Other Personal Taxes	19.1
Total State and Local Tax Raised	**4,581.0**

Key Franklin County industries affected by its tree fruit industry are identical to those state-wide (Table 3.3), and generally to those in all other counties. Ranked by value added, agricultural support companies, the real estate sector, wholesale trade, and ambulatory healthcare providers are the five sectors most connected to the tree fruit industry in the county.

Table 7.4: Franklin County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	281	7.6	6.5
Imputed rental activity for owner-occupied dwellings	0	0.0	2.2
Wholesale trade businesses	24	1.3	2.1
Offices of physicians, dentists & other healthcare providers	15	0.7	0.7
Real estate establishments	6	0.1	0.7
Food services and drinking places	27	0.5	0.7
State & local government electric utilities	6	0.4	0.6
Private hospitals	8	0.5	0.6
Banks & credit unions	8	0.4	0.5
Federal government electric utilities	2	0.1	0.4
Retail Stores - Motor vehicle and parts	7	0.3	0.4
Transport by truck	6	0.3	0.4
Maintenance & repair of nonresidential structures	7	0.4	0.4
Other state and local government enterprises	6	0.3	0.4
Retail Stores - Food and beverage	9	0.2	0.4
Medical/diagnostic labs & other ambulatory outpatient services	3	0.2	0.3
Retail Stores - General merchandise	9	0.2	0.3
Electric power generation, transmission & distribution	1	0.1	0.3
Warehousing and storage	7	0.2	0.3
Other Federal Government enterprises	2	0.2	0.3

8. The Tree Fruit Industry in Grant County and Model Results

8.1 Tree Fruit in the Grant County Economy

Like Franklin County, Grant County enjoys a strong and diversified agriculture sector. Table 8.1 displays the twelve most important non-government industries in 2007, by value added and those industries' shares of county employment. Seven of the top industries were agricultural; in addition, the wholesale trade sector, fifth largest, is likely rooted in agricultural products. Tree fruit farming was clearly the largest industry, by both value added and employment. Support activities cover the downstream activities from fruit and vegetable growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables. In light of Grant County's diversified crop mix, support activities for agriculture are spread out over a variety of products.

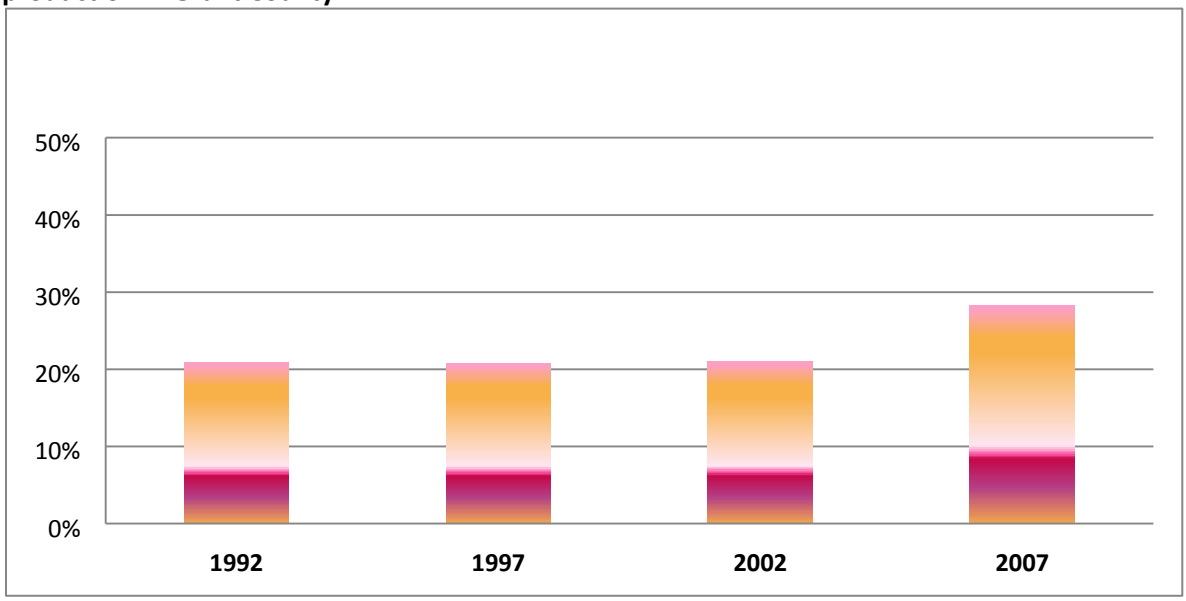
Table 8.1: Top private industries in Grant County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Tree fruit farming	201.8	10.4%	5,290	13.4%
Vegetable and melon farming	154.3	7.9%	1,613	4.1%
Imputed rental activity for owner-occupied dwellings	124.2	6.4%	0	0.0%
All other crop farming	115.8	6.0%	1,785	4.5%
Wholesale trade businesses	94.3	4.8%	1,151	2.9%
Frozen food manufacturing	69.0	3.5%	1,406	3.6%
Fruit and vegetable canning, pickling & drying	66.9	3.4%	639	1.6%
Real estate establishments	58.4	3.0%	605	1.5%
Support activities for agriculture and forestry	43.0	2.2%	2,151	5.5%
Food services and drinking places	42.9	2.2%	1,832	4.6%
Grain farming	33.4	1.7%	2,632	6.7%
Individual and family services	34.3	1.8%	1,868	4.7%
All Other	907.0	46.6%	18,431	46.8%
Non-Government Total	**1,945.3**	**100.0%**	**39,403**	**100.0%**
Government	**446.2**		**7,364**	

Source: IMPLAN

As the following graph reveals, the share taken by tree fruit production of the value of total agricultural production in the county has grown slightly over the 15 years considered: from approximately 21% to 28%.

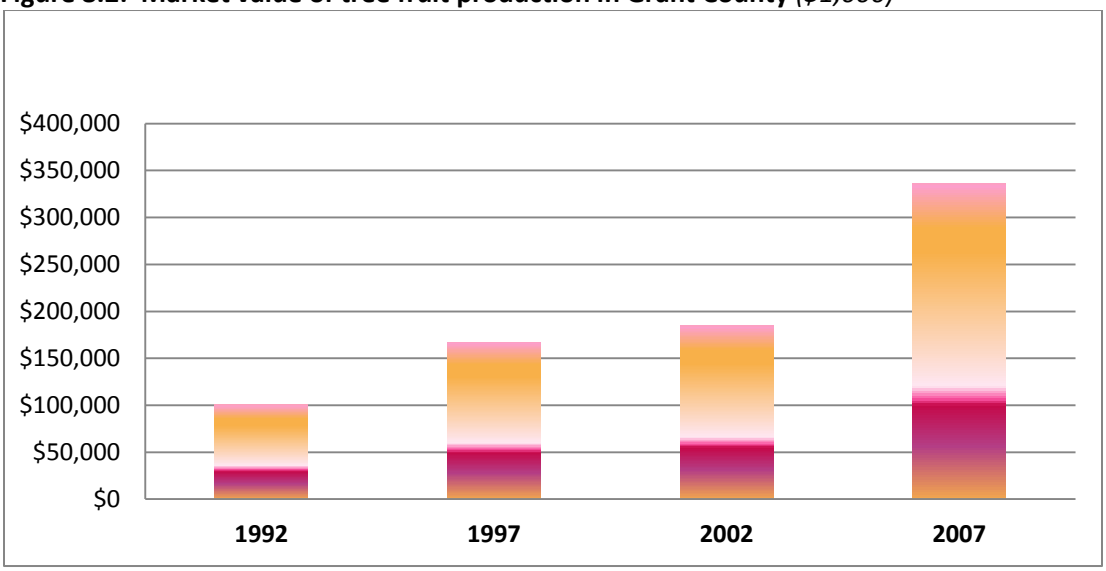
Figure 8.1: Share of tree fruit market value of total market value of agricultural production in Grant County



Source: USDA Census of Agriculture

As in Franklin County, this relatively modest increase in share of the county agricultural economy masks a dramatic increase in the value of tree fruit production. As Figure 8.2 portrays, tree fruit's market value has increased about 235% in nominal terms over the 15-year period shown. This contrast in growth rates is a testament to the robust and diversified agricultural economy of Grant County.

Figure 8.2: Market value of tree fruit production in Grant County *($1,000)*



Source: USDA Census of Agriculture

The 2007 results place Grant County as the second largest fruit-growing county in the state, by market value.

8.2 Model results for Grant County

The tree fruit industry provided about $202M in value added directly to the county economy in 2007. Once the indirect and induced effects of this activity are taken into account, the total impact, by valued added, was nearly $255M. In a county economy of about $2.39B, this implied a share of 10.7%, third highest among all the study counties. The total impact of the industry on the county employment was higher yet, at 14.3%. As true in nearly all counties, the total impact of the industry on labor income (wages & proprietor's income) was the smallest of the three measures, at 8.1%. The Grant County tree fruit value added multiplier was 1.25, lowest among the seven counties while the multipliers for the industry's effects on employment and income were in the middle of the range of values from the other counties.

Expressing input-output results in terms of a one $million increase in final sales, or output, one can observe from Table 7.2 that 20 jobs in Grant County follow. Similarly, one $million of final sales of tree fruit led to approximately $400,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 8.2: Summary of tree fruit industry economic impacts on Grant County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	5,290	$80.4	$201.8	$336.3
Indirect	986	$27.1	$30.8	$45.9
Induced	395	$11.8	$22.2	$36.9
Total Impacts	**6,670**	**$119.3**	**$254.8**	**$419.1**
Per $M Output	**20**	**$0.4**	**$0.8**	**$1.0**
Multipliers	*1.26*	*1.48*	*1.26*	*1.25*
County totals	46,767	1,481.1	2,391.5	5,179.4
Shares	***14.3%***	***8.1%***	***10.7%***	***8.1%***

Estimated total state and local taxes tied to the tree fruit industry's activities in Grant County amounted to approximately $12.9M. Sales and property taxes made up nearly 82% of the total. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue, while Grant County local taxing districts took in most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at about $482,000, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 8.3: Summary of Grant County tree fruit industry tax impacts on Washington State and Grant County, 2007

Tax Effects	**Total** *$(1,000)*
Sales Tax	7,234.4
Property Tax	3,342.8
Motor Vehicle Licenses	199.4
Severance Tax	29.8
Other Taxes	1,100.2
State & Local Non-Taxes	481.7
Fees & fines	406.4
Personal Property Taxes	51.2
Other Personal Taxes	40.0
Total State and Local Tax Raised	**12,885.8**

Grant County industries most affected by its tree fruit industry are approximately the same as those state-wide (Table 3.3), and to those in all other counties. Ranked by value added, agricultural support companies, the local public utility district, real estate and wholesale trade are the five sectors most connected to the tree fruit industry. As in the other counties, agriculture support industries make up the sector that is by far the most affected by Grant County tree fruit growers.

Table 8.4: Grant County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	712	16.6	14.2
State & local government electric utilities	37	3.5	5.0
Imputed rental activity for owner-occupied dwellings	0	0.0	4.8
Wholesale trade businesses	40	1.9	3.3
Real estate establishments	29	0.5	2.8
Offices of physicians, dentists & other healthcare providers	21	1.3	1.4
Food services and drinking places	60	1.0	1.4
Banks & credit unions	22	1.1	1.3
Transport by truck	17	0.7	1.0
Other Federal Government enterprises	8	0.9	0.9
Warehousing and storage	17	0.7	0.9
Retail Stores - Motor vehicle and parts	15	0.6	0.8
Other state and local government enterprises	11	0.5	0.8
Retail Stores - Food and beverage	20	0.5	0.8
Maintenance & repair of nonresidential structures	17	0.7	0.7
Retail Stores - General merchandise	20	0.5	0.7
Medical/diagnostic labs & other ambulatory outpatient services	7	0.4	0.7
Retail Stores - Building material and garden	8	0.3	0.5
Non-depository credit intermediation and related activities	3	0.2	0.5
Legal services	10	0.3	0.4

9. The Tree Fruit Industry in Okanogan County and Model Results

9.1 Tree fruit in the Okanogan County economy

Agriculture is slightly less dominant in the economy of Okanogan County than its neighbors to the south, Douglas and Grant. Nonetheless it is important, placing three industries in the top twelve. Table 9.1 ranks these industries by value added and gives their employment shares in 2007. Tree fruit farming comes in first, by both value added and employment. Support activities cover the downstream activities from fruit and vegetable growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables. Given the county's crop mix, these activities are undoubtedly related to tree fruit production.

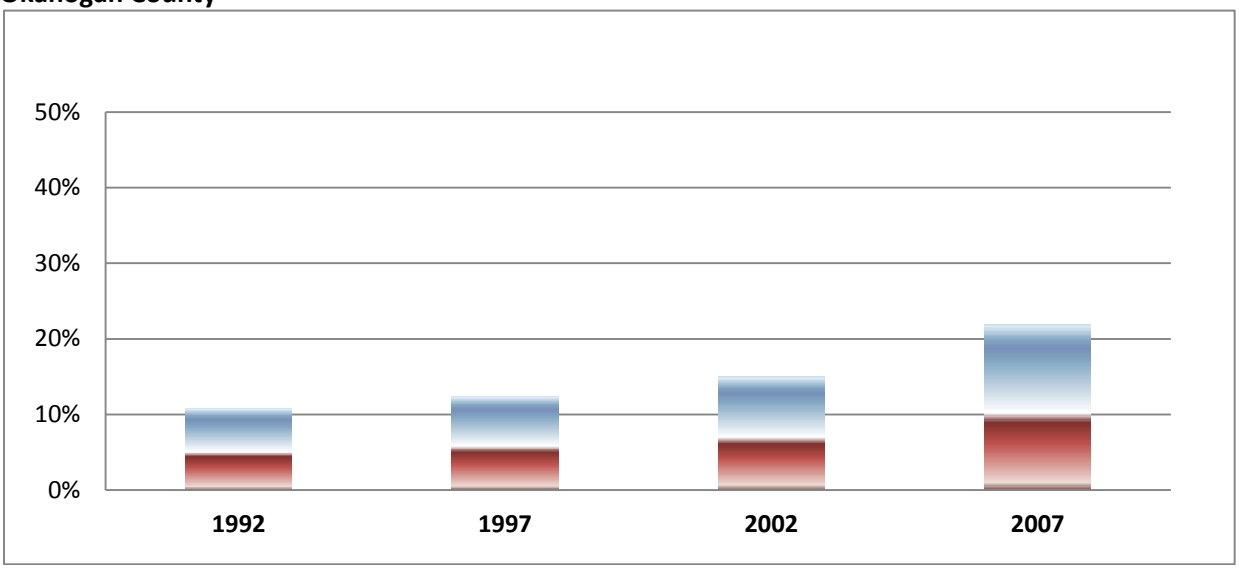
Table 9.1: Top private industries in Okanogan County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Tree fruit farming	104.5	13.3%	5,182	25.4%
Imputed rental activity for owner-occupied dwellings	65.5	8.4%	0	0.0%
Retail Stores - Gasoline stations	53.0	6.8%	316	1.6%
Wholesale trade businesses	46.6	5.9%	640	3.1%
Real estate establishments	35.4	4.5%	427	2.1%
Offices of physicians, dentists, other healthcare providers	31.3	4.0%	508	2.5%
Retail Stores - Food and beverage	29.4	3.8%	712	3.5%
Mining of gold, silver & other metal ores	26.4	3.4%	39	0.2%
Retail Stores - general merchandise	24.0	3.1%	648	3.2%
Support activities for agriculture and forestry	23.1	2.9%	1,295	6.4%
Food services and drinking places	22.4	2.9%	950	4.7%
Cattle ranching and farming	5.1	0.6%	668	3.3%
All Other	316.7	40.4%	8,999	44.1%
Non-Government Total	**783.4**	**100.0%**	**20,384**	**100.0%**
Government	**299.2**		**5,577**	

Source: Implan

Not surprisingly, fruit farming commands a high share the agricultural economy of the county. Figure 9.1 depicts the share of county agricultural output taken by tree fruit. It steadily increased over the 15 years shown, doubling in size from 1992 to 2007. For the most recent year, that share stood at 22%.

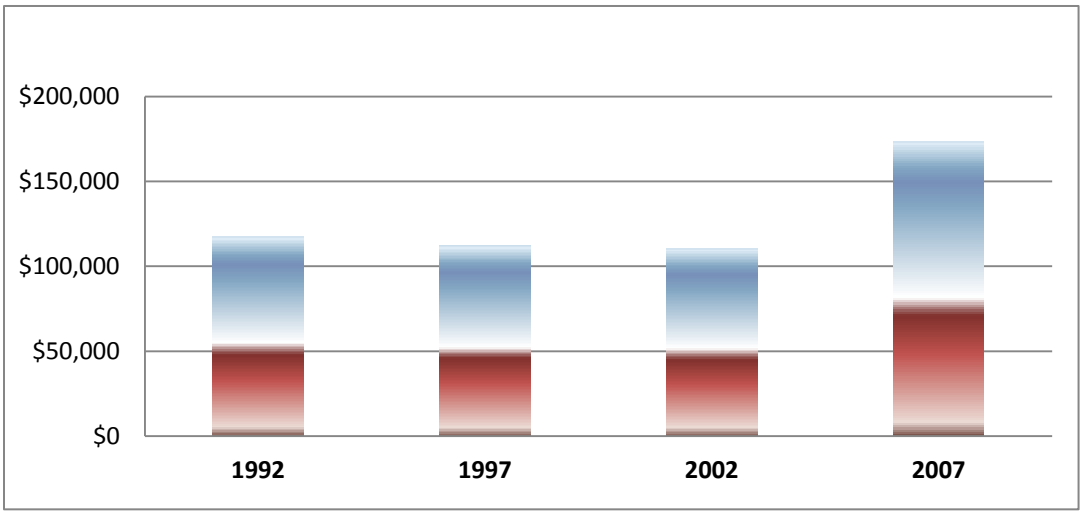
Figure 9.1: Share of tree fruit market value of total market value of agricultural production in Okanogan County



Source: USDA Census of Agriculture

In nominal dollar terms, the value of tree fruit production has less than doubled. In 2007, tree fruit marketings amounted to approximately $174M. For a good part of the 15 years, the value of tree fruit marketing actually declined from 1992; however, in 2007, a sharp uptick took place. Its 2007 results put Okanogan County fourth among all tree fruit producing counties, by market value.

Figure 9.2: Market value of tree fruit production in Okanogan County *($1,000)*



Source: USDA Census of Agriculture

9.2 Model results for Okanogan County

The tree fruit industry created about $105M in value added directly to the Okanogan County economy in 2007. Once the industry-to-industry and consumption (indirect and induced) effects of this activity are modeled, the total impact, by valued added, was about $153M. In a county economy of about $1.08B, this implied a share of 14.1% -- second highest among all the study counties. The total impact of the industry on the county employment is almost twice as large, with a share of to all county employment of 26.2%. At 14.1%, the industry's total impact share of labor income is similarly larger than all that of all other counties except for Douglas County. Okanogan County's tree fruit value added multiplier was 1.46, third highest among the eight counties while the multipliers for the industry's effects on employment and income were in the middle of the range.

The standard way of expressing input-output results is in terms of a given increase in final sales, or output, is also found in Table 9.2. One $million in final sales of tree fruit in Okanogan County in 2007 led to approximately a total 39 jobs in the county. Similarly, one $million of final sales of tree fruit led to approximately $600,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 9.2: Summary of tree fruit industry economic impacts on Okanogan County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	5,182	$66.1	$104.5	$173.8
Indirect	1,177	$26.2	$27.1	$37.4
Induced	445	$11.5	$21.2	$36.2
Total Impacts	**6,804**	**$103.8**	**$152.8**	**$247.4**
Per $M Output	**39**	**$0.6**	**$0.9**	**$1.0**
Multipliers	*1.31*	*1.57*	*1.46*	*1.42*
County totals	25,961	736.1	1,082.6	1,787.6
Shares	***26.2%***	***14.1%***	***14.1%***	***13.8%***

Estimated total state and local taxes attributable to the tree fruit industry's activities in Okanogan County totaled over $8.5M in 2007. Sales and property taxes constituted 81% of the total. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue, while Okanogan County local taxing districts claimed most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at about $714,000, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 9.3: Summary of Okanogan County tree fruit industry tax impacts on Washington State and Okanogan County, 2007

Tax Effects	**Total** *$(1,000)*
Sales Tax	4,693.8
Property Tax	2,168.9
Motor Vehicle Licenses	159.8
Severance Tax	19.3
Other Taxes	713.8
State & Local Non-Taxes	312.5
Fees & fines	365.8
Personal Property Taxes	47.8
Other Personal Taxes	35.0
Total State and Local Tax Raised	**8,516.8**

The list of Okanogan County industries most affected by its tree fruit industry is approximately the same as those state-wide (Table 3.3), and those in other study counties. Ranked by value added, agricultural support companies, the real estate sector, wholesale trade and the local public utility district are those sectors most connected to the tree fruit industry. The various agriculture support industries are unsurprisingly those most bound to the fortune of the tree fruit industry.

Table 9.4: Okanogan County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	961	20.0	17.1
Imputed rental activity for owner-occupied dwellings	0	0.0	4.0
Wholesale trade businesses	45	2.0	3.3
Real estate establishments	33	0.5	2.7
State & local government electric utilities	21	1.4	2.0
Offices of physicians, dentists & other healthcare providers	31	1.7	1.9
Banks & credit unions	20	1.1	1.3
Food services and drinking places	56	0.9	1.3
Electric power generation, transmission & distribution	3	0.3	1.0
Other state and local government enterprises	10	0.5	0.8
Retail Stores - Motor vehicle and parts	16	0.5	0.7
Retail Stores - Food and beverage	17	0.5	0.7
Retail Stores - General merchandise	17	0.4	0.6
Medical/diagnostic labs & other ambulatory outpatient services	7	0.3	0.6
Maintenance & repair of nonresidential structures	14	0.5	0.5
Retail Stores - Building material and garden	9	0.3	0.5
Retail non-stores - Direct and electronic sale	33	0.2	0.4
Telecommunications	2	0.1	0.3
Accounting, tax preparation, bookkeeping & payroll services	7	0.3	0.3
Transport by truck	6	0.2	0.3

10. The Tree Fruit Industry in Walla Walla County and Model Results

10.1 Tree fruit in the Walla Walla County Economy

Agriculture does not loom as large in Walla Walla as it does in six of the major tree fruit growing counties. Among the top twelve industries by value added, fruit and grain farming made up 5.8% of the total in 2007, as Table 10.1 reveals. In a county known for its wheat, it is noteworthy that tree fruit production's share of value added was greater than that of grain in 2007.

Table 10.1: Top private industries in Walla Walla County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Paper mills	104.9	6.9%	688	2.3%
Imputed rental activity for owner-occupied dwellings	94.2	6.2%	0	0.0%
Private hospitals	73.0	4.8%	1,211	4.1%
Wholesale trade businesses	64.1	4.2%	819	2.8%
Offices of physicians, dentists, other healthcare providers	61.9	4.1%	891	3.0%
Tree fruit farming	59.5	3.9%	2,270	7.7%
Real estate establishments	54.8	3.6%	563	1.9%
Private junior colleges- colleges- universities	46.8	3.1%	1,292	4.4%
Other industrial machinery manufacturing	43.6	2.9%	336	1.1%
Mining copper- nickel- lead- and zinc	41.8	2.8%	112	0.4%
Grain Farming	28.3	1.9%	2,997	10.2%
Food services and drinking places	38.6	2.5%	1,579	5.4%
All Other	803.3	53.0%	16,643	56.6%
Non-Government Total	**1,514.7**	**100.0%**	**29,401**	**100.0%**
Government	**370.5**		**5,593**	

Source: IMPLAN

The growth in tree fruit, and in fact, fruit production in the county has been dramatic enough for the USDA to note it only in the most recent census, 2007. In that year, the share of tree fruit market value to the total market value of all agriculture in the county was estimated to be nearly 30%, or 28.8%. In dollar terms that market value of tree fruit was nearly $100 million, or $99.2M, that year.

10.2 Model results for Walla Walla County

Walla Walla's tree fruit industry registered about $60M in direct value added directly to the local economy in 2007. After the industry-to-industry and consumption (indirect and induced) repercussions of this activity are accounted for, the industry's total impact, by valued added, was about $85M. In a county economy of about $1.89B, this implied a share of 4.5% -- second lowest among all the study counties. Total impact of the industry on county employment is considerably larger, at 8.1%, although the total impact on county labor income is about the same. The Walla Walla tree fruit industry's multiplier for value added was 1.42, about in the middle for the eight counties.

After expressing input-output results in terms of a one $million increase in final sales, or output, one can see from Table 10.2 that this sum associates with 29 jobs in Walla Walla County. Similarly, one $million of final sales of tree fruit led to approximately $600,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 10.2: Summary of tree fruit industry economic impacts on Walla Walla County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	2,270	$39.0	$59.5	$99.2
Indirect	364	$11.1	$12.6	$18.1
Induced	214	$7.5	$12.5	$21.2
Total Impacts	**2,848**	**$57.6**	**$84.6**	**$138.5**
Per $M Output	**29**	**$0.6**	**$0.9**	**$1.0**
Multipliers	*1.25*	*1.48*	*1.42*	*1.40*
County totals	34,994	1,304.0	1,885.3	4,012.5
Shares	***8.1%***	***4.4%***	***4.5%***	***3.5%***

Estimated total state and local taxes attributable to the tree fruit industry's total activities in the county totaled over $4.5M in 2007. Sales and property taxes contributed about 81% to the total. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue, while Walla Walla County local taxing districts claimed most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at about $384,000, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 10.3: Summary of Walla Walla County tree fruit industry tax impacts on Washington State and Walla Walla County, 2007

Tax Effects	**Total** *$(1,000)*
Sales Tax	2,523.2
Property Tax	1,165.9
Motor Vehicle Licenses	78.6
Severance Tax	10.4
Other Taxes	383.7
State & Local Non-Taxes	168.0
Fees & fines	174.5
Personal Property Taxes	21.2
Other Personal Taxes	17.5
Total State and Local Tax Raised	**4,543.0**

The list of Walla Walla County industries most affected by its tree fruit industry is largely the same as to those state-wide (Table 3.3), and those in all other counties. Ranked by value added, agricultural support companies, the real estate sector, banks or credit unions, and private electricity distribution companies comprise those sectors most connected to the tree fruit industry. Not surprisingly, the various agriculture support industries are unsurprisingly those most bound to the fortune of the tree fruit industry.

Table 10.4: Walla Walla County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	246	7.2	6.2
Imputed rental activity for owner-occupied dwellings	0	0.0	2.1
Banks & credit unions	24	1.5	1.8
Real estate establishments	14	0.3	1.3
Electric power generation, transmission & distribution	2	0.3	1.2
Offices of physicians, dentists & other healthcare providers	15	0.9	1.0
Wholesale trade businesses	13	0.6	1.0
Private hospitals	15	0.8	0.9
Other Federal Government enterprises	6	0.8	0.8
Food services and drinking places	23	0.4	0.5
Retail Stores - Motor vehicle and parts	6	0.3	0.3
Retail Stores - Food and beverage	8	0.2	0.3
Maintenance & repair of nonresidential structures	7	0.3	0.3
Retail Stores - General merchandise	8	0.2	0.3
State & local government electric utilities	2	0.2	0.3
Warehousing and storage	5	0.2	0.3
Private colleges & universities	8	0.3	0.3
Other state and local government enterprises	3	0.2	0.3
Grain farming	27	0.1	0.3
Telecommunications	1	0.1	0.2

11. The Tree Fruit Industry in Yakima County and Model Results

11.1 Tree fruit in the Yakima County economy

Along with Chelan County, Yakima County has been the traditional center of tree fruit activities in Washington State. Agriculture is clearly critical to the county's economy, yet other industries are not insignificant. Table 11.1 lists the top twelve private industries by value added and their employment in 2007. Healthcare, for example, registered three industries in the top 12. Three from agriculture were also present: Tree fruit farming, ranked third largest by value added but largest by employment; support activities for agriculture and milk production. The number one industry by value added, wholesale trade, undoubtedly reflects many agricultural products, including tree fruit. Support activities cover the downstream activities from fruit and vegetable growing: the pre-cooling, sorting, grading, packing and drying of fruits and vegetables.

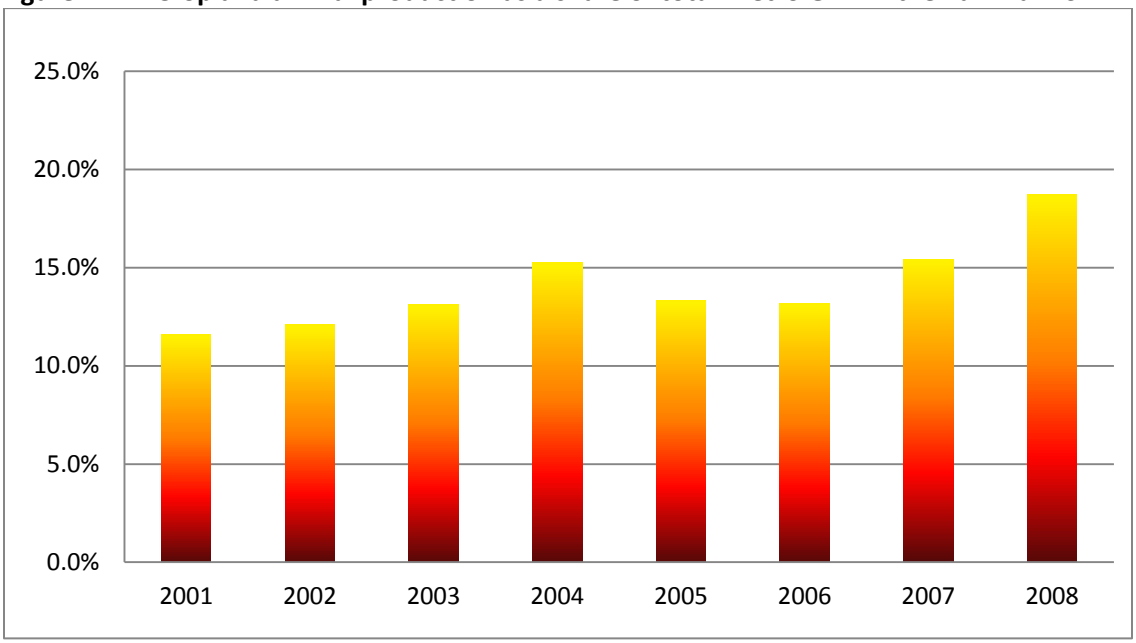
Table 11.1: Top private industries in Yakima County in 2007 and their share of the county economy

	Value Added		Total Employment	
Industry	*($M)*	**% of Non-Govt. Total**	**Number**	**% of Non-Govt. Total**
Wholesale trade businesses	462.7	8.8%	5,386	4.8%
Imputed rental activity for owner-occupied dwellings	381.0	7.2%		0.0%
Tree fruit farming	314.2	6.0%	12,478	11.2%
Offices of physicians, dentists, other healthcare providers	275.6	5.2%	3,867	3.5%
Support activities for agriculture and forestry	240.6	4.6%	10,461	9.4%
Real estate establishments	210.7	4.0%	2,077	1.9%
Private hospitals	167.3	3.2%	2,876	2.6%
Food services and drinking places	140.1	2.7%	5,366	4.8%
Dairy cattle and milk production	116.0	2.2%	3,757	3.4%
Retail Stores - Food and beverage	104.5	2.0%	2,409	2.2%
Nursing and residential care facilities	54.8	1.0%	2,435	2.2%
Retail Stores - General merchandise	96.0	1.8%	2,340	2.1%
All Other	2,708.4	51.4%	58,011	52.0%
Non-Government Total	**5,272.0**	**100.0%**	**111,463**	**100.0%**
Government	**1,028.7**		**18,183**	

Source: Implan

Metro GDP for the Yakima MSA (Yakima County) in 2007 was estimated at approximately $7.5B. At $1.4B, agriculture's share of total county GDP in that year was estimated to be about 19%. In absolute (and nominal) dollars, the value added contributed to the county economy went up by nearly 140% over the period shown, while its share of the total economy climbed from 12%. Figure 10.1 shows the growth path of agriculture's share of metro GDP estimates in the county.

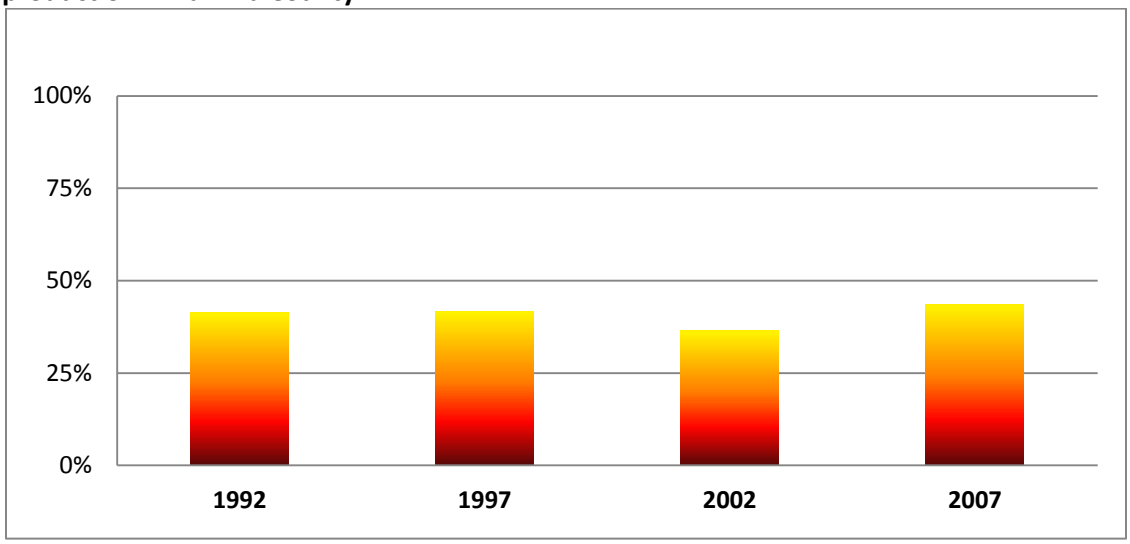
Figure 11.1: Crop and animal production as a share of total Metro GDP in the Yakima MSA



Source: Bureau of Economic Analysis

It is clear that agriculture steadily increased in importance to the Yakima County over this period decade, starting in 2001 at about 12% and ending at approximately 19%. Tree fruit in Yakima has traditionally played a highly significant role in the overall economy. Indeed, it is the county's most important agricultural industry. In contrast, however, to some of the other counties studied, the share did not grow appreciably over the period, as Figure 11.2 demonstrates.

Figure 11.2: Share of tree fruit market value of total market value of agricultural production in Yakima County

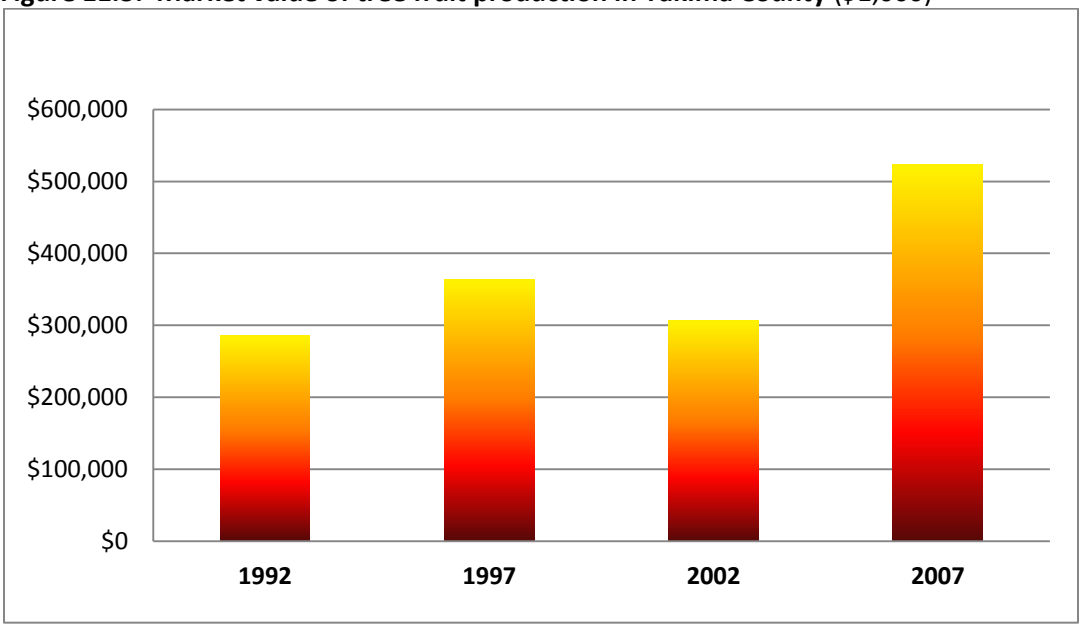


Source: USDA Census of Agriculture

At the start of the period, tree fruit represented approximately 41% of the value of all agricultural production in the county; in 2007, this share had risen to about 43%. Note the decline in 2002. Among the seven study counties, an average share in the low 40% range still represents the third highest.

In dollar terms, the value of tree fruit production in the county displayed far more than a modest increase. Between 1992 and 2007, tree fruit marketings increased approximately 83%, in nominal terms. Actual value in 2007 was greater than a half billion, or $523.5M.

Figure 11.3: Market value of tree fruit production in Yakima County ($1,000)



Source: USDA Census of Agriculture

The result for 2007 put Yakima County at the top of the seven study counties; it has consistently been the largest fruit-producing county in the state, by value.

11.2 Model results for Yakima County

Yakima's tree fruit industry yielded about $314M in direct value added for the county economy in 2007. After industry-to-industry and consumption (indirect and induced) effects of the activity are accounted for, its total impact, by valued added, was about $488M. This was the highest among all eight study counties and certainly highest among all counties in Washington. In a county economy of about $6.3B, this implied a share of 7.7%. This result was actually the only fourth-highest ranking among all the study counties, undoubted a reflection of the diversified agricultural and general economy of the county. As in other counties, the total impact of the industry on the county employment was larger, with a share of 13.1%. The share of the industry on total labor income was quite close to that of value added, at 7.4%. Yakima County's tree fruit value added multiplier was 1.55, second highest among the eight study counties, and the multipliers for the industry's effects on labor income were second highest.

A standard way of expressing input-output results, in terms of a given increase in final sales (output), can also be found in Table 11.2. One $million in final sales of tree fruit in Yakima in 2007 led to approximately total 32 jobs in the county. Similarly, one $million of final sales of tree fruit was associated with approximately $600,000 in paid income, either from wages or proprietor's salaries, throughout the county.

Table 11.2: Summary of tree fruit industry economic impacts on Yakima County in 2007

Impact Type	Jobs	Labor Income *(M)*	Value Added *(M)*	Output *(M)*
Direct	12,478	$187.0	$314.2	$523.5
Indirect	3,023	$88.5	$94.2	$141.1
Induced	1,450	$46.7	$79.9	$138.3
Total Impacts	**16,950**	**$322.1**	**$488.3**	**$802.9**
Per $M Output	**32**	**$0.6**	**$0.9**	**$1.0**
Multipliers	*1.36*	*1.72*	*1.55*	*1.53*
County totals	129,646	4,338.3	6,300.8	12,564.2
Shares	***13.1%***	***7.4%***	***7.7%***	***6.4%***

In 2007, estimated total state and local taxes tied to the tree fruit industry's activities in Yakima County came to $27.7M. Sales and property taxes constituted 81% of the total. As the discussion in chapter 3 noted, state government claimed the bulk of the sales tax revenue, while Yakima County local taxing districts took most of the property tax revenue generated by the tree fruit industry. The third largest category, "Other," at about $2.3M, contains local business license fees, state business and occupation tax, state and county real estate excise taxes and state public utility tax revenues.

Table 11.3: Summary of Yakima County tree fruit industry tax impacts on Washington State and Yakima County, 2007

Tax Effects	Total *$(1,000)*
Sales Tax	15,009.3
Property Tax	6,935.4
Motor Vehicle Licenses	483.9
Severance Tax	61.7
Other Taxes	2,282.5
State & Local Non-Taxes	999.3
Fees & fines	1,087.7
Personal Property Taxes	134.8
Other Personal Taxes	108.6
Total State and Local Tax Raised	**27,103.2**

Yakima County industries most connected to the tree fruit industry are largely the same as those state-wide (Table 3.3), and those in all other counties. Ranked by value added, agricultural support companies, the real estate sector, wholesale trade, and ambulatory healthcare providers are the five sectors most connected to the tree fruit industry. As in all jurisdictions studied, the various agriculture support industries are those most bound to the fortune of the tree fruit industry.

Table 11.4: Yakima County industries most affected by the tree fruit industry, 2007

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	2,456	66.1	56.5
Imputed rental activity for owner-occupied dwellings	0	0.0	12.9
Wholesale trade businesses	147	7.5	12.6
Real estate establishments	86	1.6	8.7
Offices of physicians, dentists & other healthcare providers	90	5.7	6.4
Private hospitals	86	4.7	5.0
Food services and drinking places	168	3.1	4.4
Banks & credit unions	61	3.6	4.3
State & local government electric utilities	32	2.6	3.6
Pesticide and other agricultural chemical manufacturing	11	0.7	3.2
Electric power generation, transmission & distribution	7	0.9	3.0
Retail Stores - Motor vehicle and parts	42	1.8	2.4
Other state and local government enterprises	29	1.6	2.2
Retail Stores - Food and beverage	50	1.5	2.1
Transport by truck	35	1.6	2.1
Retail Stores - General merchandise	48	1.3	2.0
Medical/diagnostic labs & other ambulatory outpatient services	22	1.2	1.9
Maintenance & repair of nonresidential structures	40	1.7	1.7
Legal services	30	1.2	1.6
Warehousing and storage	33	1.2	1.5

12. Comparison to Prior Studies of the Impact of the Washington State Tree Fruit Industry

The economic impact of the Washington tree fruit industry or its various components is an understudied subject. A review of the scholarly literature identified only one study directly concerned with some aspect of the economic impact of the industry and two related studies, one examining the impact of apple production and the other pear production. For comparative purposes, two other studies are considered, one involving the impact studies of the Florida citrus industry and the other examining the impact study of the Iowa fruit, including tree fruits, and vegetable industry.

While comparing results from different impact studies is suggestive and helps to frame the results from any single study, it should be recognized that the studies differ significantly in terms of methodology, data utilized and purpose. Compounding comparison difficulties is the tendency for the studies to be incompletely and abstractly described with important details omitted.

Studies are compared on the basis of their direct impact multipliers, that is, the ratio of total economic impact to direct impact as represented by the employment, wages paid, earnings and sales of producers, noting that total impact includes the indirect effects of business to business transactions and the induced effects of spending incomes earned either directly or indirectly. A second comparison is based on order of magnitudes estimates of employment, value added and output.

Table 12.1: Impact multipliers from various studies of fruit production

Study	Industry	Data Year	Jobs	Labor Income	Value Added	Output
Present Study	Tree Fruit	2007-8	1.65	1.83	1.74	1.77
Mon and Holland	Apples	1997	1.26	n/a	n/a	1.59
Hedrick and Wassell	Pears	2007	1.46	1.68	2.08	2.37
Rahmani & Hodges	Citrus	2007-8	2.76	3.26	2.69	2.22
Swenson	Fruits, vegs.	2004-5	1.54	1.54	n/a	1.65

Table 11.1 reports multipliers estimated for various tree fruit types by apparent year of data used. In a comparative study of organic as opposed to conventional apple production in Washington State, Mon and Holland (2006), using a modified IMPLAN impact model, estimated that in 1997 the output multiplier of conventional apple production in Washington State was 1.59 while the employment multiplier was 1.26. That is, every million dollars of apple sales resulted in an additional increase in state sales of $590,000 while every 100 jobs in the apple industry caused another 26 jobs to be created. In the current study of the entire tree fruit industry in Washington state, of which apples are a dominate component (Jones, et al), 2007 output and job multipliers are 1.77 and 1.46, respectively. This study also found a 1.83 multiplier for labor income and 1.74 for total value added, implying that every million dollars

in wages increased state labor income by $830,000, and every million dollar in incomes paid to not only workers but proprietor income as well, indirect taxes and other property income increased by $740,000.

In a recent study, Hedrick and Wassell (2010) using 2007 data estimated the output and employment multipliers for the Washington pear industry to be 2.37 and 1.46, respectively, while the multipliers for labor income and valued added were 1.68 and 2.08. In a study of the Florida citrus industry, Rahmani and Hodges (2009), with the exception of output, estimated significantly larger job, labor income and value added multipliers, ranging from 2.69 to 3.26. These findings are largely explained by the extraordinary large induced impact of the industry which in some instances was twice or even larger than its direct impacts. Finally, apparently using data circa, 2004-05, Swenson (2006) estimated job, labor income and output multipliers for different scenarios of Iowa fruit and vegetable production under different conditions of state consumption patterns and production. Averages of the impact multipliers from this study are found in Table 11.1.

Overall, the range of values from multipliers estimated by different studies of the economic impact of the tree fruit industry or components of the industry or of related fruit or food items are comparable to the multiplier values estimated for this study. This conclusion seems especially merited when again it is recognized that each study utilizes its own special methodology and estimation procedures.

The problem of comparable impact studies is most apparent when comparing the only other impact study of the Washington tree fruit industry, conducted by Jensen (2004), using apparently 2002 data. Since Jensen did not publish his impact multipliers, comparisons must be on the basis of magnitudes. Table 11.2 includes job, value added and output estimates of this study and the present study as well as job estimates from the 1997 Mon and Holland apple industry study.

Using the IMPLAN impact model as a basis, Jensen developed his own impact methodology and impact concepts which seem to be sharply different than those used in the present study. Consequently comparisons could be invalid. Nevertheless, Jensen estimated the total job impact of the tree fruit industry to be 142,100 as compared to 38,800 by the present study and 26,500 by Mon and Holland for 1997. The value added estimates are similar, $2.84 billion as opposed to $2.28 billion, but the Jensen output figure of $5.60 billion is much larger than the $3.97 billion found for 2007.

Table 12.2: Jobs, value added & output from various studies of Washington State tree fruit

Study	Industry	Data Year	Jobs	Value Added *($M)*	Output *($M)*
Present Study	Tree Fruit	2007-8	38,756	2,284	3,968
Jensen	Tree Fruit	2002	142,117	2,842	5,600
Mon & Holland	Apples	1997	26,460	n/a	n/a

13. Conclusions and Qualifications

To the best of our knowledge, this report represents only the second effort to measure the overall economic effects of the entire Washington State tree fruit industry on the state and the first to measure the industry's effects on the most important producing areas in the state. It is certainly the most current effort. The report adopts the input-output model and data set that is currently most widely used for studies of economic impact, IMPLAN.

The study demonstrates the large impact of the industry within the state's agricultural sector. It also reveals how important the tree fruit industry is for most of the counties studied. Indeed, among all eight counties, tree fruit production ranked seventh, sixth, fifth, second or first (for three counties) among all private industries, by direct value added. This implies that the industry enjoys a similar, but not identical ranking in these counties by its effects on jobs and labor income. By extension, it is also one of the primary producers of taxes for local jurisdictions.

The county multipliers of tree fruit production are generally in the 1.5-1.8 range, depending on the measure. Washington state multipliers are higher, in the 1.7-1.9 range. Importantly, nearly all the crop is exported, either to other states or abroad. This flow guarantees that the industry represents an annual injection of dollars into the state economy and into those of the largest producing counties.

It is useful to be aware of the methodological limitations of the study. Input-output analyses are inherently short-run, representing a snap-shot in time of the economic effects of a given year, in this case 2007 or 2008. This report, then, is not a forecast, or one capable of providing scenarios, easily anyway, of what might happen if certain factors of production change, such as increases in electricity rates or wages. Further, the study team assumed that the specific production process for Washington State tree fruit was not that different than the average US production process. There might be differences. However, given the paucity of information on Washington state tree fruit production processes and our general assumption that differences to national norms would be slight, the IMPLAN model was not modified.

The authors are aware, however, that the industry is dynamic. Consequently, when more county-level data on tree fruit are released, another rigorous look at the economic effects is recommended. That opportunity will not arise until the next release of the USDA Census of Agriculture, sometime in 2014.

Appendix A: Creation of the Data Set for the Washington Tree Fruit Industry

The USDA Census of Agriculture county coverage of tree fruit also includes grapes, nuts and berries. While nuts and berries production was negligible in the study counties for that year, grapes were not for many of the counties. Consequently, a methodology was devised to isolate the tree fruit portion of the category. Statewide averages were used to do this. A statewide revenue yield of "Total Cash Receipts per Bearing Acre" was developed for grapes. The total number of bearing acres of grapes in each county was then multiplied by this value of production/acre to "back out" grapes from the category of Tree Fruits, Nuts, and Berries. Since the majority of Washington grape production takes place in the eight counties analyzed, any bias from variation in yield would appear to be negligible.

IMPLAN calculates employment impacts on the basis of jobs, regardless of multiple job-holding by an individual. Consequently, QCEW (Quarterly Census of Employment & Wages) data covering employment from the Washington State Department of Employment Security were adjusted. The employment and annual wage data for each county came from non-published LMEA tabulations of county QCEW data for NACIS industries 111331 (Apple orchards) and 111339 (Other Non-citrus Fruit Farming).

To arrive at tree fruit *jobs* for each county, the employment numbers were multiplied by the ratio of all agricultural jobs divided by all agricultural employment. Tables A.1-A.3 shows the detail for three years, 2007, 2008 and 2009. This adjustment factor can be found in the bottom line of the tables; its usual effect of the adjustment was a 20 and 25 percent increase over the number employed in the tree fruit industry. Data for the total average agricultural jobs come from the most recent studies on the Washington agricultural workforce (see citations below); data for total average employment from the most recent annual datasheets of the state QCEW by the LMEA. This assumption implies that the multiple job-holding in the tree fruit production sector is the same as in all agricultural production in the state. Possible bias from this assumption would appear to be low, since most of Washington's multiple job-holding in agriculture likely takes place in tree fruit production.

Direct labor income from the production of Washington tree fruit came from two sources: wages & salaries paid, plus proprietors' income. The first of the components, and by far the larger of the two, was found at the state level in the annual QCEW reports. At the county level, the study team relied on non-published data from LMEA. Proprietors' income was derived from the IMPLAN model and the county value of production data described above. IMPLAN calculates a coefficient (share) of the dollars of final output (sales) claimed by proprietors every year for every industry. This share was multiplied by the calculated value of output by county for 2007 and by the state for all years. It was generally in the 4-5% range.

To arrive at value added, IMPLAN ratios for value added to final sales were maintained when USDA sales figures were substituted for the IMPLAN ones. IMPLAN generally estimated that 40 percent of tree fruit sales went to input payments while the remaining 60 percent was

distributed as Employee Compensation (wages), Proprietor Income, Other Property Income, and Business Taxes. When sales figures were revised and employee compensation calculated, the other components of valued added were adjusted to maintain their preexisting proportionate value added shares, much as was done to arrive at proprietors' income.

Table A.1: 2007 WA Tree Fruit Industry Wages, Employment, Jobs and Sales

Area	Firms	Ave. Employmt	Wages *($000)*	Ave. Jobs	Ave. Wage	Sales *($000)*
Benton Co.	106	1,677	24,006	2,095	11,456	136,452
Chelan Co.	567	5,774	92,630	7,215	12,839	202,976
Douglas Co.	259	2,152	31,090	2,689	11,562	145,217
Franklin Co.	74	2,388	37,947	2,984	12,717	102,167
Grant Co.	171	4,234	71,927	5,290	13,596	336,251
Okanogan Co.	263	4,147	61,666	5,182	11,901	173,780
Walla Walla Co.	13	1,817	36,530	2,270	16,090	99,190
Yakima Co.	748	9,986	173,793	12,478	13,928	523,480
8 Co. Total	2,201	32,175	529,590	40,204	13,173	1,719,513
Rest of WA	40	1,273	22,855	1,591	14,368	
State Tree Fruit	2,241	33,448	552,444	41,794	13,218	1,897,371
State Total Ag		76,449		94,810		
Job/Employmt Factor				*1.240*		

TableA.2: 2008 WA Tree Fruit Industry Wages, Employment, Jobs and Sales

Area	Firms	Ave. Employmt	Wages *($000)*	Ave. Jobs	Ave. Wage	Sales *($000)*
Benton Co.	108	1,538	24,426	1,922	12,710	na
Chelan Co.	549	5,549	94,836	6,934	13,678	na
Douglas Co.	247	2,116	33,447	2,644	12,650	na
Franklin Co.	79	2,460	39,436	3,074	12,830	na
Grant Co.	167	4,331	78,355	5,412	14,479	na
Okanogan Co.	248	4,282	67,555	5,350	12,626	na
Walla Walla Co.	13	2,116	44,717	2,644	16,913	na
Yakima Co.	717	10,392	186,689	12,985	14,377	na
8 Co. Total	2,128	32,784	569,462	40,964	13,901	na
Rest of WA	29	1,272	23,553	1,589	14,819	na
State Tree Fruit	2,157	34,056	593,015	42,554	13,936	2,261,074
State Total Ag		76,621		95,740		
Job/Empl Factor				1.250		

Table A.3: 2009 WA Tree Fruit Industry Wages, Employment, Jobs and Sales

Area	Firms	Ave. Employmt	Wages *($000)*	Ave. Jobs	Ave. Wage	Sales *($000)*
Benton Co.	109	1,759	29,848	2,140	13,946	na
Chelan Co.	540	6,237	104,177	7,589	13,727	na
Douglas Co.	252	2,539	39,759	3,089	12,869	na
Franklin Co.	79	2,674	41,948	3,254	12,892	na
Grant Co.	168	4,903	79,952	5,966	13,401	na
Okanogan Co.	240	4,696	75,505	5,714	13,214	na
Walla Walla Co.	13	2,030	42,860	2,470	17,351	na
Yakima Co.	699	11,489	208,573	13,980	14,920	na
8 Co. Total	2,100	36,327	622,623	44,203	14,086	na
Rest of WA	28	1,259	24,361	1,532	15,902	na
State Tree Fruit	2,128	37,586	646,984	45,735	14,146	1,585,574
State Total Ag		84,262		102,530		
Job/Empl Factor				*1.217*		

Sources:
County Firms, Average. Employment and Wages: LMEA, Special Tabulation of County NACIS 111331 and 111339 (accessed 07/2011)
County Sales: 2007 Census of Ag, Tree Fruits and Nuts Industry excluding non-tree fruit industries.
State Firms, State Average Employment, Wages: 2007, 2008 QCEW NACIS 111331 and 111339, (accessed 07/2011)
State Total Ag Average Employment, Ag Jobs: 2007, 2008 Agricultural Workforce Report, p19 and pzz; p17 and p70.

Ag reports: employment, jobs data (2007 special LMEA sort)
http://www.workforceexplorer.com/admin/uploadedPublications/10528_Agriculture_Report_WEX_2010.pdf
http://www.workforceexplorer.com/admin/uploadedPublications/9724_Agriculture_Report_2009.pdf
http://www.workforceexplorer.com/article.asp?ARTICLEID=8992

QCEW data
http://www.workforceexplorer.com/admin/uploadedPublications/10435_2009_AA_Pub_Revised.xls
http://www.workforceexplorer.com/admin/uploadedPublications/9776_2008AA_REVISED_Pub.xls
http://www.workforceexplorer.com/admin/uploadedPublications/9120_2007_AA_Final_Pub.xls

Appendix B

Table B.1

2008/9 Deciduous U.S. Tree Fruit Consumption Calculations -- farm-weight basis

	Production	Imports	Exports	Apparent Consumptn	Imports' Share of Supply***	USDA* Per capita Availabty	US Productn Share of Per capita Consumption
	-- million lbs --	-- million lbs --	-- million lbs --	-- million lbs --			-- lbs --
Apples -- fresh**	6,403.9	361.3	1,694.2	5,071.0	0.07	15.92	14.8
-- canned	1,253.4	157.4	0.0	1,410.8	0.13	3.69	3.2
-- juice *10	1,348.8	6,417.6	96.0	7,670.4	0.84	25.08	4.1
-- other	569.7	0.0	0.0	569.7	0.00	2.4	2.4
-- total processed						31.17	9.7
Total -- fresh basis	**9,575.8**	**6,936.3**	**1,790.2**	**14,721.9**		**47.09**	**24.5**
Pears -- fresh****	1,097.9	185.0	331.0	951.9	0.19	3.1	2.5
-- processed	639.9	63.5	16.8	686.6	0.09	2.2	2.0
Total	**1,737.8**	**248.5**	**347.8**	**1,638.5**		**5.3**	**4.5**
Cherries -- fresh	694.6	40.2	100.3	634.5	0.06	1.00	0.9
-- processed (F.22)*6	253.8	3.5	19.1	238.1	0.01	0.80	0.8
Total -- sweet & tart	**948.4**	**43.7**	**119.4**	**872.7**		**1.80**	**1.7**
Peaches -- fresh*5	1,445.4	111.5	200.7	1,356.2	0.08	4.4	4.0
-- processed	1,103.5	117.0	30.8	1,189.7	0.10	3.9	3.5
Total	**2,548.9**	**228.5**	**231.5**	**2,545.9**		**8.4**	**7.6**
Prunes/plums -- fresh	279.2	0.0	0.0	279.2	0.00	0.74	0.7
-- processed*9	716.1	8.5	287.8	436.8	0.02	0.31	0.3
Total	**995.3**	**8.5**	**287.8**	**716.0**		**1.05**	**1.0**

* 2010 FTS Yearbook, Table A.1

** 2008-09 marketing year (8.01-7.31); canned FW = product weight*1.25

*** Available supply = production + imports - exports

**** 2008-09 marketing year (7.01-6.30)

***** Due to a discrepancy zw. Table A.1 & F.20 (canned), using a mid-point of two numbers of per capita consumption

*6: 2008-9 marketing year (5.01-4.30); sweet converted from product weight by 1.195; tart from product weight by factor = 0.95; no dried cherries

*7: 009-10 marketing year (5.01-4.30)

******** 2008-09 marketing year (5.01-4.30)

*9: 2009-10 marketing yeaer (5.01-4.30); canned converted to fresh weight by dividing by 1.51; dried by 2.6; production includes change of stocks

*10: based on USDA juice consumtion spreadsheet of 2.16.10, 12 lbs of apples made 1 gallon of cider in 2008

Table B.2

Calculation of Net Exports of Washington Tree Fruit -- to the U.S. & abroad for Marketing Years beginning in 2008

	All U.S. Per capita Consmptn of Domestic Productn *Fresh wgt*	Relative Consmptn Factors for West. U.S.*	Weighted *WA* Per capita Consmptn of Domest Productn *Fresh wgt*	Calculatd WA State Consmptn of *WA* 2008 Fruit****** *Fresh wgt*	2008 WA State Utilized Productn *Fresh wgt*		2008 WA State Utilized Productn available for dom. & internatl export	Share of 2008 WA Utilized Productn available for dom. & internatl export	2008 WA farmgate price	Value of 2008 WA Utilized Productn available for dom. & internatl export	Value of 2008 WA State Utilized Productn Consumed in WA State
	-- lbs --		*-- lbs --*	*-- mill lbs --*	*-- mill lbs --*		*-- mill lbs --*		*-- $/lb --*	*-- $ (mill) --*	*-- $ (mill) --*
Apples -- fresh	14.8	1.33	19.7	129.55	4,550.0	**	4,420.5	0.97	0.271	1,197.94	35.11
-- canned	3.2	0.97	3.1	20.62							
-- juice	4.1	1.06	4.3	28.60							
-- other	2.4	0.86	2.1	13.65							
-- total processed	9.7	0.983	9.5	62.87	850.0		787.1	0.93	0.050	39.28	3.14
Total -- fresh weight basis	**24.5**		**29.2**	**192.42**	5,400.0		5,207.6		0.274	**1,237.22**	**38.24**
Pears -- fresh	2.5	1.33	3.3	21.88	516.4	***	494.5	0.96	0.295	145.63	6.44
-- processed	2.0	1	2.0	13.15	209.6		196.5	0.94	0.114	22.30	1.49
Total	**4.5**		**5.3**	**35.03**					0.236	**167.93**	**7.94**
Cherries -- fresh	0.9	1.33	1.2	8.21	170.0		161.8	0.95	1.465	237.03	12.02
-- processed	0.8	1	0.8	5.19	42.5		37.3	0.88	0.949	35.41	6.14
Total -- sweet & tart	**1.7**		**2.0**	**13.40**	212.5					**272.44**	**18.16**
Peaches -- fresh	4.0	1.33	5.4	35.38	11.7	****	-23.7	n/a	0.320	-7.57	3.75
-- processed	3.5	1	3.5	23.17	13.1		-10.1	n/a	0.158	-1.59	
Total	**7.6**		**8.9**	**58.55**							**3.75**
Prunes/plums -- fresh	0.7	1.33	1.0	6.48	3.4	****	-3.1	n/a	0.178		0.60
-- processed	0.3	1	0.3	2.00	3.8		1.8		0.113	0.21	
Total	**1.0**		**1.3**	**8.49**						**0.21**	**0.60**
All fruit total										**1,677.79**	**68.70**

* from: Perez,A., Lin B-H, Allshouse, A., "Demographic Profile of Apple C in the US," Fruit & Tree Nuts Situation, 9.01, pp 37-47; assume that other fruits follow this pattern

** Breakdown of utilization data available for WA; source: Ag Yearbook 2009

*** Used the U.S. average breakdown of utilization to arrive at disposition of WA pears; source: Ag Yearbook 2009; prices from 2010 FTS annual & are national averagers

**** Ditto for peaches

***** Used the OR breakdown of utilization to arrive at disposition of WA plums; source: Ag Yearbook 2009; used

6,587,600 was the April 1, 2008 WA total population estimate

Appendix C

Table C.1: Tree fruit Industry Total Economic Impacts on Washington State in 2007

Impact Type	Employment	Labor Income*(M)*	Value Added *(M)*	Output *(M)*
Direct	41,794	$600	$1,139	$1,897
Indirect	10,273	$321	$350	$526
Induced	4,634	$189	$327	$573
Total	**56,701**	**$1,111.0**	**$1,816.0**	**$2,996.2**
Per $M Output	**30**	**$0.6**	**$1.0**	**$1.0**
Multiplier	***1.36***	***1.85***	***1.59***	***1.58***

Table C.2: Tree fruit Industry Total Economic Impacts on Washington State in 2008

Impact Type	Employment	Labor Income*(M)*	Value Added *(M)*	Output *(M)*
Direct	42,554	$698	$1,339	$2,261
Indirect	10,893	$369	$400	$702
Induced	7,332	$314	$578	$1,009
Total Impacts	**60,779**	**$1,381.5**	**$2,317.0**	**$3,971.7**
Per $M Output	**27**	**$0.6**	**$1.0**	**$1.0**
Multipliers	***1.43***	***1.98***	***1.73***	***1.76***

Table C.3: Tree fruit Industry Total Economic Impacts on Washington State in 2009

Impact Type	Employment	Labor Income*(M)*	Value Added *(M)*	Output *(M)*
Direct	45,735	$721	$799	$1,586
Indirect	8,143	$297	$393	$723
Induced	6,892	$296	$540	$915
Total Impacts	**60,769**	**$1,313.0**	**$1,731.7**	**$3,223.6**
Per $M Output	**38**	**$0.8**	**$1.1**	**$1.0**
Multipliers	***1.33***	***1.82***	***2.17***	***2.03***

Table C.4: Summary of the Washington State Tree Fruit Industry Average Tax Impacts on Washington State 2007

Tax Effects	Total *$(1,000)*
Sales Tax	55,771.9
Property Tax	25,770.8
Motor Vehicle Licenses	1,705.7
Severance Tax	229.4
Other Taxes	8,481.3
State & Local Non-Taxes	3,713.4
Fees & fines	3,725.3
Personal Property Taxes	431.8
Other Personal Taxes	402.3
Total State and Local Tax Raised	**100,232.1**

Table C.5: Summary of the Washington State Tree Fruit Industry Average Tax Impacts on Washington State 2008

Tax Effects	Total *$(1,000)*
Sales Tax	72,113.8
Property Tax	34,413.5
Motor Vehicle Licenses	2,216.9
Severance Tax	550.5
Other Taxes	10,776.0
State & Local Non-Taxes	5,264.0
Fees & fines	4,880.7
Personal Property Taxes	545.4
Other Personal Taxes	546.0
Total State and Local Tax Raised	**131,306.8**

Table C.6: Summary of the Washington State Tree Fruit Industry Average Tax Impacts on Washington State 2009

Tax Effects	Total *$(1,000)*
Sales Tax	61,093.5
Property Tax	29,342.0
Motor Vehicle Licenses	2,276.4
Severance Tax	128.2
Other Taxes	7,882.6
State & Local Non-Taxes	4,162.7
Fees & fines	5,599.4
Personal Property Taxes	540.5
Other Personal Taxes	497.8
Total State and Local Tax Raised	**111,523.0**

Table C.7: Washington State Industries Most affected by Washington's Tree Fruit Industry in 2007, by Total Impact

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	8,406	231.7	198.3
Real estate establishments	368	8.6	45.6
Imputed rental activity for owner-occupied dwellings	0	0.0	44.4
Wholesale trade businesses	348	24.9	42.2
Banks & credit unions	253	20.8	24.7
Offices of physicians, dentists & other healthcare providers	294	18.5	20.8
Food services and drinking places	512	10.6	15.1
State & local government electric utilities	111	9.8	13.8
Private hospitals	187	12.6	13.4
Electric power generation, transmission & distribution	17	2.9	10.0
Retail Stores - Motor vehicle and parts	118	6.0	8.2
Legal services	89	5.5	7.3
Insurance carriers	64	4.7	7.3
Retail Stores - Food and beverage	147	4.9	7.1
Other state and local government enterprises	80	4.9	7.1
Non-depository credit intermediation and related activities	37	3.6	6.8
Transport by truck	102	5.0	6.7
Maintenance & repair of nonresidential structures	119	6.4	6.7
Retail Stores - General merchandise	146	4.4	6.5
Medical/diagnostic labs & other ambulatory outpatient services	61	3.9	6.4

Table C.8: Washington State Industries Most affected by Washington's Tree Fruit Industry in 2008, by Total Impact

Sector	Jobs	Labor Income	Value Added
		$(M)	*$(M)*
Support activities for agriculture and forestry	8,664	255.0	182.7
Real estate establishments	703	18.1	85.5
Imputed rental activity for owner-occupied dwellings	0	0.0	80.6
Wholesale trade businesses	459	34.5	59.5
Banks & credit unions	251	22.3	58.3
Offices of physicians, dentists, and other health practitioners	419	28.7	33.3
Food services and drinking places	845	17.1	25.5
Private hospitals	267	18.8	19.7
Insurance carriers	109	9.0	16.6
Telecommunications	65	6.1	16.5
Other state and local government enterprises	139	10.0	13.1
Electric power generation, transmission, and distribution	18	3.3	12.2
Retail Stores - Food and beverage	227	7.9	12.0
Medical/diagnostic labs & other ambulatory outpatient services	94	6.4	11.2
Non-depository credit intermediation and related activities	69	7.1	11.1
Retail Stores - General merchandise	232	7.3	10.8
Retail Stores - Motor vehicle and parts	171	8.6	10.8
Legal services	121	7.7	10.0
State and local government electric utilities	61	5.1	9.1
Retail Non-stores - Direct and electronic sales	87	2.5	8.8

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WISERTrade, email, April 2010.

Endnotes

[i] At the state level, one might find an approximate count of jobs involved in fruit packing via Washington's Quarterly Census of Employment and Wages. Data for that 6-digit NAICS code, "post-harvest crop activities," however, still contain activities done for vegetables and other fruit. At the county level, there are no counts for this level specificity.

[2] At the state level, one might find an approximate count of jobs involved in fruit packing via Washington's Quarterly Census of Employment and Wages. Data for that 6-digit NAICS code, "post-harvest crop activities," however, still contain activities done for vegetables and other fruit. At the county level, there are no counts for this level specificity.

[2] Hay production has recently occupied 5th place as well. Source: USDA, NASS (2010).

[3] If one measures growth over the 2000-2008 period, the value of tree fruit nearly doubled, at 97%.

[4] These were 85% for agriculture and 82% for the state economy as a whole. The numbers are not adjusted for inflation, as measured by the Consumer Price Index, increased about 25% over the same period.

[5] USDA, Agricultural Statistics 2009, Table 5.7.

[6] USDA (2009), Table 5.24.

[7] This figure measures "utilized production"; in recent years total and utilized have been the same in Washington State.

[8] As in apples, these data refer to utilized production.

[9] US Census: http://www.census.gov/compendia/statab/cats/foreign_commerce_aid/exports_and_imports.html

EASTERN
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VALUE-ADDED COURSE AGENDA - Generic

Draft

		TOPIC:	RESOURCES:	SPEAKER:	CONTACT INFO:
WEEK ONE: Tuesday or Wednesday	9:00 - 10:15	Introductions and expectations	Distribute link to 'toolbox' and Course Outlines	ALL	Develop Spreadsheet with participant input
	10:15 - 11:00	Overview of Workshop content and style	Review Outline Comments & Input	Fred	
	BREAK				
	11:15 - NOON	Setting the Stage: Roundtable Discussions - Questions		ALL	
	12:00 - 12:45	LUNCH (served on site)	Local caterer		Need local contacts/options
	12:45 - 2:45	Business Planning	See toolbox for multiple resources	Local recommendations (SBDC) (WSU)	Need local contacts/options
	BREAK				
	3:00 - 3:30	Review/discussion and questions		ALL	
WEEK TWO: Tuesday or Wednesday	9:00 - 10:00	Identifying Resources - Where do I go to get help?	See toolbox for multiple resources	Fred	
	10:15 - 11:15	USDA - VAPG	USDA RURAL DEVELOPMENT	LOCAL OFFICE CONTACT	Regional Office of USDA
	11:30- NOON	Group discussions	See toolbox for multiple resources	ALL	
	12:00 - 12:45	LUNCH			
	12:45 - 2:45	Food Safety/Regulations	See toolbox for multiple resources	WSDA FSP RM &/or local FSO	Lucy Severs, WSDA FSPM
	BREAK				
	3:00 - 3:30	Review/discussion and questions		ALL	
WEEK THREE: Tuesday or Wednesday	9:00 - 10:00	Group discussions	REVIEW	ALL	
	10:00 - 11:00	Financing your venture	See toolbox for multiple resources	FSA + NWFCS	Local FSA Office Local NWFCS
	BREAK				
	11:15 - 12:15	Insurance		Local contact re: Lesa Boxx	lesa.boxx@countryfinancial.com; 360-354-2975
	12:00 - 12:45	LUNCH			
	12:45 - 3:00	Food Technology		Dale Nelson	(360)794-9778 dale@21Acres.org
	BREAK				
	3:15 - 3:30	Review/discussion and questions		ALL	
WEEK FOUR: Tuesday or Wednesday	9:00 - 10:45	Market Research - Developing your product		Local Marketing resource (WSU)	Need local contacts/options
	BREAK				
	11:00 - 12:15	Commercialing your product Labeling / Branding		Local Marketing resource (WSU)	Need local contacts/options
	12:15 - 1:00	LUNCH	Developing your product line DIY or Co-packing?	Fred & Group	
	1:15 - 2:30	Marketing		Local Marketing resource (WSU)	Need local contacts/options
	BREAK				
	2:45 - 3:30	Review/discussion and questions - WRAP-UP	Follow-up Survey	ALL	

Specialty Crop Block Grant Program

Turn your idea into a marketable product!

Value-added Workshop/Roundtable Series – Clark and King Counties

Register now at: http://wintervalueadded.eventbrite.com

Four weeks of one-day/week intensive classes to learn all you need to know in order to extend your market season through value-added products.

WHO? - Farmers, chefs, passionate foodies, current and/or wannabe food processors…

WHAT? - A fun and fact-filled opportunity to learn, network, and develop your own ideas into profitable value-added specialty crop products.

WHY? – Because you can! Value-added products, with shelf life for year round sales that you can market directly can generate higher profits. Produce (or have co-packed) and market high-value products! (And we'll have FUN doing it!)…

WHEN & WHERE? - Beginning: in *Clark Co.* *(Vancouver),* Tuesdays, Feb. 19th at 9:00 am – 3:30 pm; through Mar. 12th.

in *King Co.* *(Woodinville/21 Acres),* Wednesdays, Feb. 20th at 9:00 am – 3:30 pm; through Mar. 13th.

Value-added processing is sometimes most feasible in partnership with other producers or appropriately-scaled processors due to infrastructure and labor costs. Based on past successes using small roundtable formats, we will conduct a series of workshops with 12 -18 people at each. Farmers and small processors will be included together to share ideas, experiences and knowledge to develop self-sustaining teams to mutually support each other's efforts. One of the biggest challenges to farmers expanding their businesses into value-added processing is lack of knowledge of the resources available, the potential benefits and potential risks, and the steps to get started. The target beneficiaries for this project will be small and midsized fruit and vegetable producers and small and midsized food processors (YES, chefs, you too can be processors!) that may be partners or provide co-packing for the farmer/entrepreneur. For those interested and willing to make the commitment, diverting part of their crop into direct sales or value-added processing will diversify their revenue, reduce market risk, and give them greater control over their markets, pricing and the bottom line.

The primary objective is to help specialty crop producers and processors increase their total farm or business income and to be more profitable and economically viable. We expect that all participants will gain knowledge and access to resources that will allow them to improve their business operations and marketing outlets which will benefit their profitability. We also expect that the project will benefit existing and new processors who may partner with growers, or develop new product ideas using specialty crops acquired from these growers.

Some of the topics will include:

- Benefits to the producers of directly marketing their product
- Opportunities to develop unique or added value, processed products
- Critical steps in developing a value added product
- Commercializing a product
- Marketing and market research

- Food Safety
- Sources of knowledge and expertise
- Financing
- Co-packing options

For more information or questions, contact: Fred Berman, fberman@agr.wa.gov; 360.656.5063

Washington State Department of Agriculture

Thursday
ept. 26, 2013

Tomorrow:
Cloudy, windy, showers

Highs: mid 60s
Lows: upper 40s

For details, see
Records, pg. 2

Big Tuesday

Tigers, Eagles, WC netters get wins

- See **Sports**, pg. 6

A door cl

Marlin Presbyt hold final servic

- See **Community** se

Grant County Journa

. 105 NO. 96
EPHRATA, WASHINGTON

Getting a taste of Washington state

Kylee Noah, Kylee Garces, and Natania Vela eagerly ask Cloudview EcoFarms farmer Carli Thompson for carrots during Grant Elementary School's Taste of Washington Day Wednesday. Statewide, schools celebrated the state's agricultural diversity by providing students with a lunch consisting of a variety of locally grown produce. The event is designed to encourage children to eat more local, healthy and in-season produce as part of their daily diet. During lunch students ate apples from Omak, salad greens from Cloudview EcoFarms and Washington-grown potatoes in addition to the carrots and cherry tomatoes Thompson provided. Right, Mackenzie Johnson enjoyed the event by biting into a local carrot.

Photos by Lauren McLaughlin

Lake Stevens JOURNAL

Students create food rainbows with fruits and veggies

Published on Tue, Apr 23, 2013 by **JOURNAL STAFF**

Red strawberries, orange, yellow and purple carrots, multicolored cauliflower and leafy greens adorned students' lunch trays on April 16 during the Food and Nutrition Services Department's "Make a Rainbow at the Salad Bar Today."

Students were challenged to make a rainbow at the salad bar with at least three different colors on their lunch tray. Those who did received a colored bracelet from high schoolers dressed as fruits and vegetables.

The event is part of the Fresh Food in Schools Project. Lake Stevens School District is one of 19 districts in the state participating in the project with the Washington Sustainable Food and Farming Network. The goal is to strengthen relationships between farmers and schools by encouraging schools to purchase more fresh fruits and vegetables from local farmers.

"This was a great opportunity to challenge students to reinforce healthy habits by selecting different colored fruits and veggies," said Mollie Langum, Food, Nutrition and Health Services Manager.

(Article available at: http://www.lakestevensjournal.com/news/article.exm/2013-04-23_students_create_food_rainbows_with_fruits_and_veggies)

Nourishing the Future Generations:
Opportunities for Selling to Schools in WA

Fresh Food in Schools Project

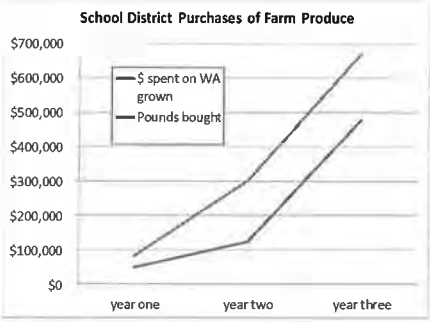
is a program of Washington Sustainable Food & Farming Network funded by WSDA & USDA Specialty Crop grant and WA Women's Foundation.

www.wsffn.org

Three regional coordinators have helped twenty school districts across the state connect with farmers who want to sell fruits and vegetables to school meal programs. In the 3-year grant period, Fresh Food in Schools districts purchased over $1,055,000 in Washington-grown produce from at least 33 farms, 9 produce brokers, and 2 major food distributors. Schools are looking for local producers to supply required healthy foods, including winter storage crops and organics.

Taste Washington Day is a time to celebrate Washington agriculture by featuring school meals sourced directly from local farms. Over 137,000 school children have been served farm fresh foods in 20 school districts across WA.

Farm to School is a win-win for kids and farms!



Benefits for Farmers selling to schools:

- New direct market for fresh produce
- Flexible volume demanded
- Small-sized fruit can be sold
- Can sell to multiple schools
- Time savings over selling at farmers markets
- Having a solid weekly order and payment
- Can move product when there is excess
- Knowing orders ahead of time so can plan harvest & deliveries around other markets
- Being a part of your local community
- Getting high quality food to kids
- Working with buyers who are happy to receive fresh, quality produce
- Educating our next generation of eaters and potential farmers
- Getting the word out about your farm

National Farm to School Survey reports that on average farmers increased income 5% by adding direct sales to schools.
(www.farmtoschool.org)

How to get started:

1. Email or call the FSD (food service director) at your local school
2. Take sample product to FSD
3. Send weekly fresh sheets to FSD
4. Visit school cafeterias for taste tests

Challenges for Farm to School:

- Seasonality of school year
- Distribution to many sites
- Bidding process
- Competing with commodities
- Relatively low price points
- Need forward contracts
- Food safety protocol
- Liability insurance requirements

RESOURCES: *www.wsffn.org; www.wafarmtoschool.org;*

Joan Qazi, jqazi@wsffn.org, 509-664-6691

Acacia Larson, alarson@agri.wa.gov, 206-256-6151

Newsletter

Dining Service

Othello School District

"Fresh Food in School Summit"

February 21

I attended an event put on by Washington Sustainable Food & Farming Network and it was titled " Fresh Food in School Summit". This was a very informative event on our local farmers and what they can offer to us. The picture above is the author of "Sylvia's Spinach" children's book. I had read about this book before hand and had the opportunity to meet her and she signed the 4 books I purchase for are school library's. Katherine daughter's class at school planted a garden and Sylvia received spinach seeds and she was not happy about that! So you will have to check the

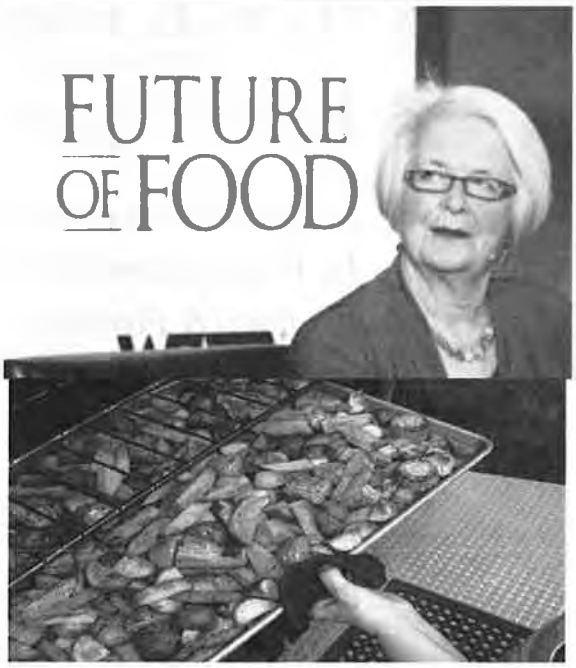
Katherine & Janette

Key Beast Practices Panel with Food Service Directors and Farmers

I was invited to sit on a Foodservice director's panel and bring a new farm to introduce to schools. I choose to have Columbia Valley farms who we buy our picked Asparagus from and plan to get fresh from them this April. The owners Kevin Filbrun & Bryan lynch sent Sandy Lehrman their public relations person to set with me on the panel. Sandy also let us know that they due field trips for school. We also herald from 2 other school how they are working well with other farmer in the area.

Dayle Hayes MS, RD : School Meal's that Rock!

Dayle was another speaker at the summit that we received lots of information from to bring back to our schools.



Schools are doing truly incredible things to serve local, fresh – and yes, organic – foods that kids love to eat. To see super salad bars, hyper-local apples (grown five miles from school!), and a lunch with Sautéed Cabbage that students devoured, please visit **School Meals That Rock on Facebook**. This gorgeous tray from the award-winning **Portland (OR) Public Schools** is just a tiny taste of the delicious school feast that you can see there. **Everything on this tray in OREGON GROWN – and the pear is ORGANIC!!** Please take a tour **School Meals That Rock** and see the amazing food that is loving prepared and served by America's School Nutrition HEROES!!

Farm to school Field Trip Opportunities

Cloudview Farm offer Fall and Spring Field Trips for preschool– 3rd grade students. For more information just e-mail Janette.

Our kitchen staff went to this farm and toured it and they made us lunch form their farm grown food.

Cloudview EcoFarms grow nutrient-dense, certified organic vegetables and fruit in Central Washington near Royal City. We strive to farm in an ecologically sound

Chef LJ was back!

Chef LJ came on February 27 & 28 and work in our new kitchen at Wahitis . He work with our head cooks Kevi and Renee on operating the rotating oven. They also worked on our mini loaf recipe's to make them more nutritious and meet OSIP new regulations. It was a very successful day and they really enjoy working with Chef L.J.

Chef L.J is very excited about our Wahitis kitchen being a future baking site for our school bread products. He has a lot of baking skills he can share with us!

He work in the high school kitchen for a couple of hours with the staff. He than want over some of our inventory in the warehouse that we need to use in recipe that work with the new regulation.

He is scheduled to come back March 27 & 28 and the 27 we will be baking again!

Things to come from our bakery and Kitchens

Thank you ,

Janette Root / Dining Service Director

Study Underway to Choose Research-Based, Positive Behavior Frameworks to Link with *Make Your Day*

Wenatchee Superintendent Brian Flones formed a committee of parents, school administrators and teachers to review current research and best practices on school behavior models. The intent is to improve the current Make Your Day school behavior model and to allow schools the flexibility to adopt a new model. "When the school district adopted Make Your Day sixteen years ago there were few options for behavior support models, and the research and best practices on student behavior support was minimal," Flones said. "Over the past ten years there has been a great deal of research on student behavior support and the impact it has on academic success. The Make Your Day program does have components that are research based, but it also has gaps that need to be addressed."

> Schools will have a choice in selecting behavior management tools.

Flones said that since the Make Your Day model was adopted in 1996 it has provided the district with a consistent framework for schools and staff to address student behavior and classroom management. Over the last three years a parent group formed that proposes a different model called Positive Behavioral Interventions and Supports (PBIS), a model that is supported by the U.S. Department of Education.

Flones said that if a student behavior support model is research-based as a best practice, and endorsed by the United States Department of Education, schools should be able to adopt it. He recommended that schools be allowed to modify or adjust components of Make Your Day.

"Concerns about Make Your Day over the years have been in the context of being punitive and negative, and not having enough affirmative and positive, as well as concerns over points, and the need for students to self-reflect every hour," Flones said. "These are topics we need to have a conversation about."

Flones said the committee will work over the next three months, with a recommendation to be made to the school board by June 12, 2012. "I want to provide best practices in the district," said Flones, "and also provide the flexibility if schools want to use a different model."

New Law Defines Teacher/Principal Evaluation

A new teacher/principal evaluation state law (ESSB 5895) mandates a number of changes in how teachers and principals will be evaluated. Student growth data will be a substantial factor for at least three of the evaluation criteria, and the law requires that school districts adopt one of three instructional frameworks.

Jodi Smith Payne, Assistant Superintendent of Learning and Teaching in Wenatchee School says, "In late January of 2011 we discovered that our evaluation tool had to be based on a well-researched instructional framework. It didn't take us long to select Dr. Robert Marzano's Instructional Framework."

> "We were able to shift our thinking from an evaluation model that finds a teacher satisfactory or not to an evaluation model that requires growth of every teacher on a specific scale."

During the last three years more than seventy Wenatchee educators had already attended a series of workshops sponsored by North Central Education Service District (NCESD) which featured Robert Marzano, PhD. Marzano is a leading researcher in education, a speaker, trainer, and author of more than 30 books on instruction, assessment, writing and implementing standards, cognition, effective leadership, and school intervention.

"We felt confident in his work and the instructional framework he developed based on his research," says Smith Payne.

Wenatchee asked Marzano and his team to work with them to align their instructional framework to the new evaluation criteria. The Marzano framework is now embedded in the evaluation tool.

Marzano's researched-based philosophy is that all teachers can continually learn and grow into better and better teachers.

"We were able to shift our thinking from an evaluation model that finds a teacher satisfactory or not to an evaluation model that requires growth of every teacher on a specific scale," says Smith Payne.

The Marzano framework also gives educators a common language to talk about effective instruction, and experts say that talking in common language increases teacher effectiveness, which increases student achievement.

Jodi Smith Payne

"The Marzano work is based on over thirty years of research into classroom strategies that have a known effect on student achievement," says Smith Payne.

And student growth is at the core of the new evaluation system.

Federal Grant Helps Connect Farmers, Produce and Kids

Kent Getzin, Director of Food and Nutrition Services, has been working with farmers to bring locally grown produce into schools for several years now. A recent two-year grant from the U.S. Department of Agriculture is helping the effort. **Joan Qazi** is the grant coordinator for Central Washington, and her mission is to encourage fresh, locally grown food in schools and to educate kids on nutrition.

ASB student leader Christie Adams serves spinach at Washington Elementary as Kent Getzin looks on. Getzin received an award from the Washington Sustainable Food and Farming Network in Olympia in March for his leadership in the area of farm to school and providing fresh food in schools.

The *Harvest of the Month* program is part of the effort. Qazi recruits high school ASB and FFA student leaders to introduce a different fruit or vegetable each month into elementary school lunches.

ASB officers **Christie Adams** and **Addison Goveia** were at Washington School in March offering spinach, which was something of a hard sell.

"We are giving little kids spinach," Adams explains, "to help talk about good healthy lifestyles and what they should be eating."

The spinach came from farmer **Chris Bailey** of Sunshine Farms in Chelan. He harvested the spinach the day before it was served at Washington and Mission View Elementary schools.

"The schools are interested in putting money into the local economy," says Qazi, "and getting the freshest possible produce for the kid's lunches and breakfast. The farmers really want to connect and nourish the kids in the community."

Along with helping bring food into the schools, Qazi brings nutrition information, like the new federal nutritional guidelines. The USDA recommendations have shifted from the food pyramid to a new graphic of a plate showing more than half the plate full of fruits and vegetable.

"We're trying to create the lunchroom as a classroom," says Qazi, "so we can help kids understand the importance of healthy foods."

3 free views left!

Growing to school: Students taste success with local food program

51

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By Joan Qazi, Washington Sustainable Food and Farming Network

Thursday, January 19, 2012

Joan Qazi photo

Taste Washington Day at Wenatchee High School last fall allowed local growers to tout the quality and value of their produce to teen consumers.

Fresh Food in Schools is a three-year project which aims to increase the amount of public school food budget dollars spent on Washington grown produce, and to build meaningful, mutually beneficial relationships between school food programs and local farmers.

Twenty school districts across the state have been selected to participate in this project in order to create or enhance a farm-to-school program. Within North Central Washington, the school districts selected are Oroville, Tonasket and Wenatchee.

An example of community success related to this project is Taste Washington Day, which took place last year on Sept. 28.

On Taste Washington Day, school meals feature locally grown fruits, grains and vegetables, and provide activities for students to learn about the farms that feed them. The lunch menu in Wenatchee schools included tomato, black bean and cabbage salsa along with carrot "coins" and cucumber "wheels" — all fresh produce grown by Cloudview Ecofarms near Vantage.

Students sampled freshly picked fruits from Smithson Ranch in Peshastin at a mini-farmers market set up at Foothills Middle School. Wenatchee High School FFA students and ASB leadership students visited elementary schools to tell kids that a pluot is a plum-apricot and show them what a carrot straight from the ground looks like (complete with greens).

ON THE WEB

• The Washington Sustainable Food & Farming Network: **wsffn.org**

The high school students tried to convey the importance of eating nutritious fruits and vegetables as well as the importance of our agricultural heritage.

Wenatchee schools have been sourcing locally grown fruits and vegetables directly from a number of regional farms over the past year. In fact, Jan Hanson the kitchen manager at Wenatchee High School, says "Everyday is Taste Washington Day in Wenatchee schools," because schools here are prioritizing locally grown produce.

In the first three weeks of the current school year, Jan's kitchen bought over 2,000 pounds of produce directly from local farmers rather than relying solely on Food Service of America's products.

The development of farm-to-school programs in the region has mostly grown from the efforts of individual champions within school or farming communities and timely connections with other collaborators. For example, farmer Albert Roberts of Slow Food Okanogan organized a meeting with the Tonasket superintendent, school board members and the food service director who manages school meals for Oroville, Tonasket and Omak districts. This meeting helped spark a series of discussions in the schools, in community meetings and at the Okanogan Farmers Market to find ways to address the particular challenges related to high insurance liability and GAP (good agricultural practices) certification required for farmers by the schools' food management company. These barriers remain at this time, but the schools are very enthusiastic to support local farms while improving student access to fresh, minimally processed foods.

Joan Qazi photo

Wenatchee High School students passed out locally grown fruits and vegetables to elementary school students on Taste Washington Day in late September.

The success of Taste Washington Day and the planned harvest of the month programs that turn cafeterias into classrooms inspire us to find the 'win-win' community solution. When students can put a face on their food and that food tastes good as well, then they are more likely to eat the half a plate of fruits and vegetables that they should to maintain optimal health and combat the recent tripling of childhood obesity.

Fresh Food in Schools is a project of The Washington Sustainable Food and Farming Network and is funded by WSDA through a USDA Specialty Crop Block Grant, the Washington Women's Foundation, the Whatcom Community Foundation's Sustainable Whatcom Farm 2 School Fund and private individual donations.

Joan Qazi is regional coordinator for the Washington Sustainable Food and Farming Network.

Like 21 people like this. Be the first of your friends.

THE WENATCHEE WORLD

Taking a bite out of local produce

By Rick Steigmeyer World staff writer Thursday, September 29, 2011

World photo/Mike Bonnicksen

Foothills Middle School seventh-grader Archie Zaldivar gets a bowl of African Peanut Soup.

World photo/Mike Bonnicksen

Lewis and Clark Elementary School first-grader Ashlee Nunez tries out a pluot.

World photo/Mike Bonnicksen

Lainie Smithson of Smithson Ranch, at right, lets Foothills Middle School students taste some of the many different kinds of fruits and vegetables her company provides to the Wenatchee School District for meals.

WENATCHEE — Such a choice: Vietnamese street food, veggie wraps, Spanish chicken and vegetable paella, chicken fajitas with Walla Walla onions and a trio of sweet peppers, chipotle sweet roasted vegetables, homemade salsa, tree-ripened pluots and whole grain chocolate chip cookies.

No, it's not a menu from some Seattle bistro. It's a few of the things kids were eating at Wenatchee schools Wednesday. And nearly every item featured nutritious, fresh fruit and vegetables and whole grains grown on local farms.

Taste Washington Day was celebrated at dozens of Washington schools Wednesday, including every school in the Wenatchee School District. Several local farmers also visited schools to educate students about fresh food.

"Selling to schools is a small piece of what we do, but it's important to us because the kids have to learn where their food comes from. They are the produce buyers of the future," said Lainie Smithson, who could hardly keep up slicing samples of apples, peaches, pluots and pears for the long line of excited students at the Smithson Ranch fruit stand she set up in the Foothills Middle School cafeteria.

Farm-fresh food is more than a one-day deal at Wenatchee schools, said Kent Getzin, the school district's food service director. The district spent 25 percent of its produce budget on fruit and vegetables from local farms last year and he hopes to spend at least that this year, he said.

"We want to feature whole foods and locally grown foods throughout the year," said Getzin, who has also designed posters to show students the location of the farms where the food comes from. "We want to raise awareness for kids and hopefully steer better lifelong eating habits."

"This was quite an effort, but it was worth it. We ran out of food," said Thera Judd, kitchen manager at Foothills Middle School, where lunches for all Wenatchee elementary schools are also prepared.

There are many benefits gained by feeding kids fresh, locally produced foods, said Joan Qazi, Fresh Food in Schools Project coordinator for Central Washington.

"Schools want to do it because they want to support the local farming community," she said. Farm fresh local food also means better nutrition for kids, she said, and it's a way to teach kids where food comes from. A carrot with the greens still attached begs the question. Chicken nuggets not so much.

"We can't source all food this way, but we want to get as much as possible and practical," she said. Getting schools to buy local apples is no problem. Kolrabi and squash are more of a challenge, she said.

As practical as that all sounds, these are tough times for such programs that are still considered idealistic. The state's Farm to School Program lost its funding in recent budget cuts. School kitchens also have tight budgets tied to funding that limits what they can buy. Many farmers like the idea of selling their products in quantity to schools — especially smaller apples and pears that don't sell well elsewhere — but there's a lot of extra work involved in packing and delivering the products to several schools.

Qazi's job is to match up the right local farmers with schools eager to participate. The part-time job for the Washington Sustainable Food and Farming Network is funded by a three-year U.S. Department of Agriculture block grant, the Washington Women's

Foundation, the Whatcom Community Foundation's Sustainable Farm 2 School Fund and private donations.

Five Central Washington school districts, including Wenatchee, Oroville and Tonasket, are involved. Statewide, 20 school districts participate in the program. Had it not lost funding, the state's Farm to School Program would have involved all Washington schools.

Wenatchee, however, has found ways to impact other school districts on its own, Qazi said. Getzin has offered demonstrations in other districts on how to use whole foods purchased from local farmers in their lunch menus. Jan Hanson, kitchen manager at Wenatchee High School, has invited other school cooks to visit and see how she incorporates fresh produce and local wheat, dried beans and lentils into her school lunches.

"Wenatchee is way ahead of the curve," Qazi said. The district purchased $13,000 worth of apples, pears, pluots, potatoes, tomatoes, squash, grains, dried beans and other foods from local farmers last year. Wenatchee High School bought more than 2,000 pounds of local produce in the first three weeks of this school term, she said. Local farms participating in the project include Cloudview Ecofarms, Vantage; Yaksum Canyon Truck Farm, McManus Orchards and CR Produce, all of Cashmere; Smithson Ranch of Blewett Pass and T&T Farms of Quincy.

Rick Steigmeyer: 664-7151 steigmeyer@wenatcheeworld.com

Skagit County

Consolidated Dike District No. 22

P.O. Box 535, Conway, WA 98238

District Commissioners
Stan Nelson, Chairman
John Wolden, Commissioner
Robert Hughes, Commissioner
David Hughes, Commissioner
Nolan Lee, Commissioner

A ***Special Election*** is scheduled for ***June 14, 2011*** regarding the district's proposal to reorganize as the ***"Skagit County Consolidated Diking Improvement District No. 22."***

Several landowners within the district have asked the district to reorganize the current dike and drainage service to include irrigation services. Most other Skagit Delta farmland areas currently receive the benefits of an irrigation improvement district authority.

Why reorganize as an "improvement" district for irrigation services?

Agricultural production is the predominate land use within the district. Nearly 6300 acres on Fir Island are farmed annually, and of that, about 2,500 acres are seasonally irrigated. Irrigated crops depend on ready access to a reliable supply of water. Presently, growers withdraw water for irrigation from wells, and from the existing drainage ditches when ditch water levels are adequate. There is also some limited seasonal supplementation in the drainage ditches from other sources. Reorganizing the district to include irrigation improvement authority will help add to the supply and mobility of water during the irrigation season. An "irrigation improvement district" is uniquely empowered to control and convey waters developed by the drainage system for irrigation purposes, and can make system improvements for the transfer of water to key areas for crop irrigation purposes.

How will the district recover costs for delivery of irrigation services?

There will be no additional dike and drainage tax assessments to pay for the new irrigation services within the district. New services for irrigation water use and any system improvements for irrigation will be borne totally by the irrigators directly benefiting from the irrigation services. The district will establish and adopt irrigation water ***"User Fees"*** as a component of the program to recover all irrigation service costs. Under the district irrigation services program an irrigator may submit a water use application to the district for review and approval to use drainage system water resources. The program will include seasonal management and oversight of district system water use.

The Commissioners are available to answer any questions you may have about the district's proposal to reorganize as an "improvement" district for irrigation services. Please give us or any of the other commissioners a call.

David Hughes, Commissioner (360) 770-2166

Stan Nelson, Chairman (360) 202-7310

Skagit County Consolidated Dike District No. 22
P.O. Box 535
Conway, WA 98238

SKAGIT COUNTY
CONSOLIDATED DIKE DISTRICT NO. 22

SPECIAL ELECTION

TUESDAY, JUNE 14, 2011

PLEASE REMEMBER TO VOTE

Skagit County
Consolidated Diking Improvement District No. 22

Irrigation Water Use Management Manual

Prepared By
Western Washington Agricultural Association
August 2011

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Introduction

The special purpose dike, drainage and irrigation districts that serve the Skagit Delta agricultural areas provide both drainage function and irrigation water via complex networks of drainage ditches and appurtenant structures. These districts include the Drainage and Irrigation Improvement Districts located in the Skagit River and Samish River delta areas. They include: DID #5, DID #14, DID #15, DID #16, DID#17, DID #18, DID #19, CDD #22, DID #22, and DID# 25. Also included is DDID #12, a consolidated dike, drainage and irrigation district.

The purpose of this manual is to provide guidance and assistance to the districts in managing, conveying, disposing and contracting for the use of the waters developed by the drainage system for the benefit of the district and the landowners served by the district.

Agricultural land was developed in the Skagit and Samish river delta areas by construction of dikes in the mid- to late 1800s. Water was constrained by the dikes, and lands were cleared, drained, leached, and farmed. Individual farmers found it difficult to prevent and control flooding and associated salinization, and farmers thus began to work cooperatively to address the problem in the 1880s. In the 1890s, it became apparent that a local entity was needed to facilitate tax collection from property owners for construction and maintenance of ditches and dikes. In 1895, the State Legislature passed laws which legally sanctioned the organization and funding via taxation of diking and drainage districts. Diking and drainage districts are authorized under Title 85 RCW. New technology allowed farmers to construct an intricate system of drainage ditches and tide gates to maximize the potential for agricultural production in the Skagit Basin. These drainage systems required adequate outlets, and the drainage districts worked to provide and maintain these ditches and outlets.

This drainage system is necessary since a significant portion of the area is sub-tidal or subject to tidal influence, and the area receives a lot of rain and the water table is high. In many areas, the drainage system is shallow and drains only the top few feet of land, and does not function as deep drainage and therefore does not affect the underlying aquifer beyond a few feet. The drainage system works to move water off the land in the late fall, winter, spring and early summer months.

Over these years, irrigation has become increasingly common in the region due to changing crop patterns and associated water needs. Most of the districts within the delta areas are organized into drainage and irrigation improvement districts under Title 85 RCW. The districts may manage use and distribution of water developed by the drainage system for irrigation and other purposes throughout the district as deemed appropriate by the district commissioners. Irrigation timing varies by crop, but generally occurs in the late spring, summer months and early fall. During this period drainage water is frequently retained in the system of drainage ditches specifically to provide drainage system water for irrigation. Irrigators also utilize the drainage ditch system for water conveyance for their water right to an irrigation location. Check dams are routinely utilized in drainage ditches to retain available drainage system water for surface irrigation diversion and/or to maintain available groundwater levels for subsurface irrigation. Retention of drainage water in the system is also practiced to prevent saltwater intrusion in lower reaches of the delta farmland areas.

A.
Water Use Authorizations

1. Purpose

The purpose of this manual is to assist Skagit County Consolidated Diking Improvement District No. 22 (District) with procedure and materials for the administration of an irrigation water management program, including instructions for applications submittal, review and issuance of authorizations for irrigation water use.

2. Authority

The District has "developed" the waters available for irrigation that were completed many years ago. By state statute, the District has the authority to control any waters developed by the drainage system of the district, including the right to dispose of and contract for the use of the waters for irrigation or other purposes. The statute provides the following authority:

> *RCW 85.08.630 - "The use of any waters developed by the drainage system of any drainage improvement district shall be subject to the control of the drainage improvement district and such district shall have the right to dispose of and contract for the use of such waters for irrigation or other uses, as hereinafter provided: PROVIDED, That the waters developed by any existing drainage system, and the waters developed by any drainage system hereafter constructed which shall remain undisposed of for three years after the completion of the improvement and the levy of the assessment to pay the cost thereof, shall not be subject to disposal by such district where such waters shall have been appropriated by any person at a point below the outlet of the drainage system of such district. The term "waters developed" as used in this chapter shall not be held to include surface waste waters from irrigation."*

As the statute further provides, the District Commissioners may enter into any contract for the use, sale or disposal of such waters that in their judgment shall be for the best interests of the district; but no such sale, contract or disposition shall be made except by the unanimous vote of the board. The District cannot guarantee nor warrant the amount or flow of, nor the title to, such waters; and no use, sale or disposition of such waters shall be lawful that will interfere with the efficiency of said drainage system. Anyone that wants to acquire and use the waters developed by any drainage system must apply to the district. The application must identify the proposed use for the water, specifying the time, place and manner of use. Notice of the applications is published in the newspaper to notify people when and where the district commissioners will hear the application. The following sections of the statute provide direction and guidance for the application, review and approval process:

RCW 85.08.640 - The board of supervisors may enter into any contract for the use, sale or disposal of such waters that in their judgment shall be for the best interests of the district; but no such sale, contract or disposition shall be made except by the unanimous vote of the board. The district shall not guarantee nor warrant the amount or flow of, nor the title to, such waters; and no use, sale or disposition of such waters shall be lawful that will interfere with the efficiency of said drainage system.

RCW 85.08.650 - Any person or corporation desiring to acquire and use the waters developed by any drainage system, may make application therefor in writing to the board of supervisors of the district, accompanying such application with a bond to be approved by the board, conditioned that the applicant will pay the costs of the investigation and hearing in case no disposal of said waters be made thereat. Successive applications and proceedings may be made and had as long as there is any water remaining undisposed of in said drainage system.

RCW 85.08.660 - When any such application shall be filed, the board of supervisors of the district shall cause to be published in the county official paper, once a week for three successive weeks prior to the date of the hearing hereinafter referred to, a notice fixing the time and place within the district when the board will hear and consider such applications. All applications shall be in writing and contain a statement of the proposed use to be made of the water, specifying the time, place and manner of such proposed use; and in entering into any such contract, the board of supervisors of the district may require such security as they may deem reasonable for the proper construction and installation of works of diversion and for the use of said water by the party proposing to use the same.

3. Application Submittal Procedure

A landowner or leaseholder may apply to the District to appropriate and divert water seasonally for irrigation purposes or other uses from drainage ditches and watercourses that are owned, operated and maintained by the district. The applications are required to be in writing and must, at a minimum, include a description of the proposed use to be made of the water, specifying the time, place and manner of such proposed use.

The applicant is required to submit a completed ***Application Form*** provided by the district. The completed application must be submitted by the due date established by the district for seasonal water use applications. A copy of the suggested standard ***Application Form*** is provided in Appendix II.

A non-refundable filing fee must accompany the application. The application fee structure is illustrated in Section 12 below.

Submission of applications will be made to the mailing address of the district, to the attention of the Secretary for the district. Upon receipt of the application by the district an application number will be assigned to the application. The district will send an ***Acknowledgement of Receipt*** letter to the applicant. A sample ***Acknowledgement of Receipt*** letter is provided in Appendix II.

Applications may be submitted for the current year water use, and will be accepted by the district anytime after January 1st of that year.

The suggested deadline date for application submittals is illustrated in Section 15 below.

4. Processing of Applications

A. Processing Criteria

Applications received by the district shall be time and date stamped to assign an order of seniority, if needed, for processing and approval of the requests.

When multiple applications for water use authorizations are received, the district may elect to batch the applications and process them in a single consolidated procedure. A joint public notice may be used to advertise the district's review of the applications, provide notice of hearing, and solicit written public comments.

B. Late Application Submittals

Applications received after the submittal deadline may, at the discretion of the district, be considered or returned. If such applications are accepted by the district, an additional late filing fee as illustrated in Section 12, must be submitted by the applicant. These applications will require separate public notice and hearing to determine whether drainage system water remains available for use following the processing of the prior applications received.

C. Water Use Authorizations Revisions

During the authorized period of seasonal water use, situational conditions may require the applicant to change a point of diversion/withdrawal, a place of use, or the amount authorized by the district. The applicant should immediately submit a revised application to the district Secretary. The district, by letter, may authorize the change if drainage system water is available, the use will not interfere with the efficiency of the drainage system, and other water users authorized by the district are not impaired by the change.

5. Public Notice Publication

The District will publish ***Legal Notice*** in the official county newspaper of the pending applications for drainage system under consideration by the district. (Note: The current official county newspaper for publication of legal notices is the Skagit Valley Herald.)

The legal notice will identify the applicants and the requested actions to authorize district drainage water for irrigation or other use. The legal notice will also include:

- Notice of hearing date, time and location.
- Describe the purpose of hearing to consider applications and receive public comment.
- Specify a timeframe and deadline for submittal of any ***Public Comments*** in writing.

The public notice will be published once a week for three consecutive weeks prior to district's hearing date in the official county newspaper.

A standard legal notice format is provided in Appendix II.

6. Conduct a Public Hearing

The District is required to hold a ***Public Hearing*** to hear and consider any applications submitted for diversion and use of drainage system waters. The district's Board of Commissioners may conduct the hearing as a component of their regularly scheduled Board Meeting, or they elect to hold a special hearing for the purpose of considering the pending applications. The hearing may consider a single application or a consolidated set of applications (depending on the scope of the published legal notice appearing in the newspaper).

The purpose of the public hearing is:

- To consider individual, or a consolidated set water use applications received; and,
- Provide opportunity for public comment on the applications by applicants or the general public.

A record of the hearing and public comments received during the hearing should be documented by the district.

7. Application Review and Decisions

Once all applicant and public comment has concluded and the hearing is closed, and the written public comment period is completed, the Board of Commissioners may issue decisions on the pending applications. The suggested date by which decisions on applications should be completed is illustrated in Section 15 below.

A. Review Criteria

"Waters Developed" - Waters developed by the drainage system of the district are available and may be authorized by the district for landowner or leaseholder irrigation use, or for other purposes. The district must determine if there is sufficient water available to authorize for irrigation or other use, and that the use will not interfere with the efficient operation of the drainage system.

- ***"Waters Developed"*** - The district may authorize for irrigation use or other purposes those portions of the drainage system waters that are determined by the district to be "waters developed" by the drainage system. Such drainage system waters may be contracted, sold or authorized by the district for diversion, use or disposal as long as there is any water remaining undisposed of in the drainage system.

- ***"Determination of Availability"*** - The term "waters developed" as used herein does not include surface wastewaters from irrigation, or where such waters shall have been appropriated by any person at a point below the outlet of the drainage system of the district. The district should verify whether anyone has obtained a water right to the waters below the outlet of the drainage system. Most districts' systems drain directly to marine waters and the district will likely not find any downstream appropriations below the marine outlet.

- ***"Best Interests of the District"*** - No use, sale or disposition of drainage system waters should be authorized that will interfere with the efficiency of the district drainage system.

B. Standard Considerations

- The district may place special conditions or requirements on the authorization for use of the water by the applicant, or for the construction, maintenance, operation and removal of any diversion works installed by the applicant.

- The district may require a security, deposit or bond for the use of the water by the applicant, and for the placement of any diversion works installed by the applicant.

- The district will not guarantee nor warrant the amount or flow of, nor the title to, any authorization by the district for the use of drainage system waters.

C. Record of Decision

Unanimous Approval Required - The district decision to approve an application for use of drainage system water for irrigation or other purposes requires the unanimous approval of the Board of Commissioners. If the Board of Commissioners do not provide a unanimous vote for approval, the application must be deemed denied.

The district will prepare sufficient documentation necessary to support each application decision. The ***Record of Decision*** should include a copy of the application and any related materials, documentation of public notice and hearing, summary of comments received on the application, and application review and district action on the application.

D. Letter of Authorization

Applicants receiving authorization from the district to use seasonal drainage system water for irrigation or other purposes will be provided a ***Letter of Authorization*** from the district, signed by the District Secretary. The Letter of Authorization should specify any terms or

conditions assigned by the district for diversion and use of the water by the permittee, or any additional securities required for diversion and use of the drainage system water. The letter should include a requirement for the permittee to submit a season-end report of water use activities to the district. The letter should also require agreement by the permittee to allow district representatives the right of entry for inspection and monitoring of the authorized diversion and water use activities.

The Letter of Authorization should provide the disclaimer that the district does not guarantee nor warrant the amount or flow of, nor ownership or the title to, the drainage system waters.

The Letter of Authorization should include a place for the permittee to sign and date the document, indicating acceptance of the approval, including any specified securities, terms, or special conditions. Two copies of the letter should be sent to the permittee. The authorization would become effective upon signature by the permittee. One signed and dated copy should be returned by the permittee to the District Secretary.

A copy of the suggested standard ***Authorization Letter*** is provided in Appendix II.

E. Denial of Application Letter

Applicants not receiving approval of their request to divert and use drainage system water for irrigation or other purposes should be provided a ***Denial of Application Letter*** by the district. The letter should provide notice to the applicant that they may request a reconsideration of their application by the district, and include direction on how to submit the request.

A copy of the suggested standard ***Denial of Application Letter*** is provided in Appendix II.

8. Applicant Requests for Reconsideration

Applicants denied a request to use drainage system water may submit a ***Request for Reconsideration*** to the District. The request should be in writing, addressed to the District Secretary, and must provide new or additional information to assist in a re-review and reevaluation of your application.

The District will hear the ***Request for Reconsideration*** at the next regularly scheduled Board of Commissioners meeting. The applicant may attend the meeting for this discussion. The District may rule on the Request for Reconsideration at the meeting, and should provide the final decision to the applicant in writing.

Copies of the sample ***Letter of Authorization*** or ***Denial of Application Letter,*** attached in Appendix II, may be modified to provide the applicant the District's decision letter on the Request for Reconsideration.

9. Emergency Authorizations

- ***Definition of Emergency***- An emergency shall be deemed to exist when all Commissioners of a District concur with the landowner or leaseholder that: 1) an unanticipated immediate threat exists; and 2) there is a concurrent need for diversion and use of drainage system water to prevent, protect or minimize damage, harm or loss of a crop, livestock or other agricultural activity or property from the threat.

Emergency Authorization

A request by a landowner or leasehold for an ***Emergency Authorization*** may be made to the District, either verbally or in writing, for diversion and use of drainage system water to protect, prevent or minimize damage or harm to crops, livestock or for other purposes considered an immediate threat to an agricultural activity or property. The requestor should describe the circumstance and emergency nature of the situation to the District, and advise of the when, where, how much, and for how long the diversion and water use will be required.

An ***Emergency Authorization*** by the District may be immediately provided verbally (with a follow up in writing) to the requestor. When it is determined by the District that:

1) An emergency exists;
2) Drainage system water is available;
3) The use will not interfere with the efficiency of the drainage system; and,
4) Other drainage system water users authorized by the district are not impaired by the change;

Such emergency use of drainage system water should be limited to the minimum amount, time and duration needed to abate the threat and emergency situation.

The application fee for processing an emergency authorization request is illustrated in Section 12 below.

Emergency Authorization Follow Up

The emergency water user should provide a brief written report to the district after the emergency diversion and water use is concluded.

The suggested standard ***Drainage District Seasonal Water Use Applicant Completion Report*** form, provided in Appendix II, may be used for this for the Emergency Authorization Follow Up report.

10. Non-Authorized Water Withdrawals

Any irrigation or other use of waters developed by the District's drainage system water by landowners or leaseholders within the district is not permitted without first obtaining prior authorization for such use from the District.

- ***Exception*** – Diversion and use of water from a drainage system ditch that is not developed by the drainage system, i.e. headwaters stream, well, or other contributory source, and such use is authorized by another entity, is not subject to the provisions of the district's water management and use authorization program.

Non-Authorized Water Use Notice Letter

The District will notify the responsible party of a non-authorized use requesting the cessation of the activity, and advising of the procedure to obtain authorization from the District for the use. Notification will consist of sending a ***Non-Authorized Water Use Notice Letter*** by Certified Mail to the landowner and posting of the notice letter on the pump or diversion equipment located at the site. The responsible party should cease diversion and use of water until authorization for such diversion and use is granted by the District.

A sample of the suggested ***Non-Authorized Water Use Notice Letter*** is provided in Appendix II.

After-The-Fact Authorization

The party notified of the non-authorized drainage system water diversion and use may desire to obtain after-the-fact district authorization to continue such diversion and use. The Non-Authorized Water Use Notification Letter should provide instructions on how the notified party may submit an a application to the District for an ***After-The-Fact Authorization*** for such water diversion and use.

The District will hear the application for the ***After-The-Fact Authorization*** at the next regularly scheduled Board of Commissioners meeting. The applicant may attend the meeting for this discussion. The District may rule on the application at the meeting, and should provide the final decision to the applicant in writing. The district may deny the application, or may authorize the diversion and use if drainage system water is available, the use will not interfere with the efficiency of the drainage system, and other seasonal water users currently authorized by the district are not impaired.

The suggested standard ***Application Form***, provided in Appendix II, may be used to submit the request for an after-the fact authorization from the District. A non-refundable filing fee must accompany the application. The suggested fee structure is illustrated in Section 12 below.

11. Field Checks and Use Monitoring

The District should routinely field check and monitor the drainage system and inspect the authorized diversions and use of water.

- Authorized users will be contacted and requested to take corrective action if the observed diversion and use is not in conformance with the terms and conditions of the authorization letter.

- Unauthorized water users will be notified and directed to cease the diversion or to apply for an after-the-fact authorization for the use as provided for in Section 10 above.

12. Application Fee Schedule

Application Submittal Processing	$ 350.00
Late Submittal Charge (additional)	$ 100.00
Emergency Authorization	$ 350.00
After-the-Fact Authorization Application (and processing)	$ 750.00

13. Reporting

At the close of the irrigation season the applicant will submit a ***Drainage District Seasonal Water Use Applicant Completion Report*** summarizing the irrigation or other water use activities conducted by the applicant. The purpose for this information is to assist the district in assessing the use of the water authorized by the district for the year.

A ***Drainage District Seasonal Water Use Applicant Completion Report*** form is provided in Appendix II.

The district should, after the conclusion of the irrigation season, prepare an ***Annual Water Use Report*** to provide a summary of the irrigation and other drainage system water use activity authorized by the district for the year. Information provided by applicant water user reports, and the district notes regarding field checks, use monitoring and drainage system operations will provide the basis for the report. The principal purpose for this report is to track water usage, provide a historical record of use, and for evaluation of the water use on efficiency and impact to the drainage system operations.

The schedule for submittal of the applicant reports and completion of the district annual report is illustrated in Section 16 below.

14. Record Keeping

The district will maintain a filing system and record retention system for the Drainage Water Management and Use Authorizations Program. All applications, letters, correspondence, public notice, public meeting materials, authorization documents, field inspection reports, compliance documents should be held physically in a filing system. Retention of permitting documents and related materials should be held permanently. An electronic file system would benefit accessibility of records for the district and assist in program evaluation and report preparation.

15. Application Schedule/Timeline/Key Dates

April 30th	Applications Due
May	Publish Public Notice - 1st
May	Publish Public Notice - 2nd
May 31st (no later than)	Publish Public Notice – 3rd (Final)
June 15th	Complete Preliminary Review
June 15th	Written Comments Due
First Week of June	Conduct Public Hearing
June 30th	Issue Authorizations/Denials Letters
Open Timeframe (30 days from Applicant Request)	Applicant Request For Reconsideration Decision Letter On Reconsideration Request
July 1st through September 30th	IRRIGATION SEASON
October 31st	Water User End-of-Season Report Due
December 31st	District Summary Report Completed

B.
Irrigation Control Structures

1. Purpose

The purpose of this guidance is to prescribe Best Management Practices and requirements for the placement, construction and operation of irrigation control structures including check dams and irrigation intakes/pumps within the district.

2. Authority

By state statute the district is authorized to develop own, operate, and maintain irrigation conveyance, distribution and control facilities. Significantly, the statute authorizes the districts to use the "drainage ditches and equipment in the district for irrigation purposes at proper times" and to "adapt such ditches to irrigation purposes by making the necessary improvements." The district also has the authority to purchase and install machinery, pumps and other equipment for the carrying on of such irrigation within the district boundaries. The following sections of the statute prescribe these authorities:

RCW 85.06.640 - Whenever in the judgment of the commissioners of any drainage district general benefits to the entire district will accrue therefrom, or the general plan for improvement as adopted by such district will be more fully or properly carried out thereby, the board of commissioners of such district is hereby given and granted authority and power to do the following things: (1) Straighten, widen, deepen, improve, or alter the course of or discontinue the use and maintenance of, or abandon any existing drains or ditches in said district, and when abandoned or discontinued, the right-of-way may be held or disposed of by said district in the discretion of the commissioners; (2) Dig or construct any additional and auxiliary drains or ditches therein; (3) Obtain, improve, or alter any existing reservoirs, spillways or outlets; (4) Lease, acquire, build, or construct additional, new, or better reservoirs, spillways, and outlets; (5) Lease, acquire, erect, build, or construct and operate any pumping plant and acquire equipment necessary therefor; (6) Divert, dam, or carry off the waters of any stream or water endangering or damaging said district and protect against damage or flood from any waters whatsoever; and (7) Implement the provisions of a drainage maintenance plan adopted by the district.

RCW 85.22.050 - The commissioners of the old district shall become the supervisors of the reorganized district and shall have all the rights and powers and be subject to all laws applicable to a diking or drainage improvement district. The supervisors shall also have the power of using such drainage ditches and equipment in the district for irrigation purposes at proper times and may adapt such ditches to such purposes by making the necessary improvements therein. The supervisors shall also have the right to purchase and install machinery, pumps and other equipment for the carrying on of such irrigation within the district. Notwithstanding such dissolution and reorganization, none of the

outstanding bonds, warrants or other indebtedness of the district, shall be affected thereby; and all lands liable to be assessed to pay any of such bonds, warrants or other indebtedness shall remain liable to the same extent as if such reorganization had not been made, and any and all assessments theretofore levied or made against any such lands shall be and remain unimpaired and shall be collected in the same manner as if no such reorganization had been had. The legislative authority of the county in which such reorganized district is situated shall have all the powers possessed at the time of the reorganization by the board of commissioners of such district to levy, assess, and cause to be collected any and all assessments or charges against any of the lands within such district that may be necessary or required to provide funds for the payment of all the bonds, warrants and other indebtedness thereof.

RCW 85.38.180 - A special district may: (1) Engage in flood control activities, and investigate, plan, construct, acquire, repair, maintain, and operate improvements, works, projects, and facilities necessary to prevent inundation or flooding from rivers, streams, tidal waters or other waters. Such facilities include dikes, levees, dams, banks, revetments, channels, canals, drainage ditches, tide gates, flood gates, and other works, appliances, machinery, and equipment. (2) Engage in drainage control, storm water control, and surface water control activities, and investigate, plan, construct, acquire, repair, maintain, and operate improvements, works, projects, and facilities necessary to control and treat storm water, surface water, and flood water. Such facilities include drains, flood gates, drainage ditches, tide gates, ditches, canals, nonsanitary sewers, pumps, and other works, appliances, machinery, and equipment. (3) Engage in lake or river restoration, aquatic plant control, and water quality enhancement activities. (4) Take actions necessary to protect life and property from inundation or flow of flood waters, storm waters, or surface waters. (5) Acquire, purchase, condemn by power of eminent domain pursuant to chapters 8.08 and 8.25 RCW, or lease, in its own name, necessary property, property rights, facilities, and equipment. (6) Sell or exchange surplus property, property rights, facilities, and equipment. (7) Accept funds and property by loan, grant, gift, or otherwise from the United States, the state of Washington, or any other public or private source. (8) Hire staff, employees, or services, or use voluntary labor. (9) Sue and be sued. (10) Cooperate with or join the United States, the state of Washington, or any other public or private entity or person for district purposes. (11) Enter into contracts. (12) Exercise any of the usual powers of a corporation for public purposes.

3. <u>Check Dams</u>

A "check dam" is a common structure associated with the use of ditch infrastructure specifically for irrigation water conveyance in the delta agricultural areas. These check dams provide two principle functions:

a. <u>Sub-surface Irrigation</u> - Check dams, usually a series of permanent (or quasi-permanent) structures in the drainage ditch, can be employed to hold water within the drainage system by retarding its passage. The effect of this action is to sustain a higher ground water level for a longer duration of time in the check dam managed area resulting in direct sub-irrigation benefits for crops in many areas of the delta in

the late spring and early summer growing period. Surface irrigation operations may also draw from these impoundments.

b. Surface Irrigation - Additionally, check dams may be used, generally temporary structures (such as sand bags), to create short-term impoundments or reservoirs to install portable pumps for surface irrigation systems such as sprinklers and big-gun equipment. These irrigation activities are very mobile and move to where the crops are located on a weekly or more frequent basis. Most surface irrigation activities occur during the midsummer to early fall growing period.

4. Impacts

The use of check dams in the ditches for retaining water for surface or subsurface irrigation purposes can impact water quality, fish species and their habitat. Check dams result in a change of the hydrologic pattern by interrupting drainage and retaining ground and surface water. In watercourses where salmon species are present, check dams can create undesirable fish passage barriers during critical salmon migratory phases. Appropriate design standards, operational procedures and maintenance practices can provide for protection of these important aquatic resources. Irrigation intakes and pumps can cause mortality to juvenile fish unless properly screened to prevent injury.

5. Check Dam Design, Operation and Maintenance

Design, operation and maintenance of check dams for irrigation purposes are addressed by the following guidance and best management practices (BMPs).

a. Permanent Check Dams

i. Installation or repair of a check dam structure will comply with the general provisions of the district Drainage Maintenance Plan for project construction, piling, treated wood and lumber, and concrete work.

ii. The permanent check dam water retention mechanisms (boards and baffles) will be adjustable in elevation and removable for check dams placed in all watercourses.

iii. In watercourses where fish may be present (green waters) the top board will be designed with a notch at least three inches in depth by four inches in width. This top board will be installed and placed at such an elevation so as to pass a minimum of two inches of depth through the notch at all times while the check dam is in use.

iv. Upon the end of seasonal check dam usage for irrigation purposes the check dam water retention mechanisms (boards and baffles) are removed.

b. Temporary Check Dams

i. Prior to placement and use of a temporary check dam for irrigation purposes or other uses the operator will obtain authorization from the district as prescribed in this manual.

ii. Installation of a temporary check dam to create a pool for surface irrigation intakes/diversions shall be limited to the period of active irrigation at that location.

iii. The temporary check dam shall be installed using filled and tied sand bags only. No loose fill of any quantity may be used in the watercourse.

iv. Upon completion of the irrigation practice at that location the temporary check dam shall be immediately removed and the watercourse restored to its pre-existing condition.

v. Temporary check dams shall not be allowed in watercourses where there may be a fish presence (green waters).

6. Irrigation Intakes/Pumps Placement and Use

An irrigation intake or pump may be a permanently installed facility or mobile/portable equipment used for seasonal crop irrigation purposes.

a. Prior to placement and use of portable intake/irrigation pumps for irrigation purposes or other uses the operator will obtain authorization from the district as prescribed in this manual.

b. Portable intake/irrigation pumps used in conjunction with surface irrigation practices in waters where there may be fish presence (green waters) will have appropriate fish guards/screens meeting the design criteria approved by the Washington Department of Fish and Wildlife.

7. Monitoring and Reporting

a. The district shall inspect, observe and record the operation of permanent and temporary check dams and intake/irrigation pumps during the irrigation season.

b. On watercourses where there may be a fish presence (green waters) the district shall further enhance watercourse flows through the check dam (beyond the BMPs provided herein) if fish are observed to be impeded in their migration patterns by the check dam operation.

Appendix I

District Resolution for Adoption of the Irrigation Water Management Program

Skagit County
Consolidated Diking Improvement District No. 22

IRRIGATION WATER MANAGEMENT PROGRAM ADOPTING RESOLUTION

The following was resolved by the undersigned Commissioners of Skagit County Consolidated Diking Improvement District No. 22 (District) under the authorities assigned to the district pursuant to Chapter 85.06 RCW, 85.08 RCW, 85.22 RCW and 85.38 RCW.

Whereas it is the interest of the District and landowners served by the District to control and manage the use of any waters developed by the drainage system, including the disposal and contracting for use of such waters for irrigation and other purposes.

And Whereas the District has authority to develop, own, maintain and operate drainage and irrigation systems and facilities, and may adapt drainage ditches and conveyances for irrigation purposes by making necessary improvements, and may purchase and install machinery, pumps and other equipment for such irrigation and drainage needs.

And Whereas There is a need to insure that the District is fully implementing statutory requirements for contracting for the use, sale or disposal of such waters.

And Whereas the District has developed a manual to provide guidance, procedure and materials for the administration of a district drainage irrigation water management program, including instructions for applications submittal, review and issuance of authorizations for water use.

And Whereas the manual provides an application fee schedule to recover costs associated with the irrigation water management services to be provided by the District.

Therefore, be it resolved by the Board of Commissioners of Consolidated Diking Improvement District No. 22 hereby adopts the ***Irrigation Water Use Management Manual***, a copy of which is attached hereto, and by this reference incorporated herein.

Dated this 10th day of August, 2011, at the regular meeting of Skagit County Consolidated Diking District No. 22

Skagit County Consolidated Diking Improvement District No. 22:

By: Robert A Hall
Commissioner

By: Stanley E. Nelson
Commissioner

By: _____
Commissioner

By: _____
Commissioner

By: _____
Commissioner

Appendix II

Standard Forms
For
Applications, Public Notice and Letters

Application for
Seasonal Use of District Water
Skagit County Consolidated Diking Improvement District No. 22

Application No._____(to be assigned by District)

(A non-refundable fee of $350.00 payable to the district must accompany this application.)

Applicant/Business Name: _____
Address: _____
City: _____**State:** _____ **Zip:** _____
Contact: _____**Title:** _____
Phone: _____**Email Address:** _____

1. <u>Water Use</u>: (note purpose as irrigation or describe other intended use)
_____
_____
Rate (GPM): _____**Acre-Feet** (total expected use): _____
Period of Use (begin and end dates of use): _____
Anticipated total number of irrigation days: _____

2. <u>Point of Diversion/Withdrawal</u>
Name of watercourse(s): _____
Number of proposed diversion points and locations (GPS Coordinates)**:** _____
_____
_____

3. <u>Place of Use</u>
Location legal description (1/4-1/4-Section-Twp-Range): _____
_____
Total acres to be irrigated: _____

4. <u>Water System Description</u> (include pump, pipes and type of irrigation description, and whether a check dam will be temporarily installed for the diversion): _____
_____
_____
_____

5. <u>Other Use</u> (describe any other uses for the diverted water): _____
_____
_____

I certify that the information provided in this application is true and accurate to the best of my knowledge.

_____ _____
Name (applicant or authorized agent) Date

Skagit County
Consolidated Diking Improvement District No. 22

Acknowledgement of Application Receipt
(Sample Letter)

Date

Name of Applicant
Address

Dear _____,

The District received your application, on _____*time and date*_____, requesting seasonal use of water from the District's drainage system. We have assigned your application this reference number: _____.

An evaluation of the application, public notice, and a public hearing will be completed by the district prior to a final decision on the application. An authorization for use must be issued by the district before water may be diverted from the system and used for the requested purposes.

In order to complete our review process, we will need you to provide the following information:

- _____
- _____
- _____
- _____

Please contact me if you have any questions regarding your application at __*phone number*__, or _____*email*_____.

Sincerely,

_____
District Secretary

Skagit County
Consolidated Diking Improvement District No. 22

Public Notice of Application For Authorization To Use System Water (Sample Form)

TAKE NOTICE: That _*name of applicant_(if multiple applicants list all names and application numbers)*_____, under Application No. _____ has filed with Drainage District No. _____ for authorization to divert and use drainage system developed water for irrigation or other uses for the __*year*___ general irrigation season beginning May 1st through September 30th.

The source of the proposed diversion is from the district's improved drainage system ditches and place of use will be located within the boundaries of the district. Further information regarding the application is available to the public upon request by contacting the Secretary of the Drainage District.

A Public Hearing will be held by the district on __*day*__, ___*time*___, _____date_____, _____*location*_____ to consider and accept public comment on the application.

Written comments may be submitted to the district at _____*district address*_____, and must be received by the district no later than 4:30 P.M. on April 15, _____.

Dates of Publication:
_____
_____
_____

(Note To Publisher: This legal notice must appear once a week for three successive weeks. The last date of publication can be no later than March 31st. Please indicate the publication dates in the area of the legal notice form.)

Skagit County
Consolidated Diking Improvement District No. 22

Authorization For Use of Drainage System Water
(Sample Letter)

Date

Name of Applicant
Address

REFERENCE: Application No. _____

Dear _____,

The District has approved your application for seasonal use of water for irrigation or other purposes from the District's drainage system. This authorization for the period _____*enter dates*_____, and the use is subject to the following special conditions:

- _____
  _____
- _____
  _____
- _____
  _____

The district does not guarantee nor warrant the amount or flow of, nor the title to any of drainage system waters authorized for use by the permittee pursuant to this letter.

The permittee agrees to allow District representatives right of entry for monitoring and inspection of the authorized water use activities.

The permittee agrees submit by _____*date*_____ a Drainage District Seasonal Water Use Completion Report (form enclosed) summarizing the irrigation or other water use activities conducted by the permittee.

Sign and date both copies of this authorization letter and return one copy to the District Secretary. The activities authorized by this letter may be commenced upon signature of the permittee.

Please contact me if you have any questions regarding your application at __*phone number*__, or _____*email*_____.

Sincerely,

_____
District Secretary

ACCEPTS:

_____
Permittee (or authorized Agent) Date

Skagit County
Consolidated Diking Improvement District No. 22

Emergency Authorization
For Use of Drainage System Water
(Sample Letter)

Date

Name of Applicant
Address

Dear _____,

The District has approved your request for Emergency Authorization for diversion and use of drainage system water for irrigation or other purposes from the District's drainage system. This emergency authorization is for the period _____*enter dates*_____, and the use is subject to the following special conditions:

- _____
  _____
- _____
  _____
- _____
  _____

The district does not guarantee nor warrant the amount or flow of, nor the title to any of drainage system waters authorized for use by the permittee pursuant to this letter.

The permittee agrees to allow District representatives right of entry for monitoring and inspection of the authorized emergency water use activities.

The permittee agrees to submit, by _____*date*_____**,** a Drainage District Seasonal Water Use Completion Report (form enclosed) summarizing the emergency water use activities conducted by the permittee.

Please contact me if you have any questions regarding this authorization at __*phone number*__, or _____*email*_____.

Sincerely,

_____
District Secretary

Skagit County
Consolidated Diking Improvement District No. 22

Denial of Application
To Use of Drainage System Water
(Sample Letter)

Date

Name of Applicant
Address

REFERENCE: Application No. _____

Dear _____,

The District regrets to inform you that we were unable to approve your application for seasonal use of water for irrigation or other purposes from the District's drainage system.

You may submit a Request for Reconsideration to the District. The request should be in writing, addressed to the District Secretary, and must provide new or additional information to assist in a reevaluation of your application.

The District will hear your Request for Reconsideration at the next regularly scheduled Board of Commissioners meeting. The meeting is scheduled for _____*date, time and location*_____ _____. You are invited to attend the meeting for this discussion.

Please contact me if you have any questions regarding submittal of a request for reconsideration. I may be reached at __*phone number*__, or _____*email*_____.

Sincerely,

_____
District Secretary

Drainage District Seasonal Water Use
Applicant Completion Report

Skagit County Consolidated Diking Improvement District No. 22
Application No._____

Applicant/Business Name: _____
Address: _____
City: _____**State:** _____ **Zip:** _____
Contact: _____**Title:** _____
Phone: _____**Email Address:** _____

Water Use: (Report actual estimated water use during the season)

Period of Use (begin and end dates of use): _____
Total number of irrigation days: _____
Total acres irrigated: _____
Acre-Feet (total used): _____

Point of Diversion/Withdrawal

Name of watercourse(s): _____
Number of proposed diversion points and locations (GPS Coordinates)**:** _____
_____
_____

Place of Use
Location legal description (1/4-1/4-Section-Twp-Range): _____
_____

Water Irrigation/Diversion Equipment Utilized (include pump, pipes and type of irrigation description, and whether a check dam will be temporarily installed for the diversion):
_____
_____
_____

Other Remarks or Observations
_____
_____

I certify that the information provided in this application is true and accurate to the best of my knowledge.

_____ _____
Name (applicant or authorized agent) Date

Skagit County
Consolidated Diking Improvement District No. 22

Notice of Non-Authorized Drainage System Water Diversion and Use

Date

CERTIFIED MAIL

Name of Applicant
Address

RE: Diversion and use of water from ____*name of ditch*_____

Dear _____,

On _____*date*_____ the District observed the diversion and use of drainage system water for irrigation or other purposes at _____*describe location*_____ from _____ _____*name of ditch*_____.

If you are diverting and using water from the drainage system without prior authorization from the District, I am seeking your voluntary cooperation in this matter. The District requests that you cease the diversion and water use until you have obtained authorization from the district for such use.

You may, using the attached application form, submit an application requesting an After-The-Fact Authorization to the District. A non-refundable fee of $750.00 payable to the district must accompany this application.

The District will hear your request for an After-The-Fact Authorization for drainage system water use at the next regularly scheduled Board of Commissioners meeting. The meeting is scheduled for _____*date, time and location*_____. You are invited to attend the meeting for this discussion.

Please contact me if you have any questions. I may be reached at __*phone number*__, or _____*email*_____.

Sincerely,

_____
District Secretary

Skagit Delta Agricultural
Irrigation Supply & Management Project

As approved by the WSDA & USDA
FY10 Specialty Crop Block Grant Program

The Challenge

The Skagit River is one of the great rivers of the West, and the lower Skagit delta area is often referred to as "The Agricultural Heartland of Western Washington." The rich soils, flat topography, and moderate maritime influenced climate of the Skagit delta provide some of the most optimal farming conditions in the world. While the Skagit delta is legendary worldwide for its agricultural productivity, the American Farmland Trust has identified it as "one of the five most threatened agricultural areas in the nation." Today critical agricultural irrigation water availability, conveyance, and mobility needs exist that are affecting the long term security of production of crops in the Skagit agricultural delta area. Additionally, confusion over state water rights requirements and complexity of regulatory programs are challenging the certainty of access to historically available and utilized irrigation water on the delta.

The Objective

Growers of all crops in the Skagit delta agricultural area will benefit from this project which will improve the protection, management and certainty of delivery, of water for their irrigation needs.

Key Partners

The Skagit Conservation District (SCD), Washington State University Extension (WSU-E) and the Western Washington Agricultural Association (WWAA) are partnering on this project to provide the management, engineering and technical assistance to the districts and landowners.

Skagit Delta Agriculture & Water

Over 80 different commercially significant crops are grown locally. Agriculture defines the Skagit Delta, and it is the No. 1 industry in Skagit County. The farmers of land in the Skagit delta have formed a unique level of cooperation where land is seasonally leased, swapped, exchanged, and bartered for the cultivation of a variety of crops, many of which depend on irrigation. Principal crops including potatoes, broccoli, cauliflower, cucumbers, cabbage, carrots, kohlrabi, vegetable seed, and cut flowers and bulbs depend on irrigation for their successful growth and harvest. There are critical agricultural irrigation water availability, conveyance, mobility and regulatory requirements affecting the production of specialty crops in the Skagit agricultural delta area.

The Project

The farming community has completed a Skagit Basin Comprehensive Irrigation District Management Plan (2006) and a subsequent Skagit Delta Agricultural Water Management Pilot (2008). These documents presented a comprehensive analysis of actual water use by agricultural irrigators, a review and evaluation of current water rights and water allocation authorities, and a thorough evaluation of drainage and irrigation district water management and service delivery operations. The reports evaluated a variety of options and forwarded several recommendations intended to improve agricultural water availability, management and delivery to Skagit delta agricultural users. Through this project the agricultural community and drainage and irrigation districts serving this area are proceeding with implementing the key recommendations of the Skagit CIDMP documents. These activities include providing direct professional and technical assistance to the landowners/irrigators, and the drainage and irrigation districts, to assist them in implementing improved water management and service delivery functions in the Skagit delta area.

The project elements are:

- Regulatory and permit compliance technical assistance to the districts in developing and processing new water right applications, change applications, transfers, etc. needed for irrigation purposes;

- Assistance with developing and implementing required administrative programs for drainage and irrigation districts' water contracting to agricultural irrigation users;

- Design and engineering assistance to the drainage and irrigation districts for improving existing or installing new infrastructure and conveyance improvements; and,

- Technical and design assistance in the development of water conservation measures and water use efficiency projects for landowner/agricultural irrigators.

Agricultural Pioneers

Agricultural land was developed in the Skagit Delta by construction of dikes in the mid 1800s into the early 1900s. These pioneer farmers found they needed to prevent and control tidal flooding and the associated salinization to grow bountiful and diverse crops on the Delta. Local public dike and drainage Districts were created to construct an intricate system of dikes, drainage ditches and tidegates. This drainage system was necessary as a significant portion of the area is sub-tidal or subject to tidal influence, and the area receives a large amount of rain and the water table is high.

Today this complex network of infrastructure is maintained and operated to support over 60,000 acres of agricultural production in the Skagit Delta. The drainage system works to move water off the land in the late fall, winter, and early spring months. Most drainage Districts are now also irrigation improvement Districts. During the summer these same ditches are managed by check dams to hold groundwater water levels up for subsurface irrigation benefit, and for conveying water to irrigated crops where needed for surface irrigation.

WESTERN WASHINGTON AGRICULTURAL ASSOCIATION

Mission Statement

"To represent agriculture by providing services for the entire agricultural community"

- Take a lead role in dealing with internal and external pressures on agriculture.
  - Economic
  - Environmental
  - Regulatory
- Interact with county, state and federal legislators and regulators.
- Seek and obtain new pest and disease controls.
- Interact with and support the agricultural research community.
- Seek out and develop future opportunities and direction for agriculture.
- Continue with our historic role of negotiating processed vegetable prices.

Western Washington Agricultural Association

2017 Continental Place
Suite #6
Mount Vernon, WA 98273

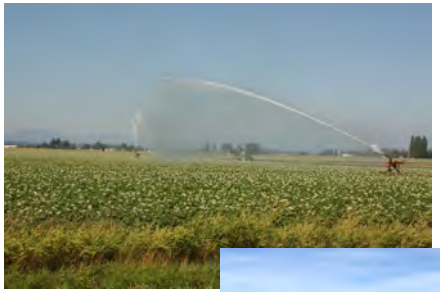
Phone: (360) 424-7327
Fax: (360) 424-9343
Email: WWAA@westag.org

The preparation of this brochure was supported with funding provided by the Washington State Department of Agriculture through the Specialty Crop Block Grant Program

WSDA Specialty Crop Block Grant Program

Skagit Agriculture

Specialty Crops And Delta Irrigation



Skagit Delta Agriculture – Irrigation and Specialty Crops

Water Challenges

The Skagit River is one of the great rivers of the West, and the lower Skagit Delta area is often referred to as **"The Agricultural Heartland of Western Washington."** The rich soils, flat topography, and moderate maritime influenced climate of the Skagit Delta provide some of the most optimal farming conditions in the world.

While the Skagit Delta is legendary worldwide for its agricultural productivity, the American Farmland Trust has identified it as "one of the five most threatened agricultural areas in the nation."

Today, critical agricultural irrigation water availability, conveyance, and mobility limitations exist that are affecting the long term security of production of Specialty Crops in the Skagit agricultural Delta area. Additionally, confusion over State water rights requirements and complexity of regulatory programs are challenging the certainty of access to historically available and utilized irrigation water on the Delta.

Specialty crops define Skagit agriculture and make it the No. 1 industry in Skagit County. Over 80 different commercially significant crops, representing a farm gate value of about $260 million annually, are grown here. Principal crops including potatoes, broccoli, cauliflower, cucumbers, cabbage, carrots, kohlrabi, vegetable seed, and cut flower and bulb depend on irrigation for their successful growth and harvest. There remains a need to improve agricultural irrigation water availability, conveyance, mobility and resolve water rights issues affecting the production of specialty crops in the Skagit agricultural Delta area.

The farmers of land in the Skagit Delta have formed a unique level of cooperation where land is seasonally leased, swapped, exchanged, and bartered for the rotational needs of these crops. To address water needs the farming community has also worked together to complete a ***Skagit Basin Comprehensive Irrigation District Management Plan*** (2006) and a subsequent ***Skagit Delta Agricultural Water Management Pilot*** (2008). These documents presented a comprehensive analysis of actual water use by agricultural irrigators, a review and evaluation of current water rights and water allocation authorities, and a thorough evaluation of drainage and irrigation District water management and service delivery operations. The reports evaluated a variety of options and developed several recommendations intended to improve agricultural water security and availability, and management and delivery to Skagit Delta agricultural water users.

Partnering To Make A Difference

The Skagit Delta agricultural community has moved forward to addressing these challenges with the assistance of Specialty Crop Block Grant funding provided by the Washington Department of Agriculture.

The Skagit Conservation District (SCD), Washington State University Extension (WSU-E) and the Western Washington Agricultural Association (WWAA) are partnering to provide water management, engineering and technical assistance to the Districts.

Partners in providing management, engineering and technical assistance to the Districts:

- Skagit Conservation District (SCD)
- Washington State University Extension (WSU-E)
- Western Washington Agricultural Association (WWAA)

These activities include: 1) Professional services to Drainage and Irrigation Districts for regulatory and permit compliance technical assistance in developing and processing new water right applications, change applications, transfers, etc. needed for irrigation purposes; 2) Assistance with developing and implementing administrative programs for Districts' water contracting to agricultural irrigation water users; 3) Design and engineering assistance to irrigation Districts for installing on-the-ground infrastructure and conveyance improvements; and 4) Technical and design assistance directly to farmers in the development of water conservation measures and water use efficiency projects.