



Final Report
Specialty Crop Block Grant Program
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Creating Farmer's Markets Where They Currently Do Not Exist, Identifying Growers and Building Cooperation to Find the Best Opportunities (Final Report Submitted 2011)

**Washington County Farm Bureau
Grant Awarded: \$45,049**

Project Summary

It was observed that a farm market system in the five-county area represented in this project was being developed but it lacked support. At the time there were farmers markets popping up ran largely by growers and all seemed to struggle to market themselves. The goal was strengthen existing markets and create additional markets and begin the process of developing a strong and healthy local foods system.

Project Approach

During the first quarter the following activities were identified as priorities:

- Activity 1 - Fill 10 Advisory Council positions. The group is representative of various grower types and the five county region, and brought with it tremendous knowledge and willingness to support the project.
- Activity 2 – The initial meeting was held where the project was introduced, along with one of several business models that were promoted throughout the life of the grant. The project provided the opportunity to get the area media involved. Several articles and ads ran in newspapers and on the radio. In total, 30 attendees and seven volunteers were involved with the actual media. The workshop generated a total of 19 stories in newspapers, on the radio, and dozens of stories on social media specifically Facebook and Twitter.
- Activity 3 - A grower survey was printed and distributed to those attending the workshop as well as other known growers throughout the counties. The survey is still open, but at the time of the report submission a total of 38 surveys had been completed and returned to the Specialty Crop Project office.
- Activity 4 - The Farm Bureau County Coordinators began contacting the schools offering the program The Incredible Edible Garden. A total of 37 presentations were scheduled.
- Activity 5 - Area FFA's were not slated to be contacted until the fall of 2010, but several were so excited about the project that they contacted us with ideas for their participation. Several of the chapters participated in the grower survey.
- Activity 6 - In an effort to identify barriers to growth, the county coordinator identified the Rural Grocery Store Summit at Kansas State University as something that should be attended. The meeting is not schedule until June 2012. Since it was not art of the initial work plan or budget, additional funds are being pursued to pay for the costs associated with attending the summit.
- Activity 7 - Meetings were scheduled with the area farmer markets to discuss the project and grower needs.
- Activity 8 - The project promoted the 2010 Buy Fresh Guide.
- Activity 9 - The coordinator and growers from the counties have started contacting all counties that requested matching funds.
- Activity 10 - The grant administrator attended the Kansas Farm Bureau Young Farmer and Rancher state annual meeting and showcased the event. She also co-led a discussion on how to identify, write and submit grant applications. During the visit district participants were contact directly with information on the project. More than 400 participants were involved and were exposed to some part of the program.

Goals and Outcomes Achieved

Goal Number 1: Consumer Education and Marketing

- Incredible Edible Garden: This project gave student participants hands-on experience with starting, managing and harvesting a garden. The project reached 612 students through a total of 68 visits. Additionally, 57 teachers and para-professionals, five county Farm Bureau coordinators, nine volunteers and an estimated 57 teachers visited this project. A Washington County preschool enjoyed the Incredible Edible Garden so much they asked for help to put in their own summer garden; and the program received state recognition for quality programming.
- Instead of a single activity, there were five “Fresh Food Sampler” activities throughout the five counties participating in the project, with additional sources of funding sought to accommodate the other counties.
- Two farmers markets registered and were accepted into the “Savor the Season” program that promotes specialty crops in season.
- A website was created - <http://www.washingtonfb.org/specialty-crop-nck.html> - to support the project, and an e-newsletter was distributed to more than 100 people. The publication was designed to promote growers, identify business opportunities and encourage consumers and institutions to support local growers.
- The project participated as a vendor in the Taste of Home Cooking School. This was a huge success and many possibilities sprang out of this activity. It was so successful that additional events were added throughout the five counties, including a display and samples at the Washington County Health Fair and the Belleville Home & Garden Show. Between the three events were met one-on one with samples and hand-outs to more than 1,000 potential consumers in the five-county area.
- Buy Fresh was released and www.Buyfreshnck.com was updated. Displays are in the process of being developed and set up in each county.
- Two separate radio interviews were conducted with local stations. The first interview talked about the North Central Kansas Specialty Crop Project and the other promoted the release of the 2010 Buy Fresh Guide of North Central Kansas.
- A collaborative project was proposed to introduce fresh foods as a learning lab for a preschools and day cares in a 9 county area of North Central Kansas. NCK Specialty Crop & Washington County Farm Bureau were approached by the Child and Nutrition Services to work on a collaborative project to develop a preschool curriculum for providers to use, focusing on healthy eating habits and using the information for in-class learning and activities, with a special segment on fresh fruits and vegetables.
- Held final wrap up meeting and workshop in Clyde, KS. More than 125 growers attended the direct marketing workshop. This was the final grant funded activity for the project.

Goal Number 2: Defining and Building Markets

- Two farmers markets registered and were accepted into the “Savor the Season” program that promotes specialty crops in season.
- Farmer Market Meetings were held throughout the life of the project.
- The project presented a workshop during the Kansas Farm Bureau Young Farmers & Ranchers annual meeting.
- Republic County partnered with the local 4-H chapters and other area producers to provide a complete meal locally sourced meal. The event went over very well and will likely become an annual activity. The 4-H food stand also used the Republic County vendors to make their fruit cups. In past year pre-packaged fruit cups were purchased.
- Two additional communities added farm markets for at least a partial season. This brings the total number of farm markets to 13 for the five-county area. These additional markets do not

seem to compete for customers, but they do compete for growers. There is a clear need for more growers, especially larger growers.

- A group of Washington County growers participated in a specialty crop and produce auction tour sponsored by the University of Missouri Extension. The purpose of the trip was to give growers ideas on ways to expand that will both enhance local food sales as well as create regional market opportunities.
- University Extension River Valley District sponsored a series of three high tunnel 101 workshops throughout the service area. A grower who recently added a high tunnel was showcased in newspaper articles in two counties.

Goal Number 3: Identifying and Addressing Barriers

- An institutional survey was developed in conjunction with Kansas State University Research and Extension. One barrier discovered was the need to have an online “order board” for area growers.
- Master Gardeners and other groups were contacted to encourage their support related to various marketing activities at each of the farmers markets. This identified new avenues of support that could potentially be utilized.
- County FFA chapters and other student groups were contacted to develop more student involvement. One FFA chapter in particular was very interested in fresh foods. Two grants were completed through Kansas FFA and the Kansas Farm Bureau Foundation for Agriculture to help purchase a greenhouse and the needed supplies. Students will attempt to supply many of their own vegetables to their school cafeteria. They have also pursued funding for a summer work program that will have students raising vegetables for area food banks.
- All of them need help with marketing, organization and moral support if they are to be able to continue. Some markets are partnering with each other to create early markets and late markets. Growers are finding these partnering opportunities very desirable. Growers are also forming their own partnership agreements to increase their competitiveness within the area.

Beneficiaries

This project added three more farmers markets in the second year of the project and 11 new high tunnels in the five-county area. However, one existing market has suffered with the addition of the three new markets. Some of the marketing activities to promote the markets continued beyond the life of the grant and we continue to produce new growers. Three county Farm Bureau associations made major efforts to incorporate local foods into their ongoing efforts and two counties added specialty crop producers to their board of directors. This change alone was a major milestone.

Lessons Learned

Continuing to find funding sources was a major problem for this project. Project staff identified a need to conduct a baseline economic survey to begin to measure economic growth in the area. “We built the growers, but now we need to build the market to handle the volume,” the project director said. There are specialty crop producers failing which is a problem. The project had been successful at creating an environment where commodity farmers and specialty crop producers viewed themselves as one agricultural community as opposed to two.

There is intense desire within this area to make something good happen BUT new projects are incredibly fragile.

Lease a Mechanical Grape Harvester, Collect Data and Information (Final Report Submitted 2011)

Kansas Grape Growers and Winemakers Association
Grant Awarded: \$39,250

Project Summary

The Kansas grape industry is small, but growing. Industry partners are striving to remain focused on quality while increasing quantity. Previous specialty crop grants moved the industry in that direction: a 2008 vine grant, a 2009 wine quality certification grant, and a 2009 grant awarded to Kansas State University for education. As a result, growers were producing more quality grapes and wineries were producing higher quality wines. With increased production came harvesting issues. Previous vintages had been harvested exclusively by hand. This grant was requested to explore the dynamics and economics of mechanical grape harvests.

Project Approach

Project staff proposed to lease a harvester and record their observations and results, positive and negative. The proposal was written assuming an OXBO harvester would be the machine leased. It was not. That impacted other assumptions used in the proposal. The OXBO has only one fruit delivery system (the continuous off-load chute) while the BRAUD that was actually leased has a choice of two fruit delivery systems (the same continuous off-load chute and a collection bin that can be dumped at the operator's discretion). The machine choice changed the match/in-kind requirements because the bin system required less equipment and people to complete the harvest. Also, only three vineyards participated in the project, not five as originally projected. The bottom line results of the plan that differed from the actual implementation were to decrease the match/in-kind contributions during the first year of the project.

Consequently, the project went into a second year so that the match/in-kind budget could be achieved. The second year results mirrored and validated the first year results.

An attached report explains in-depth the process and the findings.

Goals and Outcomes Achieved

Kansas grape industry knowledge has been increased as it relates to in-state harvests. A video of the harvester in action was posted to Facebook in 2010. A narrative summary will be posted to the Kansas Grape Growers and Winemakers Association website by January of 2012. The summary reflects that grape quality was not negatively impacted by mechanical harvesting. If anything, it increased because of quicker delivery to vineyards and because of the ability to harvest "at a moment's notice". It was determined that mechanical and hand harvests cost approximately the same at 2 ton/acre yields. If the yield is higher than 2 tons/acre, the mechanical harvester becomes the cheaper option. Observations and conclusions regarding the viability of a co-op harvester ownership versus using a custom harvester were also addressed in the narrative report that was published. Current suggested pricing for a custom harvest arrangement was also published.

An attached report outlines survey results completed through this project.

Beneficiaries

Any Kansas grape grower contemplating mechanical harvest now has in-state information they can factor into their decision-making process. They also can talk to other in-state growers who have actually experienced a mechanical harvest. Any Kansas winery contemplating the purchase of mechanically harvest fruit also benefitted from this project.

Lessons Learned

There is a lot of interest in mechanical harvest among the growers in the state. Many growers are currently small enough they cannot economically harvest by machine. But, they are still interested in the results of this project for the time in the future that it becomes economically feasible for them to also mechanically harvest. One industry lesson learned: all vineyards should plan for mechanization from the very beginning. It is much more expensive and time consuming to retrofit, than it is to do it right the first time. Another lesson: exact costs are hard to determine for a myriad of reasons. No two machines are going to cost exactly the same. Every grower has different vineyard set-ups. Different harvesters can require different support equipment.

Additional Information

Please see the following report and addendum for more information.

Field trial reports covering machine harvesting can be found at different sources. This project records the observations made during the Kansas mechanical harvester feasibility study and addresses issues to be considered if contemplating a move toward mechanization. This report also reflects information from a harvester workshop in Nebraska.

To begin, consider the following comments from the American Fruit Grower trade magazine: Perhaps only about 20% to 35% of winegrapes are still hand picked, though estimates vary. That is down from 40% to 65% just a decade ago and because of increasing costs the figure will likely drop all the way down to 15% a decade from now. “It’s really dwindling, but there’s always going to be someone who’s against (machine harvesting)”, says Robbie Roberts, the sales manager for American Grape Harvesters of Fresno, CA. “But it’s funny how some of them change their attitude when it hits their pocketbooks”. *Mechanical Marvels, David Eddy, American Fruit Grower, June 2004.*

Most local discussions about moving toward machine harvesting start with two perceived problems: fruit quality and potential damage to vines and/or trellising. We will discuss these issues as well as the economics of mechanical harvesting and other miscellaneous issues.

Fruit Quality:

Fruit quality is of the utmost importance and is always a primary consideration in every vineyard operation. The goal of this project was to determine if there was an impact on fruit quality (positive or negative) when an operation uses machine harvesting instead of hand harvesting. In order to make this determination, rows within the same blocks at the Smoky Hill estate vineyard were harvested both by hand and by using a harvester. Enough fruit was harvested under each method to ascertain the quality of the must (post crusher juice/skins/seeds mixture). Following are the details and observations.

- Harvest Delay Effect – Harvest activities are scheduled when the fruit is analyzed as “ready for harvest”. Because hand harvesting often needs to be scheduled for Saturdays, there can be a significant change in the fruit parameters before Saturday. Scheduling harvests for Saturday, instead of when perfectly ripe, often results in harvested grapes that are either under- or over-ripe. Due to the extreme heat in 2010 harvest, this factor caused a large impact on the must quality. Separated by 4 days, the pH went through such a drastic increase that the musts started at a difficult level for the winery to manage into excellent wine. Probably the single most positive factor for machine harvesting is that the fruit can be picked when it is exactly ready.
- Heat Index Effect – Hand harvesting usually starts early morning when the sun first rises. Most vineyards try to have the fruit picked by noon. The grapes picked first will sometimes sit in a shaded enclosure, but mostly sits in the open air. As noted above the heat during harvest was extreme in 2010. The resulting effect on the hand-picked fruit was that it often reached the vineyard some 30 to 40 degrees hotter than the machined fruit. This had a very dramatic effect on the must quality -- impacting the aroma and flavors -- and made fermentation rates very fast, resulting in other wine quality issues. It is important to note that when the fruit is ready for harvest, the machine can be run during the darkness of early morning, yielding cooler fruit and having a very positive impact on the must quality.

- **Fruit Damage** – It is often argued that machines damage the fruit and hence degrade the must quality. Our trials showed the must quality was not impacted in either way due to the machine harvesting. The unit used for this study was a Braud self-propelled unit that was equipped with gentle rods. There is a number of existing research trials documenting



the fact that older technology units without gentle picking rods did damage fruit.

- **Matter other than Grapes (MOG)** –

Observations were made regarding the amount of MOG in the form of leaves, sticks, stems, etc... This is an area where the machine can have a negative impact. There are devices that can be adapted to the machine (MOG Wheel) that remove some of these items. The hand harvested fruit does have some stray leaves, but rarely any sticks or other things found within machined fruit. Though this was minimal and we could not ascertain the impact on the wine quality, this must be recommended as an item from the

machine operation to monitor and reduce or eliminate.

- **Transportation Time** – The machine will harvest an acre in under an hour, whereas hand harvesting an acre will often take 4 to 5 hours or longer, depending on the number of pickers and their skill level. Transportation distances will remain the same, but because of the faster harvest, vineyards will be able to deliver to the winery much earlier in the day. Consequently, vineyards may be able to cultivate customers that otherwise would be out of their “heat-index delivery zone”.

Potential Damage to Assets (vines and trellising) and other trellis concerns:

In general, some vineyards may be established with a trellis system or layout that does not allow for machine harvesting. Metal t-posts can cause high wear on the machine rods, spacing can be too narrow or many other things can just make the vineyard unable to be harvested by machine. Each vineyard operator should request a tour of the vineyard by the harvester operator early in the season to be sure the vineyard will allow for machine harvesting.

Specifically, we observed damage to vines did not occur unless the vine trunks and cordons were way outside the vine row. Mechanization does require straight rows; if not, the vines will be damaged. Shoot damage was not an issue. Trellis damage was observed on pine posts that had dry rot at ground level. Trellis damage was also observed if the trellis did not follow a straight line. If mechanization potential has been considered when the vineyard was established, damage to the vines and trellising should be minimal or non-existent.

Economics:

There are economic factors associated with either form of harvesting. Following are some observations and information learned locally and from other states that have machine harvesting services. Each grower needs to consider how these factors fit their individual operation.

- Harvester Costs – For a used self-propelled machine with gentle picking rods the unit costs are between \$85,000 and \$200,000. There is a transportation cost to deliver the unit; and a trailer to transport the harvester will need to be purchased. The height of the harvester requires a special drop trailer that can easily run \$10,000. In addition to the purchase costs, there are also annual costs. It is assumed 300 acres would need to be harvested in order to reach a pay-back position on the unit.
- Annual operating costs – If purchased, there is an annual “sunk” cost related to the purchase price of the harvester. Above that, there would be annual operating costs: operator, maintenance, etc. The harvester co-op in Nebraska indicated direct costs associated with the harvester was \$.06 per pound compared to \$.10 -\$.20 per pound for hand labor.
- Purchase considerations
 - Vineyard: size, row spacing, training system, height of cordon.
 - Machine reliability and user friendliness.
 - New vs used.
 - Self-propelled vs pull-type.
 - Enclosed cab vs not.
 - Fruit delivery system: bin or chute.
 - Ability to accommodate different trellis styles (high wire, VSP, Geneva double curtain).
 - Funding assistance programs.
- Hand Harvest Costs – Vineyards located by major metropolitan area often can find a volunteer base to allow for “free” labor. There are costs associated with this method as most vineyards will provide lunch, drinks, tee shirts or other items. For this study the Smoky Hill vineyard does not have such a volunteer pool and, therefore, pays a typical rate of \$200 per ton. Research showed that vineyards pay between \$100 and \$200 per ton. There are also picking costs (picking totes, cutting tools, scales) in addition to the costs mentioned above (lunch, etc).
- Machine harvest rates are typically around \$500 per acre and have a mobilization charge depending on the distance traveled (assume \$500 on average). Note the suggested machine rates are per acre, not per ton. Also, custom harvesters may set minimum acreage requirements to even come to a vineyard. Hand harvesting versus machine harvesting costs are equal at approximately 2 acres. Above two acres the cost is lower for the machine harvest costs and below 2 acres it is higher.
- Co-op Considerations – Due to the high amount of acres required to bring the harvester costs to break-even and the small amount of acres within Kansas, having a harvest co-op or being able to hire a custom harvester is a necessity for most operations. A co-op would bring with it the structural and business issues of ownership, insurances, loss and/or profit sharing, etc... which when coupled with the long pay-back time, would steer many people away from harvester ownership and toward utilizing the services of the custom harvester. The custom harvester would be an entity that owns and operates the machine and trailer and charges vineyards for the harvesting services.

- Fruit Transportation Costs – Transportation distance is an economic issue that each grower needs to consider when selling to a winery on a “delivered” versus “FOB vineyard” basis. Discussions between the grower and the winery need to be on-going as the price of fuel increases and decreases. Long transport distances by either the harvester or the fruit can have a significant impact on overall costs.

Other Factors:

- Management efficiency is increased while management overhead is significantly reduced when used a harvester. Example: a weather delay at the vineyard is just two phone calls: the harvester operator and the winery. Weather delays with hand harvesting can involve up to 75 calls, if that many pickers are used. Example: Vineyard labor requirements for a mechanical harvest would be the vineyard manager, a tractor driver, and a person to “clean up” the row ends. Vineyard labor requirements for a hand harvest requires all contracted pickers plus at least one more person to weigh the fruit and walk the picked areas to be sure there is no fruit left behind.
- Fruit loss can occur from hand pickers not getting all the fruit within the canopy. Assuming a chute fruit delivery system, losses can also occur during machine harvest if the tractor/trailer driver is not aware of the fruit stream coming from the harvester spout and does not have a bin in the proper position. Both of these are factors that can be observed and managed to avoid.
- (Assuming machine harvest) time is freed up for the vineyard manager by reducing both onsite time and picker coordination time. If the vineyard is also a winery they will have less overtime requirements for wine production employees. Machine harvest will also allow the winery to receive and process grapes during the week, leaving weekends open for events.
- Transportation requirements if choosing a cooperative form of ownership:
 - Over-the-road truck and drop-trailer (unless the vineyards are close enough to move the harvester by driving it on public roads).
 - CDL operator needed to transport harvester from vineyard to vineyard.
 - Wash-out tank with pump.



Summary

This specialty crop grant to study the feasibility of machine harvesting grapes has been a very valuable grant and has yielded much information. Mechanical harvesting offers many advantages for Kansas vineyards and Kansas wineries. In short:

- Dependability - no worries about laborers not showing up, weather issues are minimized.
- Harvest time is shortened, increasing fruit quality delivered to wineries.
- Nighttime harvests are possible (and practicable), also increasing fruit quality.
- At and above 2 tons/acre yield, costs are less than for hand harvests.

Mechanical harvests would require closer coordination between the grower, harvester, and winery, but that is still less coordination than that required by hand harvests. Increased equipment would be needed including larger harvest containers (such as macro-bins), forked equipment to lift harvest bins, and equipment to transport harvested grapes from the field to the transportation trucks.

One of the most important outcomes of the grant is the observations that fruit quality was not negatively impacted by the machine (other than small amounts of MOG). It is safe to conclude that the machine harvested fruit is of greater quality. Machine harvesting also has a positive impact on fruit temperature, which can offer significant impacts on wine quality.

In general, the machine provides the best opportunity for efficient planning and management of the fruit harvest for all the reasons discussed above. Therefore, the only possible considerations for not using a machine to harvest fruit in a vineyard that has trellis allowing for machine harvesting would be vineyard operators desire to hand pick or the size of the vineyard not allowing for the economic feasibility.

Report Addendum

As part of this study, we have actually observed two methods of harvester business ownership. In Nebraska, they created a growers cooperative. In Kansas, we have a custom harvester available for vineyards to hire.

Some of the principles involved in this grant project attended a harvester workshop in Western Nebraska in Sept, 2011. In Nebraska, five growers went together to purchase a used Korvan out of California. Each grower invested \$10,000 and the remaining \$50,000 was secured from a Rural Economic Development Grant. All five growers lived within a 25-30 mile radius, so they planned to “road” the harvester between vineyards. Hence, no need for a truck, trailer, and CDL operator.

The information in this report incorporates information from both this grant and the workshop in Nebraska.

There are several makes and models harvesters to choose from. Some are quite damaging to the vines. And some are so well used as to make them an unreliable option for a one-machine operation “in the middle of nowhere.” Also, as with all equipment, prices are all over. For the purposes of this report, we will assume a used, self-propelled unit costing \$100,000.

Machine pay-off calculation:

(Assumes \$100,000 purchase price with no off-setting grants or other funding sources)

\$100,000 purchase price (assumed price)

 \$500/acre custom harvest fee (assumed rate)

200 acres to pay off purchase price

 7 years (assumed life)

 29 acres needed per year to pay off purchase in seven years

If you choose to consider a ten year life, 20 acres would need to be harvested per year to pay off the purchase price. Of course, if you're able to obtain grant funding such as what they did in Nebraska, the number of acres needed to reach pay off would be halved.

These calculations are based on assumptions. Actual pay off calculations would be impacted by actual purchase price, etc. These calculations also include no direct costs such as maintenance, operator labor, and transportation.

Harvest Costs:

It takes approximately 75 to 100 hours to hand harvest 1 acre of grapes vs. 1-1.5 hrs. mechanically. (Source: Iowa State University) We'll use the smaller numbers for the following:

Option #1: Pickers paid by the hour: 75 hrs x \$10/hr = \$750/acre

Option #2: Pickers paid by the pound: 2,000 lbs/T x 3.5 T/acre x \$.10/lb = \$700/acre

Option #3: Custom harvest charge (assumed at \$500/acre) \$500/acre

Caveat: many custom harvesters will have a minimum required acreage per vineyard before they will enter into a custom harvest agreement with that vineyard.

Hand costs = machine costs at 2.5T/acre (2.5T/acre x \$.10/lb = \$500). Yields below 2.5T/acre are less expensive to hand harvest, considering no factors other than cost.

The following summaries should be read in concert with the narrative previously submitted.

General statement

Most local discussions about moving toward machine harvesting start with two perceived problems: fruit quality and potential damage to vines and/or trellising. We felt this study addressed both those issues. The following surveys will reflect some negatives of machine harvesting. However, we feel that just like most issues in the vineyard/winery, those issues can be either negated or minimized with good management.

Summary of information outreach efforts

- Early September, 2010 – a tailgate workshop was conducted at one vineyard with approximately 10 people in attendance.
- Mid September, 2010 – a newspaper near a second vineyard ran a featured article in their local paper. A Wichita television station then picked up the story, traveled to the second vineyard and videoed and aired a segment showing the harvester in action.
- Also in September, 2010 – a video of harvest was uploaded to YouTube.
- Summer 2011 – harvester pictures were posted to the KGGWA Face book pages.
- Post harvest, 2011 – a narrative report was posted to the KGGWA website.
- Conferences: Jan. 2010 and Jan. 2011 – presentation space had been requested, but the agenda was too full. Will try again in Jan. 2012.

- 2012 workshops – Highland Community College will have one of their monthly workshops at Eagle Creek Vineyards this June. We will discuss mechanical harvesting along with their other planned topics.

Survey of participating vineyards

What did you learn about mechanized harvest?

Faster, more convenient

Communication (vineyard, winery, harvester) is critical

Dramatically reduced labor considerations

Do not have to cultivate a labor pool

Damage can occur in the vineyard (both vines and trellis)

How did it impact your operation?

Removed the logistics of finding pickers

Able to harvest at optimal quality grape parameters

Negative: can introduce more M.O.G (matter other than grapes) into harvested grapes

Negative: potential scheduling problems re: more than one vineyard and/or winery

Was it cost effective?

Yes

Pros and cons of the machine

Pros: timeliness, planning, efficiency, and fruit quality were all positively impacted

Cons: initial investment, machine scheduling, breakdown potential

Logistics of using the machine

Need for specialized trailer and truck to pull it, CDL operator required for truck driver

Scheduling the machine becomes more complicated as # of winery customers increases

How did machine harvesting impact harvested fruit quality?

Less trash, greatly reduced number of jacks in harvested crop

Ability to harvest fruit while cool, translated to higher quality fruit delivered to the winery

Negative: small fruit loads translate to higher M.O.G levels. This can be overcome with attachments on the harvester.

Any other information you wish to share re: machine harvesting vs. hand harvesting

Harvester allows grapes to be picked when ready, not when people are available

“Overall ... what remains is a decision as to how the grower is best able to meet the needs of the winery.”

Survey of participating wineries

What did you learn about mechanized harvest?

Communication is critical.

Consider a backup plan or insurance protection against breakdown losses

Inclement weather considerations can have a bearing on both machine and hand harvests

“Quality can be impacted in both positive and negative ways with either machine or hand harvesting.”

How did it impact your operation?

Ability to schedule harvest when grapes are closest to their optimal quality parameters

Breakdowns are a possibility. Consider: replacement parts may need to be shipped in.

Was it cost effective?

From the winery perspective, and over two growing seasons, cost impacts were neutral.

Crushes were more efficiently scheduled

Winery experienced some equipment damage due to M.O.G.

Pros and cons of the machine

Cost is only one part of the equation and does not fully capture all consideration.

Planning, efficiency, fruit quality, and ability to procure labor need to be considered.

Cons: potential for breakdown, quality impact on low crop canopies, machine can only be in one place at a time

Logistics of using the machine

Planning and quality were positively impacted as harvesting revolved around fruit conditions rather than the availability of labor

Potential issue: logistics of scheduling the machine in multiple vineyards

Potential issue: wineries schedule crush depending on fruit parameters and tank space

How did machine harvesting impact harvested fruit quality

Positives: ability to harvest fruit when it is cool, ability to harvest at optimal fruit parameters

Negative: low fruit yield crops produce more M.O.G

Any other information you wish to share re: machine harvesting vs hand harvesting

Not a strong positive or negative impact on operational costs. “What remains is a decision as to how the grower is best able to meet the needs of the winery. Minimizing the damage to the grapes, avoiding the introduction of foreign matter and keeping grapes as cool as possible are the three keys the grower must consider when selecting a method of harvest.”

Economic Impact Study of the Kansas Grape and Wine Industry(Final Report Submitted 2011)

**USDA NASS/Kansas Department of Agriculture/Kansas Department of Commerce
Grant Awarded: \$11,045**

Project Summary

The grape and wine industry in Kansas had requested this data so the economic impact of their industry would be available.

Project Approach

A grape and wine survey was new to Kansas, so everything was created from scratch. The main list of producers was those who reported they had grapes in the 2007 Census of Agriculture. Project staff also obtained additional names at different grape producer meetings. A questionnaire was developed using examples from other field offices as well as requesting input from producers to make it as applicable to Kansas as possible. Once the questionnaire was developed, the National Agricultural Statistics Service collected the data in early 2011 for the 2010 production year. The data was analyzed and then summarized. The summarization was time-consuming, as NASS had to create two summaries from scratch, one for the grape report and one for the wine report. NASS staff took great care to ensure they did not disclose any personal information.

The results were then sent to the respondents and posted to the NASS website. The Kansas 2010 Wine Production report may be accessed at http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Economics_and_Misc/Winery/2010WineryRelease.pdf. The Kansas 2010 Wine Production Survey may be accessed at http://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Economics_and_Misc/Winery/2010GrapeRelease.pdf.

Goals and Outcomes Achieved

The goal was to produce two reports that would be useful to the industry and others interested in the grape and wine industry. Another goal was to have the questionnaire ready to collect data for the 2010 production year. Both of these goals were achieved. It took a little longer than anticipated, because of the need to create everything from scratch. However, now that the project has been completed, it should make future projects for this industry, if there are any, easier to administer.

Beneficiaries

Obviously the members of the Kansas grape and wine industry are the biggest beneficiaries. They now have a benchmark from which they can go forward in the future. They also have a current picture of the full industry in Kansas. Others who will benefit will be people that might be interested in getting into the grape industry in the future in Kansas. Researchers will also benefit from the additional data.

Lessons Learned

NASS did discover that the wording on a few of the survey questions did not give the results they wanted, so that will be changed on future surveys. They also learned that any new projects of this variety will take longer than anticipated.

Provide Training on Good Practices for Specialty Crop Growers (Final Report Submitted 2011)

Kansas Rural Center

Grant Awarded: \$24,853

Project Summary

The relationship between specialty crop producer and buyer is built upon trust that the foods are grown, processed, and shipped in a safe manner. As specialty crop production scale increases in Kansas, it is important to ensure that new and experienced producers are aware of current and future Good Agricultural Practices guidelines (GAPs) as they evolve. This will assist producers in focusing on opportunities to produce safe foods for Kansas families and institutional buyers.

GAPs certification is increasingly becoming a requirement for producers selling to many wholesale outlets, including grocery store chains and food service providers. Certification may become increasingly important for producers selling through other market channels, such as farmers markets or restaurants, as concerns about food safety grow among consumers and regulatory agencies. To increase their competitiveness, incomes and market share, specialty crop producers in Kansas will benefit from third party GAPs certification. The USDA has created a Good Agriculture Practices & Good Handling Practices Audit Verification which can serve as a valuable tool for preparation for 3rd party GAPs certification.

However, very few Kansas fruit and vegetable producers have availed themselves of these resources. This project was designed to help them undertake this step. Training took place at events and workshops specifically designed for specialty crop producers. This project targeted GAPs training for producers of fresh fruits and vegetables on the specialty crop list.

Many of the principal project collaborators were involved in the creation of the K-State Kansas Food-A-Syst Manual which was developed as a food safety risk management guide for producers of specialty crops (in addition to dairy, meat and poultry). Another project, titled, "Research for overcoming barriers to institutional purchases of locally grown food" by Dr. Rhonda Janke evaluated food safety, cleanliness and costs as potential barriers to institutional purchases. Food safety training has been a consistent part of many on-farm fruit and vegetable demonstrations, but on an ad hoc basis, without the benefit of the new GAPs training materials and Food Safety Guides. This project provided a more consistent and intentional framework for food safety training with updated materials.

Project Approach

The project team worked with the Great Plains Growers Conference, a specialty crop education forum that targets five Midwestern states—Iowa, Kansas, Missouri, Nebraska, South Dakota, to provide general GAPs information, program updates, and post-harvest handling workshops at the 2010 and 2011 conferences. Approximately 132 farms participated in at least one of the sessions. Additionally, the Kansas Rural Center booth distributed GAPs materials to 75 farmers.

The project was somewhat stalled initially due to the departure of a key team member, the Kansas State University Fruit and Vegetable Specialist. The KRC contractor responsible for the day-to-day management of the project was also stymied by a lack of specialty crop producer interest in GAPs (see lessons learned below). At the same time as the controversy over the Food Safety and Modernization Act broke out, a KRC staff member assumed project responsibility and developed new project partners.

The team worked with the Johnson County Community College Student Farm to develop a farm food safety plan and prepare for a potential GAPs audit. As part of the JCCC effort, team members also taught

a class for the culinary arts program on farm food safety and lead a tour of the student farm noting GAPs compliance opportunities.

KRC partnered with K-State Research and Extension-Douglas County to educate specialty crop growers. An informational session was attended by 21 participants and a full-day Post Harvest Handling, Food Safety and GAPs: Making it work on a real farm workshop reached 51. Because this workshop was so well received, KRC will partner with the GPGC to host a pre-conference workshop with the same presenter in January 2012.

Goals and Outcomes Achieved

The project's first goal was to "educate Kansas specialty crop producers on the features and benefits of GAPs." To this end, five GAP certification trainings were held, reaching more than 300 existing or beginning specialty crop producers (target 400). These producers received at least minimal exposure and training to understand the fundamentals of GAPs. Participants at these training are now able to identify potential on-farm risks in their operation.

The project's second goal was to "provide educational opportunities and assist producers in the development of farm food safety plans." The project target was to assist between 50 and 100 specialty crop farmers to complete food safety self-assessments of their farms. KRC distributed Cornell's "Food Safety Begins on the Farm: A Grower Self-Assessment of Food Safety Risks" book to 63 farmers through this grant.

Using this text and the guidance provided in the educational sessions, farmers are able to identify potential on-farm risks in their operation and have the tools needed for the development of their own farm food safety plans.

The project's final goal was to "enable Kansas specialty crop producers to increase their access to institutional markets." The target of having up to 50 specialty crop farms become GAPs certified was not achieved (see notes above). However, participants did become more knowledgeable about major aspects of GAPs and farm food safety plans in relation to fruit and vegetable production and marketing and did gain an understanding of the requirements for 3rd party certification.

Since the grant period ended, KRC has continued to work on food safety issues with both farmers and specialty crop buyers. We are currently developing a farm food safety checklist that focuses on areas identified as critical in GAPs. This checklist may be used by retailers, schools, and other institutions and may lead to eventual GAPs farm audits.

Beneficiaries

At least 300 specialty crop producers have increased their awareness of Good Agricultural Practices and at least 72 now have the tools and knowledge necessary to develop farm food safety plans.

Eleven specialty crop buyers have increased their awareness of what it takes to implement Good Agricultural Practices on a diversified farm, and six will begin working with growers to incrementally increase farm food safety requirements.

Lessons Learned

The Kansas Rural Center was a bit ahead of producers when it came to GAPs; it wasn't until controversy erupted around the Food Safety Modernization Act in the fall of 2010, that specialty crop producers began showing a strong interest in GAPs. Additionally, project staff determined that the basic one to two hour GAPs informational sessions aren't what growers were requesting. To meet the outcomes of the project, KRC expanded its collaborations to include county extension agents, farmers markets, and area

businesses/organizations. They began focusing on specific, practical examples of how GAPs can be implemented on small, diversified specialty crop farms.

While project staff doesn't anticipate a significant number of farms seeking a USDA GAPs audit, they do believe that the groundwork will be laid to begin implementing some much needed examination of farm food safety risk management.

High Tunnels: Essential Equipment for the Specialty Crop Farmer (Final Report Submitted 2011)

Kansas State University
Grant Awarded: \$11,045

Project Summary

This project developed and distributed information about production of vegetables and other specialty crops in high tunnels. The demand for locally grown produce in Kansas is strong, but Kansas has one of the lowest per capita rates of vegetable production in the nation. Our variable and extreme weather presents a challenge to vegetable production. By protecting crops from these conditions and increasing marketable yield of crops, high tunnels benefit farmers. High tunnels are sustainable, low-cost and accessible equipment that can help Kansas farmers meet the demand for local food. By researching appropriate crop varieties for high tunnel production and providing education and outreach to growers, the goals were to increase use of high tunnels by Kansas growers and improve their growing practices in high tunnels.

Project Approach

The project included a combination of research on tunnel crop production and educational outreach to growers in communities state-wide. Crop production research focused on commonly grown crops that have shown a potential for increased profitability in our area. Outreach included workshops, farm tours and a field day that allowed growers to learn about the benefits and use of high tunnels on a specialty crop farm and to see tunnels “in action.” By sharing information about high tunnel use and by demonstrating the benefits and management practices associated with them, this project helped more than 200 farmers learn about high tunnels and make a more education decision about whether and how to use high tunnels on their farms.

Crop production research focused on tomatoes and cucumbers. A planned trial of seed onion production was not completed because of scheduling problems. A planned trial of raspberry varieties was not completed because of flooding and lack of available replacement plants. Variety trials took place at two state extension research stations; one in Olathe and the other in Haysville; each station trailed the same varieties. Ten tomato varieties (six heirloom and four commercial hybrid) were trialed in tunnels and in open field plots. Three beit-alpha cucumber varieties were also trialed in tunnels and in open field plots. A summary of yield data will be posted to www.hightunnels.org, a website used by high tunnel growers worldwide. Additionally, tomato yield data from the trials was presented at the Great Plains Growers Conference in January of 2011.

Educational outreach focused on providing current growers with information and meaningful examples of tunnel use within a farm system. Seven workshops were conducted at locations throughout the state, and four farms with high tunnels were toured. Five workshops included a presentation developed for this project by the Growing Growers manager. The four farms toured grew a wide variety of crops. Two of the workshops, conducted as part of the Great Plains Growers Conference, were held in St. Joseph, Mo. and reached growers from several states in the Midwest. These full-day workshops included presentations from several experienced farmers. Workshops were well attended, with many attendees reporting that they had recently purchased tunnels or were planning to do so. Workshops included general information on the benefits and management of high tunnels, as well as information on the use of high tunnels for vegetable, perennial and cut flower crops. A field day at the K-State Research and Extension Station in Olathe, Kan., was part of a vegetable equipment workshop and included a presentation on high tunnel use and an opportunity for attendees to see equipment suitable for high tunnel production (small plastic mulch layer, drip and sprinkler irrigation, hand tools, tillers) and nine different high tunnels from three different

manufacturers. These high tunnels ranged in size from 20'x30' tunnels to a multi-bay tunnel covering a half-acre.

Goals and Outcomes Achieved

Crop production trials yielded data on marketable yields of high tunnel vs. field-grown plants of selected varieties. Cucumber and tomato trial data both show higher yields in high tunnel-grown plots at both research locations. This difference in yield between tunnel and field plots is particularly stark because of heavy rains at the start of the growing season, which negatively affected growth of many plants in the field plots. In contrast, the tunnel-grown plants, while sometimes affected by heavy, wet soil where drainage was a problem, were protected from rain and the worst effects of the weather. This demonstrates one prime advantage of high tunnels to Midwestern growers: their use as a risk management tool to mitigate the impact of extreme weather events.

In the tomato trials, weather and field conditions did not permit sufficient plant health or yields to develop recommendations for particular varieties for high tunnel production. The Olathe cucumber variety trials were adversely affected by an infestation of cucumber beetles, the worst damage being in the field plots. Repeated spraying to eradicate the pests was ineffective. High tunnel plots were not as severely affected. The overall number of culls within all varieties of cucumbers was substantial because of the beetle damage. The Wichita plots did not experience the same level of cucumber beetle damage, although it was present. The two cucumber varieties exhibiting the best yield in the high tunnels were Katrina and Green Finger (respectively.) Field plot data indicated similar results, although not as compelling.

Educational outreach efforts reached 262 growers. Numerous attendees at workshops reported that they had just purchased or planned to purchase a high tunnel, and the NRCS reports that 43 high tunnels were purchased in the state of Kansas through their EQIP cost-share program in 2010. More informally, attendees at events developed their knowledge of high tunnel production systems and found inspiration from the ideas of presenters, tour hosts and fellow attendees. Some specific examples of grower changing their practices or planned practices include:

- An Amish grower in Neosho County used a high tunnel to get his tomato crop transplanted out earlier, then removed the poly covering after the risk of frost had passed, now plans to keep the poly on the high tunnel throughout the season to benefit from the high tunnel's ability to provide protection from wind and weather events. He expects higher yields of marketable tomatoes per plant because of this. He expects other growers in his community to purchase or construct high tunnels if this is the case.
- Tour attendees in Clay Center were impressed with the design and cost of the tour host's PVC high tunnels. The tour host had also recently constructed two steel-framed high tunnels. Several planned to replication the PVC tunnels until the tour host pointed out that if he had the choice he would prefer to purchase larger, steel-framed structures because of increased air circulation and ease of labor and equipment use in the larger tunnels. Tour attendees able to afford steel structures are more likely to use those, while attendees who were currently unable to afford or find space for a larger steel structure received design and construction advice for smaller, inexpensive PVC tunnels.
- Season extension and leafy green production was of interest to workshop attendees in Wichita, who received information on recommended greens varieties and the timing of plantings for winter and spring harvests of leafy greens. Growers expressed interest in trying new varieties and switching from overhead to drip irrigation. Attendees marketed their produce primarily through farmers' markets and planned to use tunnels to bring crops to market earlier.
- Attendees of a farm tour in Scandia heard from a vegetable producer who has used multiple high tunnels for more than 10 years. Two attendees who had planned to use manure extensively as a

fertilizer in a high tunnel were discouraged from doing so by the tour host, who had seen a spike in salt levels in his tunnel soil after using manure continuously.

- An attendee of the Olathe field day was impressed by a compact plastic mulch layer that was demonstrated in a high tunnel. She and her husband plan to purchase a similar model or to modify a mulch layer such that it can be used in their high tunnel.

A database was developed containing information on high tunnel producers in Kansas that are growing vegetable crops with the use of high tunnels. The database was developed with information from the results of surveys during high tunnel extension programs as well as the high tunnel workshop held at the Great Plains Growers Conference. In 2012, the database was used to survey high tunnel growers about the use of their high tunnels as well as programming needs for extension.

Beneficiaries

Outreach efforts met with success, and attendance at several workshops was higher than expected. Despite not holding a second field day (because of scheduling conflicts at the Haysville station), 262 growers attended a high tunnel workshop, farm tour or field day. While one of the goals of this project was to increase the number of high tunnels in use in Kansas, many event attendees had already purchased or planned to purchase a high tunnel and came to events as a means of learning best management practices, seeing examples of high tunnel use or for information on the construction process. The inclusion of farm tours in this project, the advice of the farm tour hosts and the experience of the primary presenter at the workshops, who has constructed and farmed in high tunnels, were valuable resources.

Lessons Learned

Crop production research results were limited by poor weather conditions, but did yield useful data, particularly in the cucumber variety trials. Two varieties, Katrina and Green Finger (respectively,) were the best performers.

In the tomato variety trials, no varieties distinguished themselves as being more or less suitable for high tunnel production systems, but yield data was limited by weather conditions, wet soil and poor plant health. Approximately 60 percent of the field tomatoes required multiple replacements for dead plants, approximately 18 percent of the high tunnel tomatoes needed replacing. None of the plants in these locations ever survived. The plant roots were unable to overcome the consistently hot and wet soil.

As mentioned previously, yields of tunnel-grown crops vs. field-grown plants in both the tomato and cucumber trials showed significantly higher yields in tunnel-grown plots. Based on observation this was due to slightly drier soil and some protection from heavy rains in the tunnels. A much higher number, around 60 percent of field-grown plants died due to wet soil conditions after transplanting than tunnel-grown plants, particularly among the tomatoes.

Event attendees were primarily interested in vegetable production, although some also expressed interest in cut flower or perennial production after seeing portions of the presentation that included those crops. One unexpected benefit of the outreach program included the distribution of the main PowerPoint presentation to other educators. Response to the high tunnel events in north central Kansas was so strong that two project workshops were held there, and a local extension agent in that area adapted the presentation for use at an area grower conference.

Given the number of new high tunnels in Kansas, the project outreach and the questions asked at workshops, high tunnel use among growers is increasing, and further outreach to address more advanced or specialized aspects of high tunnel production should be pursued in the future.

Rediscovering Conifers in Kansas

Kansas State University

Grant Awarded: \$44,688

Project Summary

In the last 20 years, Kansas has seen increased death of pine trees and the spread of pine wilt, a fatal disease caused by the pinewood nematode (*Bursaphelenchus xylophilus*) which is vectored by the pine sawyer beetle (*Monochamus* spp.). Currently, pine wilt disease is devastating pine trees across the state of Kansas. Yet, in the past 20 years little has been done to answer basic questions relating to the disease. Nor has there been much effort to investigate alternative conifer species for use by Kansans. In the western portions of the state, many Kansans are experiencing pine wilt for the first time and are seeking basic answers to their questions regarding the disease and its implications. In the eastern portion of the state where the disease is already widespread, residents and professionals are looking for replacement conifer trees. Nursery growers and Christmas tree growers are unsure what species of pine or other conifer will survive. As a result both industries are hesitant to plant or sell pines. Their needs were not being addressed with appropriate research and extension programs.

Pines, conifers, and pine wilt are the number one question that Kansas tree and shrub extension specialists field within a year. Currently pine wilt is found in all of Kansas' eastern and central counties and it is estimated that pine wilt is spreading across Kansas at a rate of 10 miles per year. There appears to be no effective control for this disease so resistant species may be the only logical answer. Unfortunately, developing, testing, promoting, and distributing resistant trees can be a lengthy process. Providing information and alternative species recommendations rapidly is important. The years required to replace a Christmas tree planting, specimen landscape conifer, or windbreak requires rapid distribution of reliable information.

Project Approach

During the grant period, the project team conducted four different research projects. The first project was an ongoing conifer evaluation. The grant funding provided the team with the means to initiate this project with sufficient plant material to make a meaningful statement. They planted 30 plants of 20 different conifers to evaluate establishment, cold hardiness, drought tolerance, pest susceptibility, and ornamental attributes. Over the past two years there have been some losses, but there have also been some successes. The team will continue to add to this planting and expect that it will continue to provide with research based information that they can relay to our industry partners.

The second research project was in support of a M.S. student thesis. In this project the team identified four species of conifer that are resistant to pine wilt disease, yet there is little known information regarding their performance in Kansas. The goal was to determine the optimum planting time to maximize root growth and therefore optimize plant adaptability and survival. These four species were planted in the fall, and every four weeks a group of plants were harvested and their root and top biomass measured for growth during the period. This project has enabled the team to make the recommendation of fall planting for two of the species, but spring planting for the other two species. This research was

presented at one national research conference and two regional industry trade shows as part of the educational program. The grant funding allowed the team to purchase the plants and necessary equipment to conduct the project. It also allowed the student to travel to present the results.

The third project was also in support of the M.S. student's thesis. In this project the team evaluated the drought tolerance of the same four species utilized in the previous mentioned project. Plants were grown in a greenhouse and water was withheld to reach a specific soil moisture content. After seven weeks of maintaining this soil moisture photosynthesis was measured and the plants were harvested to determine which plants were able to acclimate to the drought and still able to grow with the limited water they were given. This research revealed that one species was uniquely able to thrive under drought conditions and may be a suitable conifer for Kansas landscapes. The results of this research have been presented at one national research conference and two regional trade shows. The project funding enabled the team to purchase the plants, supplies and support the graduate student to travel to present the results.

The fourth research project is part of a Ph.D. dissertation. In this project the team has been evaluating the feeding behavior of the pine sawyer beetle. This beetle is responsible for spreading pine wilt disease. The goal is to identify those pine trees that the beetle does not prefer to feed on. The theory is that these species will not contract the disease if the beetle does not feed on them. In this project the team has been collecting beetles and offering them various species to feed on in a controlled environment. The team has learned a great deal about the feeding habits of the beetle. They have also identified three species of interest for follow-up projects based on these results. This data had been presented at two national research conferences and two regional trade show education programs. This work also won first place in a student research competition at one research conference. The funding from the grant enabled the team to purchase necessary supplies to conduct the research and to support the students travel to present the results.

Goals and Outcomes Achieved

This grant funding allowed the team to plant a conifer evaluation trial. Throughout the past two years there were losses in the trial, but there were also some successes. This evaluation planting will continue to be added to and data will continue to be collected since long term evaluation data is the most important to the green industry sectors that need this information. This planting will also serve as a continuing educational resource and will provide the background data for our conifer recommendation for years to come.

The three research projects outlined above are major steps forward in our knowledge of potential new conifers to add to our landscape and potential spread of pine wilt disease. The results have been submitted to peer-reviewed journals and accepted for publication. One M.S. student had completed his degree and a PhD student is advancing through his.

The results have been presented at research conferences.

The project team has hosted numerous industry and consumer events to discuss recommended trees and view the conifer plantings as successes and failures. These field days and hands on experiences are very effective in generating conversation and onsite problem solving.

A recommended conifer publication is at the editor's desk for formatting. It should be available in the spring, in time for spring planting season. This guide will be informative with color photos for consumers looking to add a conifer to their landscape.

Beneficiaries

The Kansas Christmas Tree Growers Association is one organization that has and will continue to benefit from this project.

Identifying species that can be successfully grown and sold as Christmas trees in the Kansas environment is critical to their operations. While this project did not have the time frame to follow through to harvest, its goal of identifying some species that will survive in Kansas and are resistant to pine wilt disease was successful.

The Kansas Nursery and Landscape Association is another organization that has and will continue to benefit from the project. Many nurseries have stopped selling pine trees due to pine wilt disease. However, their clients still demand evergreen trees in their landscapes. This project has identified several conifer species that are adapted to and will perform well in Kansas that are not susceptible to pine wilt disease.

Kansas Extension Master Gardeners reach thousands of Kansans every year. They have and will continue to receive training on recommended conifers every year. The information for this training will come directly from this project. In turn, the Master Gardeners themselves and the people they reach will venture to the above mentioned nurseries to purchase the plants that have been recommended from this project. The soon to be released recommended conifer publication will serve as a primary source of information for them.

The Kansas gardening public will hear and read this information through various outreach events. The recommended conifer publication will be downloaded from the website and information will be related verbally through numerous outreach events. Throughout the course of a year this information may be related to a thousand members of the gardening public through various speaking events. These individuals will then go to their local nurseries to purchase the recommended plants.

Kansas-grown trees used for lumber, Christmas trees, conservation, and windbreak plantings contribute \$1.35 billion dollars to the economy of Kansas and its citizens. It is the project team's hope that this project will help slow the decline in conifer plants across the state and perhaps offer new options to consumers wishing to plant conifers in their landscapes.

Lessons Learned

Kansas is the only state in the United States that does not have a native species of pine. In fact, the only conifer native to Kansas is Eastern Red Cedar, a species so adaptable that it can be grown in every other state. Therefore, it seems logical that it would be challenging to grow pines, and conifers in general, in Kansas. In fact, pines can be grown in Kansas fairly well if not for pine wilt disease. This disease is always fatal on susceptible species. Control measures have failed and preventative measures are unreliable. Simply put, growing conifers in Kansas is difficult. However, just because it is difficult, does not mean we should not try to improve the success of this valuable group of trees.

This project aimed to explore alternative conifers for Kansas as well as investigate potential species resistant to pine wilt disease. A conifer evaluation was planted to observe adaptability and ornamental characteristics for Christmas tree growers as well as the nursery and landscape industries. Unfortunately, Mother Nature had other ideas. Plants were planted in the fall of 2010. The following February our temperature dropped to a 30 year low. A well-established plant with an extensive root system is more capable of tolerating record temperatures than is a new transplant. Unfortunately the following spring there were several casualties in the evaluation, even among species that are known to be hardy in KS.

The following summer of 2011 saw a record setting heat wave and drought across Texas and Oklahoma. Most are unaware that heat and drought extended into southern KS. The city of Wichita set an all-time record for the number of days above 100 degrees. The US Drought Monitor also classified the area in an

Exceptional Drought. That drought has been unrelenting since. As of December 2012 the area is still in Extreme to Exceptional Drought and the summer of 2012 brought another round of record setting summer temperatures. Regional meteorologists are referring the past two summers as being 'historic' in nature.

The result for the project team's conifer evaluation has been devastating. Many species, that should be adapted to the area never had the opportunity to establish before they were tested by the climate. The losses have been severe. However, the species that have survived have proved to be among the toughest of the tough. Ideally the evaluation would have occurred under "normal" conditions and the team's information would be more relevant to the typical Kansan in a typical year.

On a positive note, the recent weather events have highlighted the need for conifer work. Pine wilt disease is expanding at an increasing rate due to the additional stresses placed on the trees. Also on a positive note, the team's work with the pine sawyer beetle (the vector of pine wilt disease) has been successful and provided additional information on the disease cycle that was not previously known.

As a result of the extreme weather, the project team was unable to make confident species recommendations regarding plant adaptability. It was difficult to discern which losses were due to genetic limitations and which were due to extreme weather. In hindsight it is difficult to imagine how the team could have predicted or prepared for such exceptional weather events. In the future the team plans to only spring plant their conifers in an effort to get them established before a dry winter. It is important to note that these conifer species are a long term crop and a two-to three-year evaluation is preliminary at best. The work that was accomplished with this grant will continue to be of value for the next ten years.

The project team also did not host the Christmas Tree Growers Association. This however, was because they had members who volunteered to host the meetings at their farms. The organization prefers this format to going to an unaffiliated location. The team has, however, attended their meetings to discuss the project and share the preliminary results as well as continue to extend an invitation to host their meeting. The team is scheduled to host their meeting in 2014. The project team has not yet completed the recommended conifer publication. The losses in our evaluation plot have them second-guessing their recommendations, and they are still trying to gather photographs to compile a document of information. This document will be completed in 2013. However, the team has had plenty of opportunities to share their thoughts on conifers with many professional groups over the past two years. They intend to continue to share their information with green industry professionals over the coming years.

Students Discover and Investigate Kansas Specialty Crops

Kansas Foundation for Agriculture in the Classroom

Grant Awarded: \$14,225

Project Summary

The primary purpose of this grant was to create awareness of specialty crops by creating resources for elementary third- and fourth-grade teachers. This was seen as a need for Kansas elementary students to understand specialty crops available to them in Kansas and to learn about those — and increase the consumption of these crops. KFAC created five written lesson plans featuring each of the following crops: pumpkins, potatoes, Christmas trees, pinto beans, and apples. Kansas Foundation for Agriculture in the Classroom (KFAC) summer course teachers created these lesson plans. The plans were then put into a KFAC format and background information was added as well as lesson plan extensions. A complimentary video was created for each of the written lesson plans. These show how the crops are planted, used in order for students to relate the video's star young people. The background material for each lesson plan is featured in the newly created chapter in the Exploring Plants, Kansas Crops Educator Guide. Grant dollars helped pay for a portion of the printing of this Educator Guide.

Project Approach

Five Lesson Plans were created featuring Specialty Crops:

- “Exploring Pumpkins” encourages the reading of books, so youth learn about pumpkins, features math as youth measure weight, height, circumference of pumpkins and graph data on mean, median, mode, and range of data. The Complimentary Video is titled: *A Learning Journey to the Pumpkin Patch*.
- “Frijoles on the Farm” features pinto beans, grown in northwest Kansas. Part one has a math focus as youth measure dry beans and soaked beans. Part two has a nutrition focus and math for recipe measurement as youth make refried beans. The complimentary video is titled: Frijoles Fun and has young people preparing the refried bean recipe.
- “Eyes to Fries” has a focus on potatoes, grown in southwest Kansas. This has a focus on the potato plant growth cycle. Students use math as they graph growth progress. The complimentary video is titled: Growing Potato's with Grandpa. It shows youth helping their grandpa plant potatoes, harvest potatoes and make French fries with potatoes.
- The “Life Cycle of an Apple” has a focus on the growth cycle of apples. It also has math as youth graph results of a taste test. Youth learn nutrition and recipe measurement as they make applesauce in a crock-pot. The complimentary video is titled: Things an Apple can Teach Us. Youth are learning fractions with apple sections, graphing results of taste test, and making crock-pot applesauce.
- “A Holiday Tradition” has a focus on Christmas trees. It includes technical reading of the background, a social studies portion about tradition of green trees during the holidays and location of types of trees. It also uses math to determine the height of a tree using a formula and a shadow. The complimentary video is entitled Bringing Green to the Season and provides awareness of different types of trees, compare and contrast deciduous trees with evergreen trees, and measuring height of the trees.

Currently, 15 teachers are receiving a stipend to pilot test the lesson plans in their classrooms. Three teachers volunteered to pilot test each of the lesson plans using a rubric and a pre-test and post-test for

each lesson plan. Early results back in on the pumpkin lesson plan indicate a high degree of leaning based on pre-post test scores. Also, there is a high degree of enthusiasm for finding a fun way to teach statistics. Youth did purchase pumpkins in order to measure information. They also had the option to consume pumpkin patch pie in a bag!

This list of partners for the project includes:

- Specialty Crops Grant
- CHS — printing of Educator Guide
- NRCS of Kansas — printing of Educator Guide
- Kansas Corn, Soybean, Wheat Commissions — printing of Educator Guide
- 15 pilot test teachers
- Kansas Farm Bureau — partner in presentation of Be Ag Wise Training 2012 and 2013
- 5 teachers who wrote the basic lesson plans
- Creator of Video lesson plans
- Mary Hammel – Graphic Designer
- Mary Anne Stoskopf – Volunteer, compiled and proofread book

Goals and Outcomes Achieved

1. Unit 5 Specialty Crops in Kansas pp 63 – 90 was created to include background information about Specialty Crops in *Exploring Plants Kansas Crops Educator Guide*. Two thousand copies were printed in October of 2012. More than 100 were distributed to teachers on a waiting list for this resource. Further copies will be distributed over the next several years with continued use of the lesson plans during summer course and Be Agwise training for teachers and volunteers.
2. Five lesson plans described above were created and pilot tested from Be Ag Wise participants January – March of 2012. Contracted with three classroom teachers for each lesson plan to pilot test and return pre-post tests and rubric to help improve the lesson plans.
3. Five complimentary video lesson plans were created to enhance the learning from the written lesson plans, to create interest and awareness of the featured specialty crops. These have been posted to a KFAC You Tube site and are featured on the front page of our website with connections to the written and video lesson plans.
4. 375 students will have completed pre-post tests measuring change in knowledge, skills and attitude with regards to the specialty crops as well as the curriculum such as math, reading, science, social studies. These results are just now coming in and will be tabulated and sent to KDA in a post report.
5. The web gallery of realistic pictures on the web was not accomplished due to loss of staff. However, the *Exploring Plants, Kansas Crops Educator Guide* has many clear pictures, tables, and illustrations in the Specialty Crops chapter pp. 63-90.

Beneficiaries

Direct beneficiaries will be the students of the teachers and volunteers who present the information on the specialty crops featured in the lesson plans or featured in the Specialty crops chapter in the updated *Exploring Plants, Kansas Crops Educator Guide*.

To estimate: 3 classrooms x 5 lesson plans x 25 students per classroom will be 375 students on which we will have measurable data for changes in knowledge, skills and attitude.

Also, 25 teachers x 25 students attended the class Pumpkin Math which featured the Pumpkin Exploration lesson plan. Teachers who attend the Be Ag Wise training in January – March of 2012 and of 2013 and NRCS in-service training in Spring of 2013 would give an accounting for 200 teachers and volunteers who teach in the schools. Summer course teachers in 2013 will be given the lesson plans and actually practice the lesson plans as a part of their training. On average there are 35-40 teachers in the summer course.

Connections with Chris Wilson, Kansas Tourism will afford the opportunity to introduce the lesson plans to farmers who host tours on their farm. It will provide them a resource to present to the teachers to support what they learned on the field trip.

Connections with Barb DePew, Kansas Department of Education, Nutrition Program, from Farm to Plate and Healthy Kansas Plate. Kansas Food Day will afford the opportunity to feature lesson plans on their website and display posters connecting to foods produced in Kansas that are served for school lunches.

And the indirect beneficiaries will be the farmers producing the featured crops as awareness and consumption increases for those crops.

Lessons Learned

It took a lot longer to produce the specialty crops chapter than planned. This delayed all the other components of the grant such as producing the lesson plans, video plans, and most of all pilot testing the lesson plans. *The main lesson learned is that it always takes longer to get teachers to implement programs and get their evaluations/pilot tests back to be taken in to consideration for changes in the lesson plans. Writing the lesson plans is considered a "moving target". Therefore the decision to create the background piece for teachers in the Exploring Kansas Plants Crops Educator Guide with complimentary lesson plans on the website is a good one, so we can continue to update the lesson plans and have them available to teachers "at their best"!*

A budget amendment of 19 percent was requested and approved as a result of these delays. *No money was added or subtracted from the budget it was just moved from travel expenses and contractor expenses to printing expenses. This helped pay for updated copies of the Exploring Kansas Plants Educator Guide.*

The project team still needs to get the results over the next few months as we get back the final rubrics and pre- and post-tests from the lesson plans. They will provide the results of those surveys to KDA as well as other partners in the funding of this project. *We have received several pilot tested lesson plan reviews back and teachers seem pleased with positive changes in knowledge scores. Attitude towards these specialty crops are more positive now as a result of the lesson plans as well!*

The teachers report that they are thrilled with the lesson plans and the educator guide.

Additional Information

One of the chapters produced for this project, "Frijoles on the Farm," is attached on the following pages.