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Cold Hardy Wine Grape Trials

Project Summary

Montana stands at the brink of a new opportunity to join other states in benefiting from the increase in local wine industries. Microbreweries and local wineries are adding to tourism and retail sales in all US states. Montana is currently ranked 49th out of 50 states in wine production. This is understandable since before spring 2012, no research or promotion had been conducted in Montana. Grapes and other wine fruits are being successfully grown in states with similar climates to Montana such as Minnesota, North Dakota and Nebraska. This is due to extensive research being conducted by University of Minnesota and Cornell University to cross the European vinifera with American native grapes.

A number of Montana producers had been unsuccessful in their attempts at grape growing because they have been trying to grow the European vinifera varieties. These varieties require anywhere from 2,400 to 4,000 Growing Degree Days (GDD). The new American hybrid varieties require 2,000 to 2,200 GDD. The hybrid grapes are much more likely to grow under Montana conditions with its short growing season and cold winters. Wine makers are making award winning wines out of these new grapes in other states.

The freeze that came in early October 2009 killed a number of tender grape varieties that were growing in western Montana. These vineyard owners were ready to plant again. The trellis systems are in and the irrigation lines set. It was perfect timing to establish a trial of the new American hybrid

grapes. Montana is ready to reap the economic benefits of increased wine drinkers by producing cold hardy grapes and other fruit suitable for wine production.

The object of this proposal was to establish four research plots in western Montana to test cold hardy wine grapes, the American hybrids. Each plot would test 12 new hybrid grape varieties. The plots were planted on land that is tended by farmers that already have grape production experience. One plot was established in Kalispell, one on Flathead Lake in Yellow Bay, one in Ronan and one in Plains, MT.

Western Montana's demographics are changing. Where there were once large expanses of cropland, there are now hundreds of small acre ranchettes. A number of these new homeowners are early retirees, above average income and education, from other states and are looking to do something "agricultural" on their land. Specialty crops such as wine grapes are an ideal fit for their lifestyle. These small acreage farmers are still an asset to the economy. The growing of grapes and other wine fruit helps keep the land in agriculture. The producer can sell at farmer's markets or to local wineries. Currently, most grapes that are grown are being used by existing wineries, much more can be grown to serve this fledgling market. Research shows that land on a southwest slope and on gravelly soil is optimum. The research trials have produced information that is now available to growers about grape production under other Montana conditions.

These trials are providing the data necessary for farmers to know whether or not wine grape production is feasible in western Montana. This helps farmers reduce the risk associated with trying a crop that has such a large upfront investment requirement. The trellis system and irrigation necessary for grape production would only be worth the investment if the success of the crop is more predictable. Montana stands at the brink of creating a unique wine industry based on cold hardy grapes and fruits.

Project Approach

Activities Performed:

- Four vineyards were planted: west Kalispell, Plains, Ronan and Yellow Bay spring 2012. Each vineyard was planted with a dozen each of nine different hybrid grape varieties. Each of these vineyards represents a different microclimate and diverse soil conditions. The growers have provided irrigation, labor and trellis systems. An additional vineyard was planted in Helena at the fairgrounds and is being supervised by MSU extension agent Brent Sarchet.
- A research assistant was hired and conducted routine checks of the test plots including documenting weed competition, vigor of plants, herbicide damage and irrigation rates.
- Dr. Hatterman-Valenti, the high value crop specialist from North Dakota State University (NDSU), toured the vineyards, met with the growers and did a public presentation on her research and the test plots in September 2012.

- As a result of the meeting of grape growers, a new Montana Grape and Winery Association (MGWA) was formed and a list serve through Montana State University created.
- June 2013, Dr. Hatterman-Valenti, NDSU and enologist, Katie Cook, University of Minnesota toured the vineyards and presented production and wine making techniques to the grape grower members. The 2013 field day had 28 growers in attendance.
- In June 2014, Dr. Hatterman-Valenti, NDSU, and Tim Martinson, Extension Grape Specialist Cornell University, toured the research plots and subsequently presented their findings at a field day in Kalispell, MT for the MGWA. National grape and wine trends were also discussed. The 2014 field day had 45 growers in attendance.

Goals and Outcomes Achieved

Project Goal: At least two varieties of cold hardy, wine producing grapes will be identified for having the highest potential for success in Montana.

Four replicated trial vineyards were established across western Montana. Each vineyard used the same varieties of cold hardy hybrid wine grapes. The plots were monitored and data collected.

There were a number of challenges experienced in this project. Three of the twelve varieties we wanted to test were not available from wholesale nurseries. The demand for these plants necessitates ordering one to two years in advance. The length of the project did not allow for a two year waiting period. Another obstacle was the host grower's difficulty in following research protocol. Irrigation and fertilizer was not applied as directed, herbicides were used on the property that drifted onto the grapes and clusters were not removed as requested. This was an unanticipated occurrence as other research plots for cherries, apples, hops and other specialty crops on farmer's fields organized by the county extension agent, Pat McGlynn had not run into this problem before. Grapes are a labor intensive crop and people keep trying to find a short cut. Site location is of immeasurable importance. The project identified a great deal about where grapes will be most successful. Barriers include wind, frost pockets, elevation and inadequate slope.

A significant unexpected benefit of the project was the formation of a new Montana wine and Grape Grower Association. This association is already setting future research priorities, making quality control recommendations and helping fledgling growers get started. These members are banding together to have a political voice to impact legislation regarding their new industry.

The association has submitted an abstract to create a research poster to be presented at VitiNord <http://www.vitinord2015.org/> in Nebraska – where the association can promote the grape research being conducted in Montana. The members will design a priority plan for future research. Research will be determined by the stakeholders themselves. The association will also be recommending what expertise they would like to have brought into Montana.

The Frontenac grapes proved to be hardier in most locations, but the Marquette grape was preferred by Montana wineries when available. Petite Pearl is anticipated to be another winner. This variety establishes slowly but appears to ripen early.

Project partners provided needed expertise. Montana does not have a grape specialist to educate prospective growers or enologists to educate the wine industry. Partners were hired and brought to Montana from North Dakota State University, University of Minnesota and Cornell University. The partners had 20 or more years' experience working with the cold hardy wine grapes in their respective states. They are also participants in the \$4.5 million Northern Grapes Project. The county extension agent, Pat McGlynn, provided leadership and managed the grant resources. New partnerships were created between institutions for future collaborations on research projects. These experts made themselves available for insect identification and grower questions.

Growers – Montana grape growers that are currently growing grapes and growers that are considering starting a vineyard, have benefited from this research project. This project has allowed us to determine the most suitable varieties available and what locations are most likely to be successful. A number of growers that have previously failed at production using the European vinifera Pinot Noir are now transitioning to Marquette and Frontenac, two of the cold hardy hybrids. Frontenacs and Marquettes have been identified as the varieties best suited to Montana conditions. Certain areas/microclimates near Flathead Lake can grow a larger selection of grapes. Some areas, such as Kalispell and Columbia Falls, present difficulties to commercial growing operations due to the low number of grapes that ripen not giving an adequate return on investment. However, certain areas, such as Sanders County, have also been identified as viable to support commercial growing operations. This transition is the direct result of reports from the Montana research project. New growers have reduced their risk of establishment by following the guidelines set by university experts brought to Montana through the grant.

The single most significant lesson that has been taught to Montana growers is the importance of managing weed competition in the vineyard. A large majority of the inexperienced growers were using herbicides that negatively impacted the grapes or allowed grass and weeds to steal nutrients and water from the fledgling plants. These plants never completely recover and are considerably less winter hardy due to the stress they endured. Leaving the soil open for the first three years is imperative to developing an economically viable vineyard. This necessitates physical cultivation but is worth it for a vineyard that can easily be there for 50 years.

Wineries – Montana specialists in making wine have benefitted from this project. The project brought a nationally recognized enologist from Minnesota to Montana to speak to the wine makers about the nuances of making wines with the new cold hardy hybrid grapes. These grapes have lower tannins and higher acid levels that must be corrected to create a palatable wine. The intention of having this enologist speak to the wine makers was to assist in developing high quality wine from the beginning and to avoid wasting winery resources. Partnerships between wineries and growers will also help in quality control. The wine maker can help the grower decide at what acid levels to harvest and the grower can let the wine maker know what varieties can be produced on a designated site.

Two new wineries are being built in Polson. At least a dozen growers have begun planting new vineyards. More than a dozen vineyards are in the planning process.

Montana Grape and Winery Association members – The meetings that were held as the outreach component of the research project inspired a group of growers to form the Montana Grape and Wine Association. This association was incorporated in July 2014. The purpose of this group is to help strategically focus future research priorities and identify professional development needs. The association is also planning on purchasing supplies as a group to save money for each small grower. Currently, the members of the association reside primarily in the western region of the state. This is due to the research project being located here. With over a hundred members already, the number is expected to grow substantially as recruitment continues across the state.

The association plans to hold several special events across the state. They are also interested in creating a unique Montana blend of fruit for a wine – for example, grape and Flathead Lake cherry or grape and huckleberry – that they will market as a specialty blend.

Montana State University Extension Agents and NRCS agents - through field days, research plot tours, media exposure and trainings – Montana agents have benefited by learning best management practices for grapes. This enables the agents to better answer Montana resident questions on the feasibility of vineyards on certain locations. Through private consultations, residents understand that all open space is not conducive to grape growing. If a vineyard is desired, certain criteria must be met. This includes soil texture and slope, wind blocks, sun exposure and adequate water supply. The agents can speak with confidence based on the findings of the research project.

Researcher - Using a portion of the travel funds, Pat McGlynn, Extension Agent, was able to attend the Viticulture 2013 conference in New York. This conference only occurs once every three years and is the one location where scientists from across the United States present the latest results of cold hardy grape research and introduce new varieties. McGlynn made contacts with a number of specialists that may be able to make presentations to Montana growers and wine makers in the future if deemed appropriate in the future. McGlynn also learned about frost protection methods and canopy management that will assist growers with Montana's short growing season.

The goal was to establish test plots and identify the best hybrid grape candidates for Montana and this was accomplished. Plots were planted, data collected, outside consultants brought in for expertise and results shared at two annual field days with growers. The 2013 field day had 28 growers in attendance and the 2014 field day was an even bigger success with 45 growers attending.

Beneficiaries

There are currently 110 Montana grape growers and wine makers on the list serve. More are added each week. An estimated 80 growers are currently growing grapes. Many of these growers are novice grape growers and have benefitted from the expertise we have brought in from universities working with the cold hardy hybrid grapes.

Lessons Learned

The positive result was that we were able to meet our goal of identifying the varieties of grapes that will be the most successful in Montana. Frontenac is the number one choice, closely followed by Marquette. Other hybrid varieties do well in certain microclimates.

Another positive result is that many growers are expanding their existing vineyards or starting new ones based on the research project results.

A negative result is that all four of the original plots did not survive. The plot in Ronan was hit with two early September frosts that killed the vines before they had hardened off for the winter. The west Kalispell site struggled due to the illness of the host farmer. He was unable to control the weed competition and see that the irrigation was properly working at all times. The research assistant did a good job of trying to help maintain the plot but it was not quite enough. This site continues to struggle. The Woods Bay site sustained an accidental herbicide overspray. Many of the plants recovered but lost a year's growth. The Plains site is rebounding after suffering from a lack of nutrients and resistance of pulling the fruit by the farmer host during the first season.

An unexpected outcome of the project was the formation of the Montana Grape and Winery Association. The group that rallied around the grape project is enthusiastic and forward thinking. They are setting future research and educational priorities for the group. Linking the wine makers and growers can only be a positive collaboration.

Before the research project, there were a number of residents that bought land, built a house and thought it would be romantic to install a vineyard where they could look at it. Now, we have the data that allows us to better consult with these people before they spend a great deal of funds on the infrastructure, only to see it fail. There is a tremendous amount of labor that goes into vineyard management. In general, the public does not understand the time commitment of a vineyard to be successful. If a client truly wants to build a commercial vineyard, we now have better tools to help them select an optimum site.

Outcomes were met and exceeded.

Extension Agent McGlynn has been conducting research on farmer's fields for years. In Montana, she has been studying sweet cherries, hops, apples, pears and plums. It can be a challenge when the experiment is not held under controlled conditions. The grape project needed to be studied in established vineyards since the grant did not cover infrastructure. This need for trellis, irrigation and fencing severely limited the options for the location of the new grapes. It was a challenge, from the beginning; to have the farmer hosts not always follow the research protocol. The continual problem was weed elimination without herbicide use. Grapes are extremely sensitive to herbicides. The other challenge was nutrient and water application at prescribed rates. These are problems farmers face with this crop. In retrospect, it is difficult to determine what should have been done differently to change this outcome.

The hosts are donating their time and property to the project. Experts were brought in by other universities to give the growers more. Their recommendations were consistent with the extension agents', but the growers would not always comply.

It is likely that these issues delayed production rate evaluation, but most likely did not alter the results of hardiness and vigor.

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Increasing Planting of Montana Certified Seed Potatoes in Home Gardens in Montana

This project's final report was previously accepted on 3/4/2014 in Montana's Second Annual report.

Project Summary:

The goal of this project was to increase distribution of Montana Certified seed potatoes throughout Montana. Increased planting of Montana certified seed in gardens in our state reduces the risk of introducing pathogens or other pests which could cause serious disease outbreaks resulting in monetary losses to growers. Marketing potatoes as garden seed adds value to certified seed potatoes and increased sales will enhance agricultural receipts. Marketing of seed potatoes has been enhanced through development and distribution of a garden seed directory including all growers who choose to list their varieties. Six new specialty potato varieties were obtained by the Montana Seed Potato Certification program and made available to growers increasing the selection for gardeners. The whole process was enhanced through development of education materials and media campaign including newspaper articles and radio coverage which educated the public on the importance of using Montana Certified potato seed. An unexpected positive outcome has been a productive partnership with Montana County Extension offices and agents in the execution of developing new marketing programs for garden seed potatoes.

Project Approach:

Develop a garden seed directory for distribution to all nurseries, garden centers and produce distributors in Montana. In 2011 we published and distributed a garden seed directory with color pictures and variety descriptions. An informational brochure on potato culture and important diseases was developed and distributed with the seed potatoes. In 2012, a section on potato culture in Montana which has recommendations for growing seed potatoes plus information on important disease and insect pests was added to the directory. In 2011 the directory was distributed to 850 garden centers and nurseries and in 2012 the distribution list was refined based on returned mail and was 575. The 2013 directory will be distributed at the end of this month with approximately the same distribution. In addition, we continue to provide directories for distribution by the Montana

Department of Agriculture and we distribute copies to interested parties at the Montana Seed Potato Seminar, the Idaho Potato Conference, the Washington/Oregon Potato conference, and the National Seed Potato Expo. We are actually producing 3 years of seed directories for this grant rather than the 2 that were originally planned. The directory has been very well received by the industry and has provided an additional marketing tool for our seed potato growers.

Obtain 4 new specialty varieties to expand the selection of varieties available to gardeners. Six new varieties (4 varieties were in the original grant) were distributed to growers in 2012 and included AmaRosa, Huckleberry Gold, Peanut, Rose Finn Apple, Russian Banana and Yukon Nugget. For the 2012 Crop year, 1958 plants were distributed to 7 growers. For the 2013 crop year, 1225 plants were distributed to 4 growers. In the original grant I indicated that it would be 2014 before enough volume had been produced of any of these varieties to have enough for sale. With multiple producers, we are actually ahead of that target and in this years' directory, all of the new varieties except Yukon Nugget will be available in limited quantities for listing in the directory.

Conduct an educational campaign to inform the public on the importance of growing Montana seed potatoes. Nina Zidack appeared on the Agricultural call-in show "Montana Ag Live" in the fall of 2011 and the spring of 2012 to promote planting of Montana Seed Potatoes by home gardeners, and answer questions on potato culture and pests. Nina Zidack gave an invited presentation December, 2011 to the Montana Organic Association on the Montana Seed Potato program and promoted the importance of using Montana seed potatoes to reduce the spread of diseases which are not currently present in Montana.

Nina Zidack appeared on Montana Ag Live 4 times in 2013 and during each episode, had the opportunity to reinforce the importance of planting Montana seed potatoes in home gardens. Potato culture and pest control recommendations were integrated into the garden seed directory as an additional outlet for this information. The garden seed directory was mentioned in a news stories on the Northern Ag Net which is broadcast on multiple radio stations and on KMON in Great Falls which has a daily agricultural show. Nina conducted interviews for the Great Falls Tribune and the Ronan Valley Journal and information on the importance of planting Montana seed potatoes was included. In early 2013, a unique opportunity presented itself. A county agent from Helena, MT approached Nina about distributing seed potatoes through county extension offices. He indicated that he had clients that had seen the garden seed directory and wanted to directly obtain some of these varieties. To introduce the program, I prepared a press release that was released through the AP and described the program and also discussed the importance of planting Montana Seed Potatoes to protect our seed potato farmers from the introduction of diseases and pests. The press release was also picked up by multiple radio stations. The growers agreed to supply the seed potatoes and we took orders from 33 Counties and 3 Tribal Extension offices including: Beaverhead, Broadwater, Cascade, Custer, Daniels, Dawson, Deer Lodge, Fallon-Carter, Fergus, Gallatin, Garfield, Hill, Judith Basin, Lewis and Clark, Liberty, Madison-Jefferson, Mineral, McCone, Meagher, Missoula, Park, Pondera, Powder River, Powell, Prairie, Ravalli, Sweet Grass, Stillwater, Toole, Valley and Yellowstone, Fort Belknap, Fort Peck, and Northern Cheyenne. A total of 6670# of seed potatoes was sold through this program. All of the potatoes for the orders were gathered at the Plant Growth

Center at MSU and Potato Lab staff packaged individual orders for the counties. The largest county total was from Lewis and Clark county with 1060#. Two counties, Ravalli and Lewis and Clark each had individual orders of 500# that went to market vegetable farms. The county agent in Ravalli county enlisted a Master Gardener to do a survey of local market farms to see where they historically purchased their seed potatoes. Most of them purchased seed potatoes from Spokane Produce and some directly from Irish Eyes in Washington. Their orders were already in place for this year but there was a significant interest in MT seed potatoes for their future production.

This spin-off project is an outcome of the interest generated by the garden seed directory. Many individuals had seen the wholesale directory and wanted to obtain some of the more unique varieties. While extremely successful, it was also very labor intensive and it would be logistically difficult to manage if the program grew. Based on the success of this program, we submitted an additional SCBG proposal to set up a distribution network with county extension offices. This will be for wholesale orders only.

An additional outcome of the garden seed sale was the opportunity for County Extension personnel to interact with new clientele that had never come into their office before. Because of this, they are very eager to participate in not only promoting the sales of Montana seed potatoes, but also disseminating information on why planting Montana seed potatoes is important to our seed potato producers.

Goals and Outcomes Achieved:

The publishing and distribution of the Montana Wholesale Directory for seed potatoes was the first formal marketing effort for garden seed potatoes in Montana, and has reached all MT licensed garden centers, nurseries, most grocery outlets that sell seed potatoes. Marketing through the directory has facilitated the creation of one new farm growing and selling seed potatoes specifically for the garden seed market. It has also generated new customers for existing garden seed producers. The press release which described new varieties of potatoes that would be available as a result of the program generated extreme interest amongst gardeners, and multiple requests for the new specialty varieties have been received. This year will be the first year those varieties are available and demand is expected to exceed supply at this point. Through the Extension garden seed sale, we were able to distribute Montana seed potatoes to 33 counties and 3 tribal offices. Many of those counties did not have Montana seed potatoes available to them through other outlets. Increasing the distribution of Montana seed potatoes to home gardens decreases the likelihood that we could import a disease or pest that could threaten the Montana seed potato industry.

The educational campaign that originated through press releases and the potato production and pest guide has been embraced by the County Extension agents throughout the state of Montana. This was demonstrated by their commitment to help with the garden seed sale in 2013, and their agreement to act as distribution centers for wholesale garden seed distribution in 2013.

Beneficiaries:

Ten Montana Seed Potato producers have already benefited from enhanced marketing opportunities from the garden seed directory and more growth in sales is expected.

Home gardeners throughout the state of Montana now have more disease-free specialty potato varieties available to them. We have no way to estimate the number of gardeners that purchase Montana Seed Potatoes.

County Extension offices have a new program where they can reach out to home gardeners and ultimately extend other services to those clients.

Lessons Learned:

While there is extensive demand for Montana Seed Potatoes by nurseries and garden centers throughout the state, it is often not economical for the grower to deliver small orders less than #500. It is too expensive to send #50 boxes through the mail, and unless the order is large, delivery costs are too high. This has impeded distribution to smaller outlets. This was the impetus for development of a garden seed distribution network through the county extension offices.

We did not expect the county extension offices to become such an integral part of this program. They enthusiastically embraced the purpose of this project – to increase distribution of MT seed potatoes to home gardeners while protecting the MT seed potato industry from imported pests.

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Additional Information

The Wholesale Directory for Montana Certified Seed Potatoes can be found on the website www.montanaspud.org

Benefits of Pulses as Ingredients

This project's final report was previously accepted on 3/4/2014 in Montana's Second Annual report.

Project Summary

Over the last three years (2010-2012), US farmers have had an average harvest of 1.2 million acres of dry peas, lentils, and chickpeas each year. Production has continually risen since 2002; yet, the majority of the crop raised in the US is exported to countries around the world. While the global population enjoys dry peas, lentils and chickpeas in many native dishes, domestic consumption of

pulses has remained fairly stagnant for over 20 years. However, recent trends in the US food industry suggest that pulses are perfectly poised to rise in popularity.

There is growing movement in the food industry to make the US food supply more nutrient-dense and to help address the current health issues facing the nation. With obesity and diabetes on the rise, food manufacturers are looking for ways to provide high quality foods that consumers enjoy, all the while reducing the amount of fat, cholesterol, and sodium in their product lines. Pulses offer food manufacturers a good source of protein, high fiber, low-fat, gluten-free and tasty alternative to current ingredients.

The USADPLC has been working with researchers and product developers over the past 5 years to help develop and understand the uses of pulses as ingredients: flours, protein, starch, and fiber. Feedback from this work has been very positive; however, the use of pulse ingredients is still a relatively new concept to many US food developers. Sample food items have been shown at trade shows around the county, yet there is still much need for product developers and other key decision makers in the US to be educated on the many benefits of pulse ingredients. Therefore, the idea of hosting a course solely focused on pulse ingredient applications was derived. Not only would this course help educate the food industry on how to make their product lines more healthful, it would also benefit the producers of dry peas, lentils and chickpeas. As value-added ingredients, the profit for pulse crops would be enhanced. Along with this, moving more dry peas, lentils and chickpeas into the domestic market would decrease grower and processor transportation costs significantly, all the while providing a more nutritious product to the end consumer.

A previous course was funded through the USDA/AMS Federal State Marketing Improvement Program. This course was in no way duplicating efforts as it educated a new class of food product developers. With pulse ingredients being a new concept to most food companies, continual education is a vital part in ensuring the implantation of pulse ingredients as a main stay for product developers. Course materials and speakers were chosen to build upon teachings from the previous course.

As stated in the original 2011 grant proposal, the USADPLC overall goal and objective for this project are as follows:

Goal: The USA Pea & Lentil Council will increase the usage of dry peas, lentils, and chickpeas in various forms as an ingredient in a variety of value-added food products.

Objective: To **EDUCATE/TRAIN** professionals of the food industry of the *benefits* of pulses:

1. **Nutritional Attributes** – Dry peas, lentils, chickpeas, and their flours are high in protein and fiber, low in sodium, fat, and cholesterol-free. They also provide a significant amount of folate, essential vitamins, and minerals.
2. **Health Benefits** – Can help reduce the risk of a variety of health problems such as obesity, heart disease, cancer and diabetes. Folate decreases the risk of neural tube defects (NTD) - most commonly spina bifida and anencephaly - in infants.

3. **Functional Properties** – Dry peas, lentils, and chickpeas, as ingredients, have unique properties that function to improve not only the nutritional quality of conventional foods but also texture, absorption, gelling of food systems.
4. **Innovation in Product Development** – Increased consumption of dry peas, lentils, and chickpeas will only be stimulated by educating the food industry of the new applications for pulses as ingredients.

Project Approach

In order to accomplish the goals set out by this project, the approach was to split it into three phases: planning, promotion and execution. The details of each step are explained below.

PLANNING

- **Venue and Date:**

The first step was to secure a location for the culinary course. After reviewing the accommodations of The Culinary Institute of America (CIA) and previous course work, the USADPLC decided to again host a course with the CIA. The Culinary Institute of America Greystone campus was secured for August 1-3, 2012. This location was chosen for a variety of reasons.

1. It is an attractive location for food industry members.
2. It is an attractive location for technical and culinary speakers.
3. The facility is equipped with the staff, classroom and kitchen facilities necessary to fulfill the full requirements of the course.
4. The CIA has contacts with several well-named speakers and chefs, which allows us better access to expert speakers.
5. The CIA will help assist in the creation of the curriculum for the course and will compile all information necessary for the course manual. This course manual was distributed to all participants of the course.



Figure 1. Photos of the Culinary Institute of America. Photo source:

<http://www.ciachef.edu/california/>

- **Program:**

The next step was to plan the program and develop the curriculum. The final schedule for the course can be found in Appendix A. The focus of the course was to provide targeted members of the food industry education on how to incorporate pulses into their value-added product lines. Therefore, the schedule included experts on pulse flours and pulse fractionations as well as chefs and speakers on consumer trends. The course was split into three segments; Day 1 included speakers on background material, basic pulse nutrition and consumer trends, Day 2 focused on technical applications and discussion of challenges of product development with pulse ingredients, and Day 3 focused on ongoing research in the pulse field and how pulses help to meet the growing consumer demands.
- **Curriculum development:**

In order to develop the curriculum for the course, Ali McDaniel consulted with culinary and technical experts at the CIA and Northern Crops Institute as well as pulse industry members and other staff at the USADPLC. The course curriculum was also structured so as to incorporate feedback from a previous course in 2011. The focus of the curriculum was on innovative ways to use dry peas, lentils, chickpeas and their fractions in value-added applications. In order to accomplish this goal, the menu items featured at the course showcased items that would translate well into value-added applications such as baked items, entrées for frozen meals and snack food products. The course was split into two types of learning: lecture style classes and hands-on culinary labs. Working with the staff at the CIA a 141-page manual containing background information on pulses, technical resources on pulse ingredients and over 100 recipes. These manuals were printed for each participant to take home with them as a resource after the course.

For the hands-on culinary portions, the course was again divided into two sections: a hot kitchen and a baking kitchen. In the hot kitchen, participants focused on ways to incorporate whole pulses into hot dishes such as entrees, sides, salads, and soups. On the baking side, participants focused on adding purees to baked goods as well as using pulse flours in a variety of baked good applications. Gluten-free baking was a specialty section of the baking side. Participants were able to interact with CIA Chef Instructors, Guest Chefs, and technical experts from Northern Crops Institute throughout the hands-on portion. This allowed for non-structured interaction between participants and instructors on how best to incorporate dry peas, lentils and chickpeas into their product line.

An additional section that was added to this course was a roundtable discussion. Participants were split into 3 sections to discuss pertinent issues surround product development with pulses. In order to determine how participants were distributed in each group, Ali McDaniel sent out an email prior to the course asking them to rank their preference among the 3 sessions. If participants did not respond they were informed they would be randomly assigned to a group upon arriving at the course. These sessions were moderated by our Speakers, Guest Chefs, and CIA Instructors/Staff. This format of these roundtables allowed for an interactive discussion among participants. Each set of

moderators had sample questions/topics to get them started and were allowed to discuss different topics as the group discussion developed. These sessions provided valuable feedback as to the types of development work still needed in the pulse industry to help product developers move forward. The topics for the roundtable discussions are below.

Round Table Group One - The Ups and Downs of Gluten-Free Baking

Moderators: Chef Aaron Flores, Finn and Porter, Embassy Suites

CIA Baking and Pastry Chef Richard Coppedge, C.M.B.

Round Table Group Two - Marketing the Health Benefits of Pulses

Moderators: Chef Walter Potenza, Educator and Restaurateur, Potenza Ristorante

Patricia Johnson, MBA, Global Food and Drink Analyst, Mintel International

Round Table Group Three - Overcoming Challenges Inherent to Pulse Utilization: Texture, Flavor, and Appearance

Moderators: CIA Director of Consulting Ted Russin

Noel Rudie, Ph.D., Director of Research, Harvest Innovations

PROMOTION AND EXECUTION

• Website Development

- The URL www.pealenticulinarycourse.com went live in May to help promote the course. The site included details on the date, time, and location of the event as well as speakers, topics and information on how to register for the course. Participants were able to register directly on the site which was linked to an excel spreadsheet to keep track of the registrants. Once an application was submitted it was reviewed by USADPLC staff for acceptance. All applicants were notified within 5 business days on the status of their application (accept or deny). This allowed the USADPLC time to assess the quality of the applicant. Once the participants were notified of their acceptance, they were instructed to confirm their attendance with Ali McDaniel and proceed with making their own travel arrangements.
- The course was also promoted on the USADPLC website www.pea-lentil.com, where participants were directly linked to the course website, www.pealenticulinarycourse.com.

- **Save-the-Date Cards and Invitations were designed** (Appendix C) and sent out to industry members and contact database at the beginning of May. These were also taken to industry trade shows to be handed out to interested participants. The save-the-date cards allowed us to inform food industry members about the course early on so that they could ask questions and have time to arrange their schedules.

• Trade Shows

Trade shows were also used to help promote the course. USADPLC attended key industry trade shows throughout the year where they promoted pulse crops as ingredients. At these

shows product samples were made available for tasting, informational brochures handed out, and the culinary course information provided. Below are a few of the key shows at which the course was promoted.

- **Research Chefs Association**

USADPLC staff attended the Research Chefs Association annual conference in San Antonio, TX March 21-24, 2012 where 1,200 research chefs and R&D professionals were in attendance. The USADPLC partnered with Northern Pulse Growers Association to sponsor the Regionals Breakfast where approximately 800 attendees gathered Friday morning. Attendees were treated to a gluten-free cinnamon pecan muffin made with pulse flour, a yogurt parfait topped with lentil and split pea trail mix and a breakfast burrito containing lentils. The USADPLC also exhibited a booth where a gluten-free cracker made with pulse flour was showcased along with hummus for attendees to try. Several attendees stopped by the booth to express their enjoyment of the items served at the breakfast. They were genuinely surprised and excited about the versatility of pulses. There was a lot of interest in the course and several attendees specifically asked to be included in the mailing list for the culinary course.



Figure 2. Pictures from Research Chefs Association 2012 Annual Convention in San Antonio, TX. Left- yogurt parfait with split pea and lentil trail mix, center- booth display, right- breakfast burrito containing lentils.

- **International Association of Culinary Professionals**

USADPLC staff attended the International Association of Culinary Professionals annual conference in New York, NY March 30-April 2, 2012. Over 1,300 culinary professionals were in attendance. The USADPLC exhibited a booth during the trade show portion of the course as well as sponsored a chef for opening reception. There was a lot of interest in pulses and new value-added applications. Several other exhibitors made it a point to stop by the booth and were interested in learning more about the course.

Over 1,000 attendees converged for the opening reception in Soho – New York’s fashion district – to sample dishes prepared by New York’s hottest chefs and experience “The

Fashion of Food.” The USADPLC partnered with Chef Brad Farmerie of the award-winning restaurant Public to develop and serve a unique recipe showcasing their versatility of lentils. The dish – Lentil Salad Summer Rolls with Pomegranate Molasses Dressing – received rave reviews at the event and via social networking sites, with Tweets like, “Shout out to @PUBLIC_NYC & Chef Brad Farmerie. Delightful lentil “sushi” at #IACP NYC opening night party!” Pulses were also featured in a number of other dishes at the showcase, including one developed by Chef Seamus Mullen of Tertulia, a James Beard Award finalist for Best New Restaurant.



Figure 3. Photos from the 2012 International Association of Culinary Professionals Annual Conference Exhibit Hall. Left – booth display, right- product samples and trail mix.

- **Institute of Food Technologist**

USADPLC staff attended the Institute of Food Technologist (IFT) Annual Meeting Las Vegas, NV in June. IFT is the premier event for food scientist and product developers. There were over 18,000 in attendance at the show this year, which was up from the previous year of 15,000. Booth traffic was heavy on all 3 days of the show and attendees were very interested in topics such as pulse flour and pea protein. A scientific session on pea protein also helped to drive traffic to our booth during the show. Extruded pulse snacks were showcased at the booth and were very well received. Save-the-date cards were handed out at this show and several attendees expressed the need for even more courses surround the topic of pulse ingredients. Several attendees expressed disappointment about not being able to attend the course this year due to scheduling conflicts; however, requested to be kept informed of future events.



Figure 4. Photos from the 2012 Institute of Food Technologist Annual Convention. Left- booth display, right- extruded snack samples.

- **Invitations**

Having collected contact lists from several trade shows, official invitations to the course were sent out. In order to save on postage, the USADPLC commissioned an electronic invitation be created. This invitation was sent out to our internal database of over 1,000 contacts as well as to contacts collected over the past year. For a copy of the invitation please see Appendix D. A follow up email was sent 3 weeks after the initial mailing to remind individuals to sign up.

Invitees were directed to the course website for more details and the registration page. Applicants filled out a form (Appendix E), which helped to shape some of the course content. A total of 30 applications were received and all were accepted after the review process (Table 1). Of these applicants 6 were unable to attend due to last minute circumstances; these are marked with an asterisks below. For all subsequent courses the USADPLC plans to implement a policy where participants leaving early or cancelling last minute will have to reimburse the USADPLC for their spot in the course (which is currently free to participants), except in extreme cases. This will help to ensure that all participants stay throughout the duration of the course as well ensure they do take a spot from others wanting to attend.

Table 1. List of culinary course applications received. *Denotes that the person did not attend.

First	Last	Company	URL	Title
Arlin	Wasserman	Changing Tastes	changingtastes.net	Partner
Claude	Matar*	Flamous Brands, Inc	www.falafelchips.com	Other R&D/Scientific/Technical
Jim	Broussalian	QSR Innovations	www.qsrinnovations.com	Director of Research/Technical Director
Rawaa	Hadid Matar*	Flamous Brands, Inc	www.falafelchips.com	Innovation Director
Kevin	Weber	The Cliff House	www.cliffhouse.com	Other
Neelesh	Varde	Roquette	www.roquette.com	Other R&D/Scientific/Technical

First	Last	Company	URL	Title
Kristen	Coad*	Roquette America Inc.	www.roquette.com	Bakery Specialist
Michael	Pate	Bay State Milling Company	www.bsm.com	VP-Research & Development
Suzanne	Slatcher*	The Good Bean	www.thegoodbean.com	Owner/COO
Sarah	Wallace	The Good Bean, LLC	www.thegoodbean.com	Innovation Director
Shari	Robins*	Penguin Natural Foods	www.penguinfoods.com	Product Development Chef
Bonnie	Chau	The National Food Laboratory, LLC	http://www.thenfl.com/	Food Scientist/Technologist/Food Engineer
Polly	Sang	Compass Group USA	www.compass-usa.com	Food Scientist /Technologist/Food Engineer
Erika	Smith	General Mills, Inc.	www.generalmills.com	Food Scientist /Technologist/Food Engineer
Nestor	Ramirez	Sensient	www.sensient.com	Research Chef
Barry	Nadler	Harvest Innovations	www.harvest-innovations.com	President
Jean	Holland	Fiberich Technologies	www.fiberichtech.com	Other R&D/Scientific/Technical
Sarah	Ramrattan	JamWest Foods	www.jamwestfoods.com	Product Development Chef
Sham	Ramrattan	JamWest Foods	www.jamwestfoods.com	Nutrition Specialist
Shely	Aronov	Oren's Hummus	www.orenshummus.com	Other
Rachel	Carlson	Northern Crops Institute	www.northern-crops.com	Food Scientist /Technologist/Food Engineer
Aram	Sloan	Basic American Foods	www.baf.com	Food Scientist /Technologist/Food Engineer
Sarah	Ramrattan	JamWest Foods	www.jamwestfoods.com	Innovation Director
Deepa	Shenoy	Crunchfuls Inc	www.crunchfuls.com	CEO and Founder
Chris	Follari*	Sodexo	www.sodexousa.com	Corporate Executive Chef
Mitchell	Fishman	Sodexo	www.sodexousa.com	Corporate Executive Chef
Scott	Nagel	Truitt Brothers	www.truittbros.com	Marketing
Shawn	Hayes	HealthCorps, Inc	www.healthcorps.org	Chief Academic

First	Last	Company	URL	Title
				Officer/Research&Ed
Kevin	Gross	Culinary Sales Support, Inc.		Managing Partner
Scott	Knue	Culinary Sales Support, Inc.		Research Chef

Goals and Outcomes Achieved

Overall, the course was very successful at obtaining the goals and objectives set forth by the USA Dry Pea & Lentil Council. All of the participants left the course feeling very enthusiastic about the possibility of using more pulse based ingredients in their product lines. Participants were all very complementary of the course and the information gained throughout the course. The main goal of this course was to EDUCATE the food industry on pulses as ingredients and 100% of participants that completed the survey had an increased knowledge of pulse ingredients after the course. This finding is very encouraging and helps the USADPLC to know that the course was indeed successful at achieving its goals. Several other benchmarks were included to help determine the success of the course and these are outlined below.

Goals and Performance Measures as stated in the original grant application

GOAL	Benchmark / Target	Performance Measures*
Education	<p>A. Increase Awareness</p> <p>B. Sample and information requests for DPLC flour, flakes, purees, extrudes, etc.</p> <p>C. In-house sample usage through product trial run</p> <p>D. Incorporation of DPLCs in commercial products - At least 75% of the participants in the process of developing at least 1 new pulse-based product</p>	<ul style="list-style-type: none"> Completed surveys, course registration and company representation Number of completed ingredient sample and information requests Overall course interaction between experts and food industry professionals (TBD with tape recording review) Post-course surveys to determine how many commercial products are being developed as a result of the effectiveness of the course
Industry Promotion	Increase the number of new domestic value-added processor members to Council	Signed new value-added membership contracts

***Each of the performance measures is outlined below.**

- **Completed surveys, course registration and company representation**

Participants of the course were from some of the top food companies in the US including companies such as General Mills, Sodexo, Compass Group, and Bay State Milling (see Table 1 for complete listing). The fact that these companies decided to spend money and time to send their employees to this events, tells us that they too see the value in pulses as ingredients. Having even one product come out of this course within such high profile companies would have a significant effect on increasing domestic pulse usage and there is a strong possibility we will see even more products than that.

In order to help us determine the success of the course and the format, surveys were administered to participants after Day 1 and 2. Examples of these surveys can be found in Appendix E and the complete results are found in Appendix F.

Sample comments on the best part of the day:

- The hands on sessions.
- Gluten free baking strategies.
- Speakers, topics, timing, professionalism.
- Product Claims, Round table discussions.
- Education about nutrition/fortifications.
- Hands on baking was great. Chef Richard was so knowledgeable.
- Great across the board.
- Clearly the hands on portion of the day.
- How useful and sustainable pulses are. Essential to being green.
- Overall experimental education was good.
- Learning from other disciplines about the use of pulses in baking/cooking.
- Horchata tasting and discussion.
- Best part was the round table discussions- they were invaluable and helped so much!

Sample comments on ways to change the day:

- Pure Hands on.
- The use of pulses in recipes is provided without a good explanation of why. How do they behave? This may be due to the chefs not knowing that.
- Noel's presentation was very technical and I was definitely not the right audience.
- Less demos, more hands on cooking; start day with culinary challenge.
- Some of the presentations were too technical. Hard to understand, not everyone is a scientist. Background information would have been helpful.
- More interactive discussion and hands on.
- More stats on consumer behavior and menu strategies.
- More hands- on; more interaction with CIA staff.
- I think the session was good, maybe less topics with more time for discussion, for extra topics.

From the comments you can see that overall the feedback was very positive; however, there are also some very constructive points to be considered for subsequent courses. Participants repeatedly mention they would like more unstructured time to discuss with instructors and other participants, so this is something that we will take into account for future courses.

- **Number of ingredient sample request**

In the post course survey participants were asked if they would like to request samples of products. Of the 19 participant responses only 5 did not request any samples, meaning that 74% of respondents did want to receive samples. The precooked flours were the most requested items with chickpea, yellow pea and lentil flours having a 57.9%, 57.9% and 47.4% requests respectively. This is very encouraging that companies want to continue to product development even after the course. Samples from member companies were sent to participants and the USADPLC will continue to follow up with the companies to determine what additional needs they have.

- **Course Interaction**

Another major goal of the course was to help facilitate interactions between participants and culinary and technical experts in attendance. Several participants mentioned the interaction as one of the best parts about the course. To help document this interaction the course was filmed to document the interactions. To see the finalized course video please visit <http://www.youtube.com/watch?v=998QnQuSbJo>. You can also see a time-lapse video of the culinary portion of the course by visiting <http://www.youtube.com/watch?v=KeivCMRYMwM>

- **Post Course Survey**

A post course survey was designed to see how participants felt after having left the course and begun the product development on their own. This survey was filled out by 19 of the 24 total participants giving us a 79% response rate. A copy of the survey questions can be found in Appendix G and the results are summarized in Appendix H.

Some of the key findings from the survey were as follows:

- Prior to the course only 26.4% of respondents were knowledgeable or extremely knowledgeable about dry peas, lentils and chickpeas. Following the course this number rose to 94.7%.
- After attending the course 89.5% of respondents agreed or strongly agreed that they feel better equipped to incorporate dry peas, lentils and chickpeas into their line of work.
- In regards to the format of the course, 78.9% felt that there was good balance between the hands-on activities and lecture portions.
- For the roundtable discussions 57.3% agreed or strongly agreed that these were valuable to the course.

Sample comments on best parts of the course:

- Hands on culinary sessions

- Very interactive
- Round table discussions
- Cooking with chefs
- Lectures and cook-off competition
- Manuel to review after course

Sample comments on missed topics:

- Differences between flours and functionality between applications
- Pricing
- Pulses in liquids/ healthy drinks
- More marketing: e.g. within the industry, promoting a crop, promoting a company, menu applications, and operator-oriented efforts, promoting a foodservice or retail product.
- Link between sustainability and cost of other proteins

Sample comments on how to improve future course:

- Provide a lecture course on functionality of flours
- How much of each to replace standard wheat flour.
- During our hands-on session experiment with different flours to determine functions (or fails to function) in a product (i.e. bakery product). This would be like a product development or R&D session.
- Limit the amount of science based information
- Have business owners speak about the issues they face in bringing their products to market
- Longer round table sessions. Or have a discussion session in the lecture room.
- More explanations/teachable moments during demos
- Similar format with focus on Mediterranean cooking

Based off of the collective feedback, the participants did feel that the course helped to educate them and make them better equipped to utilize pulse ingredients in their products. However, to improve the course additional sections on market analysis and pricing and sourcing of pulses should be included. As product developers become more aware of the technical applications of pulse ingredients these other topics will become more important to other areas of companies such as marketing and supply chain. By covering these topics the USADPLC will better help product developers build the case for pulse ingredients within their companies.

- **New signed Value-Added Memberships**

Yet another goal for the course was to help obtain new value-added members for the US Pea & Lentil Trade Association from the course. After the course, Fiberich Technologies signed up for membership of the US Pea & Lentil Trade Association. This is considered a success for the pea and lentil industry as new members help expand the reach and knowledge of the industry. When requests are made to the USADPLC, it looks to its membership to be able to provide products and

samples. We hope that more companies from the course will continue to sign up for membership in the coming months.

Beneficiaries

The primary beneficiaries of this project are the nearly 1,300 farmers growing peas, lentils and chickpeas in the US. Over 1/3 of the production is coming from Montana farmers, who represent the majority of production in the US for peas (47% in 2012) and lentils (43% in 2012). Pulse crops serve as excellent rotational crops for farmers by increasing the available nitrogen in the soil. Not only does this help reduce the need for fertilizers, it also helps break disease cycles for other crops such as wheat and barley. This is extremely important to farmers as it helps to control cost and ultimately makes their fields more fruitful.

This project helps the farmers by making pulse ingredients more appealing to product developers, research chefs, and executive chefs at major food companies. The 74% of the companies in attendance responding in follow-up surveys that they would like pulse ingredients to experiment with is evidence that the farmers are benefiting. Increased awareness among food companies will lead to an increased demand which in turn helps farmers.

The indirect beneficiaries of this project are the US food companies and the US consumer. For the food companies, this project is educating them on new ingredients, which are functional and nutritional. By helping more food companies to incorporate pulse ingredients in their product lines the consumer is ultimately benefited, because they have access to healthier value-added foods.

Lessons Learned

Overall the project was successful with very few hiccups. All of the goals and desired outcomes of the project were accomplished; however, there were a few logistical lessons learned that will make future courses more effective. The major learning came in the course registration. The USADPLC found that several companies do not finalize their travel schedules until a few weeks out. This meant that outreach to companies in the month prior to the course extremely important and useful. Another lesson learned was there needs to be some plan in place for participants cancelling last minute. The last minute cancellations mostly came through participants who registered further in advanced, meaning that continual confirmation of participants is a very important aspect. Although there were still enough participants at the course to have a full class, these last minute cancellations took the place of other potential participants.

FUTURE WORK

The USADPLC will continue to follow up with the participants to track the development of product development work during the course of the next year. We hope to be able to continue listing success stories that have developed in part due to this course. The USADPLC has already gotten inquires about when the next course will be and thankfully will be able to host a different course in 2013. The Montana Department of Agriculture has awarded a second Specialty Crop Block Grant for the 2013 year to host another product development course. The course will seek to educate an

entire new class of participants, thereby further increasing the knowledge of the food industry in regards to pulse crops as ingredients. Using the feedback from this year's course, the USADPLC hopes to continue assisting the product development efforts for value-added foods containing dry peas, lentils and chickpeas on the domestic market. Healthy food trends will continue to demand more of food companies, and the USADPLC feels that pulse ingredients are going to assist them in meeting these growing consumer demands.

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Additional Information



Appendices A-E.pdf

Promoting Good Agricultural Practices (GAP) and Good Handling Practices (GHP) for Food Safety and Marketing in Montana

Project Summary

This project proposed to expand opportunities for specialty crop growers, buyers and regulators to learn about GAP/GHP, its purpose, methods and implementation. The primary audience was specialty crop growers, who by implementing GAP/GHP will gain a competitive advantage over non-GAP/GHP farmers marketing to fresh produce and other agricultural technical assistance providers about GAP/GHP to better equip them to assist specialty crop growers with food safety plans. This project was also intended to educate specialty crop food buyers and their regulators about GAP/GHP, what it is and what its benefits and limitations are.

Project Approach

After much planning and discussion among the interested parties, two events were scheduled. A three part Good Agricultural Practices (GAP) webinar series was held in February, which was taught by Cornell GAP experts and included 21 participants. A three day training was scheduled in September. The three day GAP training was held on September 9th – 11th. The training on the 9th was on the basics of GAP, the 10th was targeted towards producers where they had the opportunity to work on their farm food safety plan, and the 11th was targeted towards educators/trainers with a discussion on future GAP education efforts in the state. The instructors were Dr. Elizabeth Bihn and Gretchen Wall from Cornell University, two of the most respected GAP instructors in the country. The training was attended by 36 people, 13 producers and the remaining was a mix of educators, county

sanitarians, food manufacturers, etc. The training received favorable evaluations. The training provided an opportunity for those interested in pursuing GAP education in Montana to discuss strategies about going forward.

Goals and Outcomes Achieved

The original objectives identified in the original application included:

- **Objective 1.** Educate the target audiences on the market- and food safety-driven need for GAP/GHP, what it is and how it works.
- **Objective 2.** Provide GAP/GHP training across the state to specialty crop farmers and other target audience members.
- **Objective 3.** Provide follow-up to the trainings by offering expert review of growers' GAP/GHP plans, and assistance with their audit preparation upon request by training participants.

The three part webinar series and the three day training offered in Montana partially filled objective 1 and 2. Objective 1 had a target of six public presentations, one in-person training was conducted and three webinars were developed and made available to the public. Objective two had a target of 180 growers being trained on GAP/GHP, thirteen growers attended the in-person training and data were not tracked on the number of growers viewing webinars. The audiences were smaller than originally planned for in the original application. Future plans include sending two Montana State University educators to a trainer certification program conducted by Cornell University in New York in December, 2014. Additional educators will be trained, so objective 3 can be accomplished outside of the timeline of this project.

Objective 3 had targets to assist 96 farmers with GAP/GHP planning assistance and 24 farmers in audit preparation. No farmers were assisted. Follow-up and farmer assistance training sessions, were not performed during the period of this grant as a result in delays in the role out of GAP/GHP guidance at the federal level. Further description is provided in the lessons learned section. The State of Montana and Montana State University plan to partner with other agencies in Montana to host these trainings in 2015.

Beneficiaries

The beneficiaries of this project included: vegetable, fruit, and lentil growers, food sanitarians, buyers of farmers' raw products, including school and other institutional food buyers, and managers of student produce farms and gardens. There were a total of 36 beneficiaries that attended the webinar and trainings, which were a mix of fruit and vegetable producers, educators, county sanitarians, food hub representatives, farm to school representatives, and community garden representatives. The economic impact of the project is uncertain. Additional GAP education efforts outside of this project will give a better insight on the economic impact of GAP education.

Lessons Learned

Through this project, we discovered how many different people, organizations, agencies, etc. are impacted by GAP and can benefit from GAP education. Future GAP education efforts need to include many of the partners that have a hand in GAP education. GAP education is a natural fit for Extension, and they were left out of the original application. Extension was brought into the project after year one which allowed little time to complete all of the objectives laid out in the original application. Future efforts will include not just Extension and Montana Department of Agriculture, but also county sanitarians, wholesale buyers, community garden representatives, etc. The training was held in September, which was not an ideal time for producers to leave their operations and attend trainings, but it was scheduled due to the time constraints with this project's scheduled completion date. Even with the less than ideal date, there was a good turnout of producers, which demonstrates the need for this education.

Expert trainer sessions were delayed to 2015 pending the FDA's approval of Cornell University's train-the-trainer curriculum. It was determined by the subgrantee and the State that the additional benefit of offering Cornell's certification training was significant enough to justify allowing the goal to be achieved outside of the scope of this grant. The State of Montana and Montana State University plan to partner with other agencies in Montana to host these trainings in 2015.

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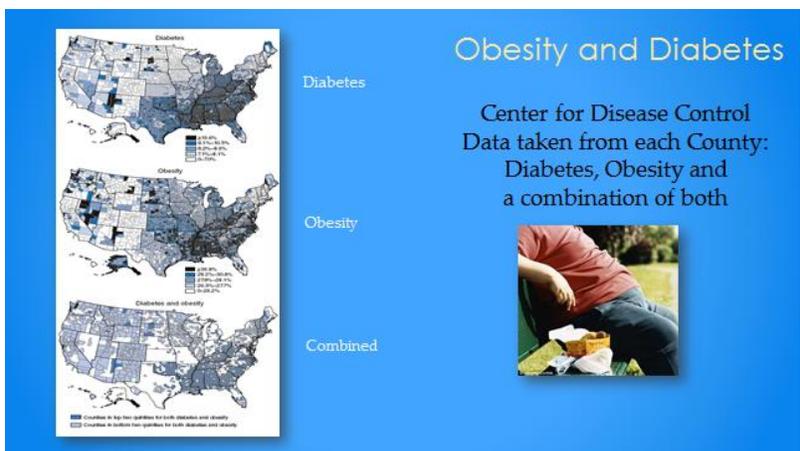
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Low Glycemic Potatoes, a Value-Added Crop for Montana

Project Summary

Potatoes are a dietary staple across the US and the world providing valuable carbohydrate and vitamins with minimal fat. However, most varieties of potato have high glycemic index. Consumption of these potatoes elicits a very rapid spike in blood glucose levels, which is undesirable in individuals who are overweight or have diabetes. Varieties of potato with low glycemic index have been identified and are commercially available in niche markets in Denmark and Australia, but are relatively unavailable in the United States. The goals of this project are to identify low glycemic index potato cultivars that are adapted to Montana and to introduce these varieties to Montana seed potato producers. The objectives of this project included screening potato cultivars for GI index, generating disease-free microtubers, and evaluating cultivars in the field. Low glycemic index cultivars were identified for production in Montana and a preliminary feasibility analysis was completed to estimate consumer demand and farm value. The project participants will continue to pursue development of this project for field analysis (seed potato and potato), scale-up for the selected cultivars, and complete human GI and taste testing as funding is identified and secured.

Importance and Timeliness: The Montana Potato Seed industry is a strong contributor to Montana’s economy with its main thrust of production being supply of virus free germplasm to potato growers in the western states. The principal variety produced is Russet Burbank for the chipping and frying industries. This project was initiated to look into a specialty niche market based on glycemic index modeled after the successful entry of the “low glycemic Carisma” potato in Australia. Glycemic Index is used by nutritionists as a measure of glucose release into the blood from a food over a period of time after eating. The higher the index, the quicker the release of glucose, a function of starch conversion to glucose due to action of amylase (starch degrading enzymes) produced during digestion. Rapid release of glucose causes a cascade of effects, a sugar high followed by a sugar low one to two hours after ingestion. Everyone is at least vaguely familiar with this phenomenon to some extent. Nutritionists point out that people who suffer from diabetes Type I and Type II are adversely affected by wild swings in blood glucose and should avoid high glycemic foods. Given the size of the population in the US that is diabetic or prediabetic, there might be a sizeable market for low glycemic potatoes. There is an increasing awareness of Glycemic Index of foods and large lists have been compiled for the benefit of the consumer who may be concerned with health issues including obesity, heart problems or diabetes.



Background: The objective was to develop a series of screens based on the straight starch to branched starch ratio of potato varieties and these assays would be able to produce a candidate list of potatoes (Table 1) that could be used by the seed potato industry in west/central Montana. In addition the varieties might be produced in a table potato industry in Eastern Montana, a separate industry from seed production.

Starch in potatoes in simplest terms, is either a long straight molecule (amylose) or a branched form of starch, amylopectin (Figure 1.). The ratio of the two correlates with the glycemic index in that straight starch when cooked can supercoil, making it less easily digested, whereas amylopectin due to its branches cannot coil up and this open form is more easily digested and assimilated into blood sugar. The initial advent of modern plant breeding was promulgated by the research of Gregory Mendel in the 1800’s who found that wrinkled peas (Figure 2) were recessive. They appear to lack a starch branching enzyme and as a result their starch granules are small and fractured. The starch granules of wrinkled peas were compared with round peas using microscopy (Figures 1 and 2) and

confirmed that there is a great visual difference between the two. The wrinkled pea starch granules were definitely smaller, and more fractured. The starch granule from round, plump seeds were large and plump as well.

Project Approach

The overall goal was to develop low- glycemic index crops suitable for production in the state of Montana. The glycemic index (GI) of a food is determined by feeding the food to test subjects and measuring the effect on blood glucose. The study involves human subjects (10-25 per food) and is subsequently very expensive (estimate \$10,000-25,000/per food). The expense of this human assay precludes its use as a tool to screen crop populations and select low GI varieties. The first objective in this proposal was to develop quick and inexpensive laboratory analyses to estimate the starch profile of potatoes or seeds. The starch profile is a significant determinant of the glycemic index. Once the laboratory assays are developed, they must be validated in order to accurately predict the glycemic index. The SCBG funding was used to optimize the laboratory assays, screen a large collection of potato germplasm to select varieties with the most promising starch profile, and confirm that the selected varieties are adapted to Montana.

Over the period of the grant, we have done preliminary consumer acceptance and demand research. In our market research we found that the Carisma potato in Australia, which has been successfully marketed for its low glycemic properties, was marketed *after* glycemic testing was done at the University of Sydney. Carisma is sold exclusively by one grocery store in Australia and sells for double the price of traditional potatoes. Additionally, there is a certain variety of potato in Peru, which we recently received and are now included in profiling, that is recognized as safe for diabetics as part of their cultural tradition and ancient wisdom, without scientific research, testing or marketing. Discussions were entered with state rural economic development centers regarding a feasibility study, but are on hold waiting for the product to be run through human glycemic index testing.

The marketing phase of this project was not fully implemented as a result of the need to develop/design several modifications of the existing starch (amylose: amylopectin) assays to adapt them to potato tissue. This took trial and error and was more time consuming than we planned, thus missing an important planting date in 2014. Of course our main costs are labor associated. Without the appropriate assays, it wouldn't have been able to select the top five varieties (cultivars) for the low glycemic trait. During these delays we were able to come up with a low glycemic potato variety that is also high in lysine, a marketable nutritional feature that no other potato can claim. Although marketing was not done to the extent planned in the original proposal, this project has brought us significantly closer to a marketable potato with desirable glycemic traits.

Goals and Outcomes Achieved Goal #1. Provide another healthy food choice for prediabetic and obese people. Performance measure: identification of potato cultivars adapted to Montana that have low glycemic index.

Target: identify potatoes that can be certified as having a low glycemic index that are adapted to MT growing conditions.

1. **Microscopic visualization of starch granules. Our preliminary assay.**

This assay using microscopy provided us with a simple and rapid screen of hundreds of potato varieties. The potato cultivars were obtained from several sources including USDA Potato labs in Aberdeen Idaho, Madison Wisconsin, and from commercial seed companies and from a private breeder in Washington State. The cultivars were greenhouse grown at Montana State University and were sliced to compare starch granule type, and starch was extracted for the second spectrophotometric assay.

There are two types of starch (Fig. 1). Amylose is a straight chain of glucose molecules. It is digested rather slowly because digestive enzymes only work on the end of the chain. Amylopectin or branched starch consists of huge branched chains of glucose (The structure is actually similar to the branches on a tree). Amylopectin is digested rapidly because the enzymes can release glucose from the end of every branch point.

Seeds with a high content of amylose tend to be wrinkled. Amylopectin takes up more room than amylose and seeds with a high content of branched starch tend to be plump. Breeders and farmers will pick the plump seed every time even though the wrinkled seed is has vast nutritional advantages. Potatoes are propagated from other potatoes. Only a few producers in the US actually use seed. The starch molecules in the potato flesh were examined. The majority of potato varieties had large round starch molecules. A few varieties had cracked, wrinkled granules (Fig. 2).

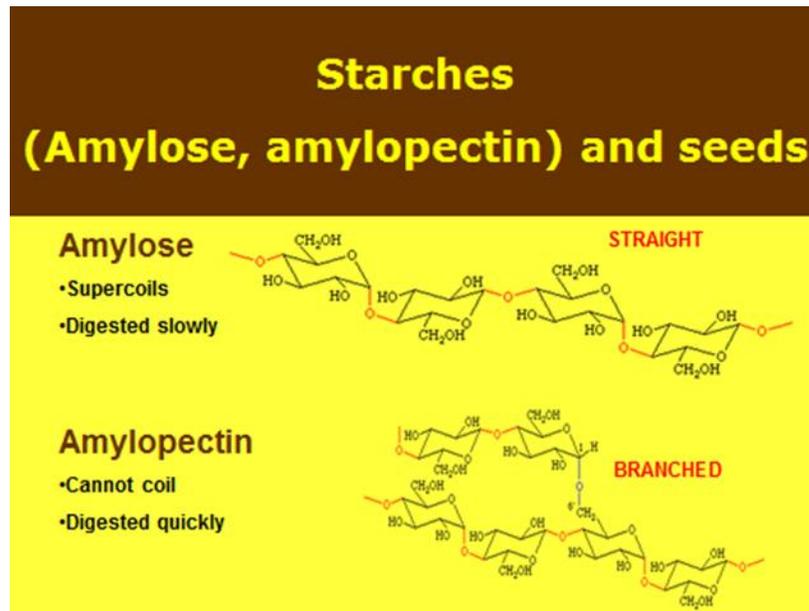


Figure 1. Starch Structures



Figure 2. Effect of starch type on starch granule shape and on seed shape

2. Biochemical Spectrophotometric Assay of extracted Starch.

The second assay was derived from published standard biochemical methods and involved the difference between amylose and amylopectin using spectroscopy comparing absorption ratios of light at several wavelengths after the starch had been stained. Using these two assays, a ranking of available lines of potatoes (Table 1) was developed with the highest amylose lines listed at the top in descending order. The microscopic analysis of the starch granule correlated with the Spectrophotometric analysis of starch profile and can be used to rapidly eliminate potato varieties with a high content of branched starch. The top 10 cultivars include two commercially available lines, a positive finding in that their agronomic and table traits have been proven to be market acceptable in the table potato category. All top ten are being increased and 50 pounds of the Green Mountain cultivar has been ordered from a commercial seed producer. This will be held for Glycemic Testing in humans if supporting funds can be found. The germplasm is made available to the Montana Seed Potato Association (Director Dr. Nina Zidack, Montana State University), for virus free verification and cultivation in tissue culture.

Table 1. Percentage of amylose in freeze dried potato tissue. Results of laboratory starch screening to date (December 2013). A high number would indicate a high content of amylose (straight starch) and should correlate with a low glycemic index. An additional 80 lines of potato were screened that are not included in this table. They all had amylose percentages below 28.

Potato Variety	% Amylose	St. Dev.
Green MT	45.1	9.2
Norland	34.4	5.2
661983	32.9	0.1
Yucon Gen	32.7	2.3

Multa	31.7	2.0
Oct Blue x Col Rose	31.1	2.2
Alaska frostless	31.1	1.8
Kuchi Akita	30.8	2.8
Anolla	30.6	1.9
Lumper	30.3	3.5
Marble Gold	30.0	1.6
Gorbea	30.0	1.4
Arma	29.9	0.4
Charlotte	29.7	1.2
Centennial Rush	29.6	1.9
Sassy Lassy	29.5	1.7
L. Range x A trope	29.5	1.3
Cherry Red	29.4	0.6
BiddyTaro	29.1	0.6
Red Pontiac	29.0	1.2
Bison	28.8	1.3
Monona	28.8	0.7

Goal #2. Develop a new market for Montana Grown seed potatoes with certifiable low glycemic index character.

Target: identify potatoes that can be certified as having a low glycemic index that are adapted to MT growing conditions and that are available from the Montana Certified Seed Program.

The development of Low Glycemic Potato cultivars will continue through 2015. Montana State University has successfully competed for a USDA WSARE grant to continue with variety analysis, and agronomics. Due to challenges outlined in the lessons learned section, there was not significant progress on this specific goal.

Beneficiaries

US consumers continue to focus on nutrition and are increasingly willing to pay more for quality foods with improved carbohydrate content. This market sector is increasing and Montana State University intends to establish Montana as a significant player. The future value of low GI potatoes will depend upon our ability to establish demand and consumer recognition.

Introduction of Low GI Crops will benefit:

Consumers: There are 110 million diabetic and pre-diabetics in the US who need to avoid high glycemic index foods. In addition, over 60% of the US adult population is overweight or obese and could benefit from foods with lower glycemic index. These consumers are forced to avoid potatoes or minimize consumption due to the high GI. The market for low GI foods is increasing in the US. Demand in Australia and Europe, would indicate that there will be similar demand for low GI potato in the US.

Seed Potato Producers: The impact on certified seed producers is dependent upon the magnitude of demand for Low GI potatoes. In Montana, there are ~30 seed potato operations (~10,400 acres). In 2010, the estimated value of MT seed potato was over \$32 million. Establishment of production and demand for low GI potato could increase the acreage, the value, or the number of producers. As demand for the potato increases across the US, demand for disease-free potato seed will increase.

Commercial Potato Producers: Currently there are ~ 1000 acres of commercial potato production in eastern Montana (These potatoes are processed into French Fries in a facility in ND). However, there are over 250,000 acres in eastern Montana and western ND that are suitable for potato production. This area could easily produce specialty potatoes given establishment of packing facilities. Funding to establish packing facilities will be sought after low GI cultivars are identified and preliminary market studies are completed.

Lessons Learned

Crop Development and Introduction is a stepwise learning curve process. Some potentially great low glycemic potatoes have been identified. The time necessary to progress from the laboratory (laboratory analyses and GI testing), to the research field (Montana adaptation, virus resistance, etc.), to the commercial grower was underestimated. There were a series of sequential steps that could not be run in parallel. Establishment of consumer demand is imperative. However, one cannot create demand without the experimental data. Now that several potato varieties have been compared, it has been determined which two should be tested on humans in a diabetes clinic. This data will create consumer demand, especially by diabetics and prediabetics. Farmers will not and should not produce a specialty crop without knowing if there is consumer demand. MSU has the expertise in crop development, and marketing experts, given favorable GI data, will be able to aim at that high-margin market opportunity. It takes such data to penetrate high margin markets, as happened with the gluten-free market, the omega-3 market and the organic market. The same growth curve will occur with the low-glycemic niche market.

Development of the low GI potato is not complete. Additional work includes completion of a human GI study, marketing, large-scale transfer of selected germplasm from MSU to Montana seed potato growers, and MT table potato growers. The marketing effort needs to include targeted marketing toward specific consumer groups including diabetics.

Further advancement, especially marketing and communication, is 100% dependent upon completion of human GI testing and correlation with laboratory analyses. Consumers and the USDA have an understanding that high GI is bad however; they do not have an understanding of the starch profile.

Additional information

Without testing completed on potatoes, there has not been outreach conducted on this project.

Contact Person

David Sands

Technical Assistance and Education for Montana Specialty Crop Processors to Meet Requirements of Global Food Safety Initiative Audits

This project's final report was previously accepted on 3/4/2014 in Montana's Second Annual report.

Project Summary:

Mission Mountain Food Enterprise Processing Facility (MMFEC) is a division of Lake County Community Development Corporation (LCCDC). MMFEC provides expertise in food business development and incubation to individual enterprises, cooperatives, and specialty crop producers and processors. This project increased the capacity of MMFEC to assist specialty crop processors in meeting the requirements of Global Food Safety Initiative Standards for third party audits demanded by the national and international marketplace. These standards include SQF, BRC, ISO 2000, PrimusGFS and others. Major retailers and food service operators in the US and internationally are requiring their suppliers to comply with one of the GFSI standards. GFSI standards are complex, demanding and require a significant investment in time and training to understand and implement. Through this project a working model and a toolkit complete with templates of pre-require programs, HACCP plans and system management procedures have been developed to assist specialty crop processors and producers to develop their own food safety programs. The project also delivered a series of training to assist specialty crop producers and processors to increase their capacity to develop food safety plans. This project was accomplished by delivering the following goals and objectives.

Objective 1 – Increase the capacity of the Mission Mountain Food Enterprise Center in meeting GFSI standards for the Farm to Institution Program and the specialty crop clients that utilize the processing center

- Finalize center pre-require programs and systems management procedures in the Mission Mountain Food Enterprise Center
- Conduct a self-test audit that meets GFSI standards
- Mission Mountain Food Enterprise Center conducts a PrimusGFS standard third party audit and is certified
- Provide technical assistance to MMFEC specialty crop clients in gaining their own third party audit certification

Objective 2- Deliver a technical assistance program in GFSI standards to specialty crop processors throughout Montana

Complete a toolkit for specialty crop processors that will assist them in meeting GFSI standards-templates of pre-require program, HACCP plans and system management procedures
Provide one-on-one technical assistance to specialty crop processors in the development of their food safety management program

Provide technical assistance to specialty crop processors in gaining their facility and products third party audit certification.

Objective 3- Deliver education programs that build a foundation for meeting GFSI standards to specialty crop processors throughout Montana

Continue to deliver HACCP and Process Control School training to specialty crop producers
Continue to partner with the Montana Department of Agriculture in the delivery of GAP training.

The center's grant \$48,540.94.00 from the USDA Specialty Crop Block Grant Program directly served specialty crop processors throughout Montana by increasing their ability to develop and implement pre-requisite program, HACCP plans and system management procedures that meet the requirements of GFSI audit standards and Group GAP planning.

Project Approach:

The Mission Mountain Food Enterprise Center (MMFEC) was committed to developing a comprehensive approach to food safety management within our facility and for our specialty crop processors and producer clients. The center embarked on the development of a Food Safety Program with the assistance of the contractual services of DDB Technical Services. After a year of development the center successfully finalized, adopted, implemented and self-audited their food safety program in March 2011. The center conducted a self-audit through a third party consultant. The center is also focusing on assisting its clients in meeting the upcoming Food Safety Modernization Act and the new regulations it will be bring forth.

MMFEC developed a digital tool kit for Food Safety Program Development and held a training in April 2013. Twelve food processing businesses attended and the course evaluation reflected that it was the most valuable training they have had in addressing the development of a food safety plan. MMFEC was organizing a Fall 2013 training but the contractor was unable to schedule the training prior grant closure. The tool kit developed was used as a template to develop a Group GAP plan for the Western Montana Growers Cooperative and its 49 producer members. The plan will be a model for developing Group GAP plans in an upcoming national meeting sponsored by the Winrock Foundation.

This project was spearheaded by a previous Specialty Crop Grant that provided technical resources and training to specialty crop producers in understanding on-farm and value added food safety. Under that project the center delivered Good Agricultural Practices (GAP) and Hazardous Analytical Critical Control Point training to specialty crop producers and processors. In this project MMFEC continued to collaborate with Washington State University in the delivery of HACCP and Process Control School Training which was delivered in March 2013 and June 2013. MMFEC collaborated with FamilyFarms.org and delivered a Wholesale Success Workshop which was attended by 61 producers. As a training outcome MMFEC partnered with FamilyFarms.org to develop a toolkit for Group GAP Food Safety Planning. This plan used the Food Safety Program toolkit as a model. The plan will be utilized by a national Group GAP training to be held in Wisconsin December 2013. Western Montana

Growers Cooperative will use the toolkit to develop a Group GAP Food Safety Plan which will umbrella 49 producers/members and their on farm plans.

Goals and outcomes achieved:

Objectives- Year 1	Benchmark	Target	Outcomes Achieved	monitoring/data collection used
Objective 1 Increase the capacity of the Mission Mountain Food Enterprise Center in meeting GFSI standards for the Farm to Institution Program and the specialty crop clients that utilize the processing center.	The center pre-requite programs, HACCP plans and food safety systems management procedures in the Mission Mountain Food Enterprise Center are finalized and adopted	Conduct a Primus GFS third party audit	MMFEC have adopted a comprehensive Food Safety Program and have conducted a self-audit through a third party consultant. The audit was approved by the consultant	All Verification systems are in place and are reviewed monthly to insure staff is upholding pre-requisites and the food safety system management. A third party consultant audited all records and monitoring systems and approved the annual audit.
Objective 3- Deliver education programs that build a foundation for meeting GFSI standards to specialty crop processors throughout Montana	GAP, HACCP and Process Control School trainings are held in western MT	Flathead Cherry Growers, Western Montana Growers, and specialty crop processors	The trainings are attended by specialty crop producers and processors. HACCP- 14 processors Process Control School- 5	Training evaluations were completed. HACCP/Process Control School- Excellent evaluation

Objectives- Year 2	Benchmark	Target	Outcomes Achieved	monitoring/data collection used
Objective 2- Deliver a technical assistance program in GFSI standards to specialty crop processors throughout Montana	A toolkit of templates for pre-requisite programs, HACCP plans and food safety systems management procedures is completed	10 specialty crop processors meet with consultant and are provided assistance in completing toolkit to meet GFSI standard audit requirements	<p>A toolkit for Food Safety Program Planning was completed. Training was held and attended by 12 processors.</p> <p>4 processors were provided direct technical assistance in development of a food safety plan.</p> <p>2 companies have successfully passed GFSI standard audits</p>	Training evaluations were completed with all attendees. Every processor indicated that this was the most valuable training they have ever had for the development of a food safety plan.

Objective 3- Deliver education programs that build a foundation for meeting GFSI standards to specialty crop processors throughout Montana	GAP, HACCP and Process Control School trainings are held in western MT	specialty crop producers and processors	<p>Trainings were delivered and attended by specialty crop producers and processors.</p> <p>Wholesale Success- 61 producers</p> <p>HACCP- 18 processors</p> <p>Process Control School- 17 processors</p> <p>Food Safety Program- 12 processors</p> <p>An outcome of the Wholesale Success was the development of a Group GAP plan for Western Montana Growers Coop</p>	<p>Training evaluations were completed with all attendees.</p> <p>HACCP/Process Control School- Excellent evaluation</p> <p>Food Safety Program- Excellent evaluation</p> <p>Wholesale Success- Excellent evaluation</p>
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The project successfully offered trainings to specialty crop producers and processors in the area of HACCP, Better Process Control School, Food Safety Training Program Planning, Wholesale Success. The producers and processors increased their knowledge in the area of on farm food safety, HACCP planning, Better Process Control Processing and development of a Food Safety Program for their operations. This was documented by the following.

HACCP planning

The course completes an evaluation on effectiveness of trainer and the participant is tested to become HACCP certified. Thirty two attendees successfully passed the test and are now HACCP certified. The evaluation indicated 95% of the attendees felt the instructor was knowledgeable in the material presented and effectively presented the material.

Better Process Control School

The course completes an evaluation on effectiveness of trainer and the participant is tested to become Better Process Control certified for acidified food processing. Of the twenty two attendees all but one successfully completed the test and is now Better Process Control School Certified. The evaluation indicated 97% of the attendees felt the instructor was knowledgeable in the material presented and effectively presented the material.

Wholesale Success

The Wholesale Success respondents stated that the workshop improved their overall understanding of risk management in the areas of food safety best practices, production and post-harvest handling. The presenter, Atina Difley, asked farmers in attendance to set a target date for completing an on farm food safety assessment. Thirteen producers wrote down dates on their evaluation forms.

Attendees overwhelmingly stated that Atina Difley provided in depth information that was easily understandable, and that her presentation style (technical information intermixed with personal stories) kept them engaged for the duration of the class.

Multiple producers stated in their evaluations that food safety had not been the highest priority in their decision making, but now after learning more about food safety and practical steps to improve their systems and record keeping they will make food safety a priority and implement on farm evaluations and changes. One producer wrote, "I thought I would hate this ... time went by quickly. Lots of likeminded people; should have more of them on various topics."

From Karl Sutton's perspective, the workshop was a resounding success. He had multiple people come up to him at the end and thank me for assisting with bringing this workshop to Montana. The attendees were engaged and asked thoughtful questions during the workshop. One producer was irritable and resistant at the beginning of the workshop. He has been a wholesale producer for 20 + years and said he only attended because Western Montana Growers Coop requested him to. By the end of the workshop he came up to me and thanked Karl. He said the information was great and he had a chance to reflect on his own food safety practices and quality control. He said he will take information with him back to his farm.

The Wholesale Success training provided the Western Montana Growers Cooperative (38 members) the information to develop a draft Quality Management System Plan (QMS or Group Gap plan). The draft was completed July 2013 and the board of directors reviewing for adoption.

Food Safety Management Program Planning

Twelve specialty crop processors attended the training and indicated the course and the electronic toolkit were very effective. Cream of the West indicated “By far the most effective toolkit they have used to develop their food safety plan”. The Mustard Seed stated, “had an excellent Food Safety Management class with Pam Ader officiating...very informative.” Of the twelve attendees four processors were provided further technical assistance in the development of their food safety plan.

Beneficiaries:

The beneficiaries of this project were specialty crop producers and processors. There is not institutionalized GAP or Food Safety training programs in Montana. This project delivered key training, HACCP and Process Control School, to 54 specialty crop processors and the training is essential to the success of their businesses. The project developed a Food Safety Toolkit that is digital and provides a clear guide and templates for 12 food processors to develop their food safety plans. The project also, in the delivery of the Wholesale Success workshop, introduced to 61 producers how they can effectively design an on farm plan for their operations. The Western Montana Growers Cooperative now has a Group GAP plan for their 49 member/owners to start operating their farm enterprises under.

Lessons Learned:

The state of Montana is very rural and it is very challenging to deliver training programs to rural farming communities. It is difficult to hold the number of trainings that can really address the need particularly in light of the Food Modernization Act proposed rules. Small scale producers and processors are just starting to understand the need for food safety planning to meet the requirements of those rules. There is a need to have an institutionalized approach to education and training and the Montana Department of Agriculture should be the lead in this area. Until there is an institutionalized approach MMFEC will continue to deliver trainings and try to meet the needs of Montana producers and food processors in building their capacity to meet increased regulation and consumer concerns around food safety.

Contact

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Increasing Consumer Awareness of Grown in Montana Nursery, Floriculture, and Horticulture Crops

Project Summary

In order to increase consumer awareness of Montana nursery, floriculture, and horticulture crops by 20%, the Montana Department of Agriculture (MDA) partnered with the Montana Nursery and Landscape Association (MNLA) and the Montana Department of Commerce's Grown in Montana (GIM) program, to procure approximately 7,700 plastic in-soil pot tag labels which identify the crops as specialty crops grown in Montana with a QR code. When scanned, the QR code links the consumer to the MNLA Buyer's Guide and GIM website's listing of nurseries.

MNLA's nursery members indicated concern over the lack of consumer awareness of Montana grown nursery products. Therefore, this project was aimed to increase consumer awareness of nursery specialty crops by 20% by 9/30/14, as well as, increase the number of sales of nursery specialty crops from 2013 by 10% by 9/30/14.

Project Approach

At the beginning of July roughly 7,700 tags were sourced and purchased for a total of \$1,578.58. They were to be distributed during the nursery association's Fall Tour at a dinner planned for August 8, 2014. However, due to poor attendance they were not widely distributed. Due to the limited amount of time that was available to work out the logistics of this project, the tags were not received in sufficient time to adequately distribute them and generate valuable data.

Goals and Outcomes Achieved

Comparing May 2014 to September 2014 there were 200 and 286 visits to the MNLA website respectively. This represents a 46% more visits the webpage at the end of the project as compared to the benchmark exceeding the target of 20%. Unfortunately, due to technological difficulties, it is not possible to draw a direct correlation between the efforts of this project and the change in web traffic. The difficulty was that the analytical software that analyzes the data from QR codes needs adequate time to compile the statistical data. Additionally, data are not available to show the impact on the GIM website.

The plastic in-soil pot tag labels with the QR codes linking the consumer to the MNLA Buyer's guide were procured. However, due to the short timeline and poor attendance, the full goals established in the project proposal were unable to be met. In addition, the analytical software that analyzes the data from the QR codes needs adequate time to compile the statistical data generated by the visitors to the website and the longer the period of time over which data is collected and analyzed the better and more accurate the results.

Raising consumer awareness, the grantee was able to start distributing in-soil pot tags with through a number of local plant vendors prior to the end of the grant period. Although the full results of this project were not realized, the Montana Landscape Nursery Association, the Department of Commerce Grown In Montana Program and the Department of Agriculture are still working together

to distribute the tags and register more of the growers in the Grown in Montana program. Initial data and results are positive and plans are in place for a wider distribution of the tags for the next growing season.

Data are not available to confirm a change in sales of specialty crops as a result of this effort. However, it is anticipated that raising consumer awareness through the use of these tags will have a positive result for Montana growers in the long run.

The full extent of this project was unable to be realized due to circumstances, such as the late delivery of the tags, which were beyond the project staff's control. It is anticipated that the tags will be more widely distributed and yield more data for the next growing season.

Beneficiaries

The beneficiaries of this project included: the growers of Montana nursery, floriculture, and horticulture crops, and the MNLA. Though the project goals were not fully completed, the growers and the MNLA consumers will definitely benefit from the added commitment to get this project up and running for the near future, as it only gave the MNLA more time to make the necessary preparations in order to better support the growers.

In today's smartphone dominated world the convenience of instantaneous access to data, via plant tags, that allow customers to scan a plant's QR code, which then directs them to the MNLA website, where more can be learned about the plant, more plants can be purchased, etc., will almost certainly contribute to added sales for the growers. To date, 30 specialty crop growers have been distributed more than 3,500 nursery tags.

The tags, however, are only the tip of the iceberg in this project. The data collected by the tags is part of a much bigger picture that has the potential for substantial economic impact. And that bigger picture is Google Analytics data analysis software, the driving force behind the data collected by the tags. Analytics software is essential for any organization doing business online. Simply put: it helps decision makers understand ways to reach their audience and drive traffic to their site. There are six key things that Google Analytics does in order to drive traffic to websites. They are:

1. The ability to show what browsers and operating systems visitors use
2. What, specifically, isn't keeping people interested
3. What, exactly, draws people to the site
4. How many people just aren't interested at all
5. How much people are poking around
6. Whether people are viewing on the go

As one could imagine the potential economic impact of simply using this software is immense. This is due to the gold mine of virtual data that able to be collected, analyzed, and displayed to the user in an easy to understand manner. And that's not even the best part. All of these things are provided free of charge whereas 15 or 20 years ago a large portion of an organization's budget would be devoted, with varying degrees of success, to trying to answer these same questions.

Lessons Learned

We learned that, ideally, this type of project should be initiated prior to, or at, the beginning of the growing season. We also learned about the statistical data that was able to be collected by the analytical software proved that the idea supporting the project is valid and that, given enough time, the original goals of this project are more than attainable. For example, the data showed that the MNLA website had a bounce rate of 51.50 % (A bounce is when a visitor lands on your page and immediately leaves. A high bounce rate is typically indicative of a problem with the pages content not being what visitors were expecting.). Generally speaking, a bounce rate of 60% or less is excellent with 60-70% being about average. The Average Session Duration (average length of time visitors were on our site) was four minutes and thirty seconds, with pages per session being approximately six. A session duration of over two minutes is generally considered as well above average. Lastly, the analytics demonstrated the percentage of new visitors to our site to be 76% of the 152 total visitors, for the month (May 2014) that was analyzed. This equates to roughly 116 new users that spent an above average amount of time on our site and viewed about six pages per visit. An above average session duration coupled with a low number of page views per visit is indicative of higher quality content that best matches what the visitor was looking for. This confirms that the data on the website is of value to consumers. Now, it's only a matter of distributing the tags, outfitted with the QR Codes, in order to increase the traffic being driven to the Montana Nursery and Landscape Association website. Future Plans for the distribution of the tags includes: distributing the tags at the MNLA Green Expo booth, in January, 2015, to attendees while also having them fill out the Grown in Montana registration form.

Contact Person

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Additional Information

See the following pages for; a screenshot of the website customers are directed to, and a picture of the tags with their QR codes (can be scanned from this report) [Link to MNLA website \(directed here when QR code is scanned\)](#)

The screenshot shows the website's header with the logo and tagline "Montana Nursery & Landscape Association - Growing our future, one seed at a time". A login form is present on the right. The navigation menu includes "HOME", "EVENTS", "MEMBERSHIP", "PUBLICATIONS", "EDUCATION & CERTIFICATION", and "ABOUT MNLA". The "MEMBERSHIP" menu item is expanded to show "Advertising", "News & Media", "MNLA Newsletter", "Membership Directory & Buyer's Guide", and "Certification Manual".

Membership Directory & Buyer's Guide



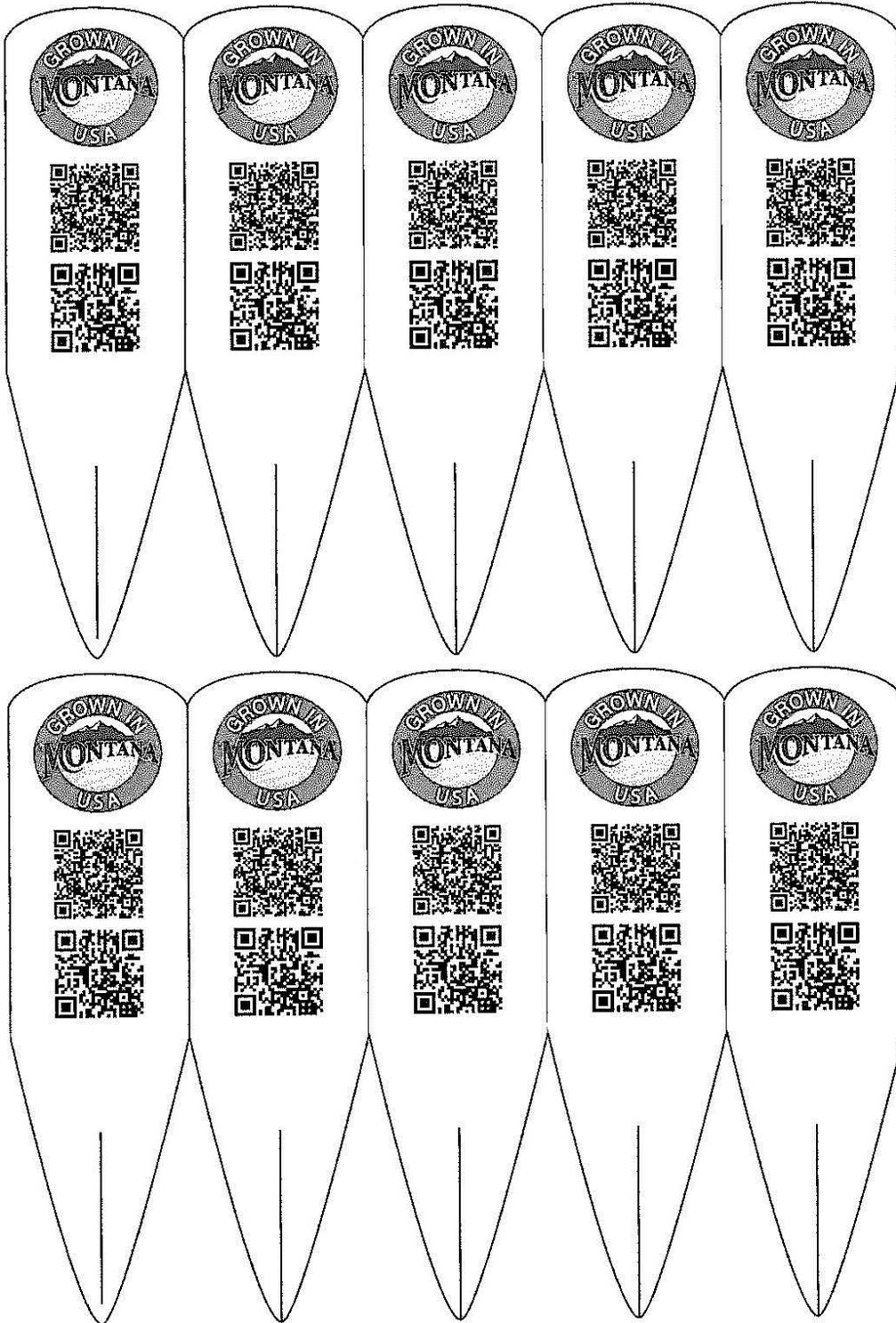
The Membership Directory & Buyer's Guide is published annually and includes comprehensive membership listings and brief descriptions of member businesses. It also includes industry resources and agencies, association information and history, a listing of the Board of Directors, information on the Certified Plant Professional and Scholarship programs. It is an excellent industry resource and tool for nursery & landscape professionals and non-professionals alike. Approximately 400-450 are mailed each year. One Membership Directory & Buyer's Guide is provided free of charge to all members. Additional copies are sold for \$25.

- [Click here for fax/mail download of Membership Directory & Buyer's Guide order form](#)
- [Click here to go to MNLA's Online Store to order your Guide](#)
- [An alphabetical listing of members is available here in PDF format](#)

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Powered by [Wild Apricot Membership Software](#)

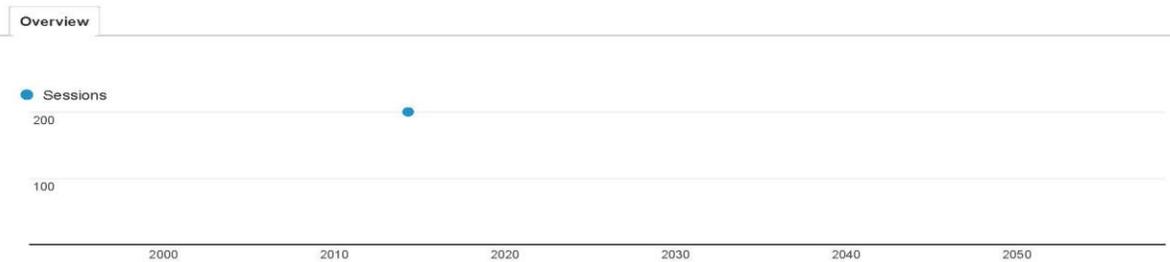
http://www.plantingmontana.com/page-1070362[12/15/2014 9:02:33 AM]



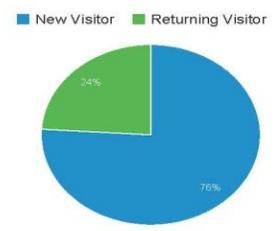
Audience Overview

May 1, 2014 - May 31, 2014

All Sessions 100.00%
 + Add Segment



Sessions 200	Users 152	Pageviews 1,168
Pages / Session 5.84	Avg. Session Duration 00:04:30	Bounce Rate 51.50%
% New Sessions 76.00%		



Language	Sessions	% Sessions
1. en-us	187	93.50%
2. pt-br	3	1.50%
3. c	2	1.00%
4. es-es	2	1.00%
5. de	1	0.50%
6. en	1	0.50%
7. fr-fr	1	0.50%
8. pt-pt	1	0.50%
9. si-si	1	0.50%
10. zh-cn	1	0.50%

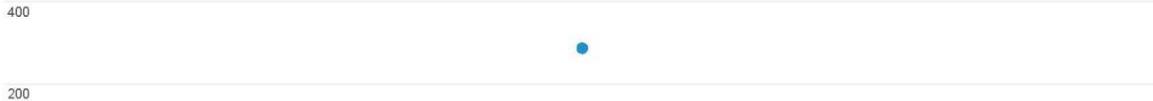
Audience Overview

Sep 1, 2014 - Sep 30, 2014

 All Sessions
100.00%

Overview

Sessions



Sep 1, 2014 - Sep 30, 2014

Sessions
286

Users
208

Pageviews
1,175

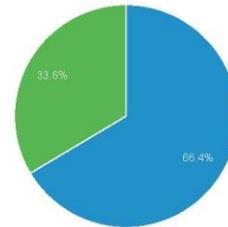
Pages / Session
4.11

Avg. Session Duration
00:04:36

Bounce Rate
53.15%

% New Sessions
66.43%

■ New Visitor ■ Returning Visitor



Language	Sessions	% Sessions
1. en-us	236	82.52%
2. pt-br	19	6.64%
3. c	13	4.55%
4. de-de	3	1.05%
5. en-gb	3	1.05%
6. es-es	2	0.70%
7. it-it	2	0.70%
8. en	1	0.35%
9. en-ca	1	0.35%
10. en-in	1	0.35%