

**WSDA**  
**SPECIALTY CROP BLOCK GRANT PROGRAM**  
**2012**  
**FINAL PERFORMANCE REPORTS**

*TABLE of CONTENTS*

---

<b>Grant Recipient:</b> U.S. Department of Agriculture – Agricultural Research Service (USDA-ARS)	
<b>Project:</b> Development of an “early warning” monitoring tool for potato psyllid	Page <a href="#">3</a>
<b>Grant Recipient:</b> Washington State University (WSU)	
<b>Project:</b> Identification of Phytophthora root rot resistant true firs	Page <a href="#">9</a>
<b>Grant Recipient:</b> Washington State University (WSU)	
<b>Project:</b> Assessing the impacts of plow-down and cover crops on field production of tulip	Page <a href="#">18</a>
<b>Grant Recipient:</b> Washington State University (WSU)	
<b>Project:</b> Economic Impacts of Grapevine Leafroll Disease	Page <a href="#">27</a>
<b>Grant Recipient:</b> Center for Produce Safety (CPS)	
<b>Project:</b> Assessment of sanitation techniques for tree fruit storage bins	Page <a href="#">35</a>
<b>Grant Recipient:</b> Pear Bureau Northwest	
<b>Project:</b> Promoting Healthy USA Pears to Children	Page <a href="#">44</a>
<b>Grant Recipient:</b> Washington State University (WSU)	
<b>Project:</b> Evaluation of Irrigation Practices for Specialty Crop Risk Reduction	Page <a href="#">48</a>
<b>Grant Recipient:</b> Washington Apple Commission (WAC)	
<b>Project:</b> Washington Apple App	Page <a href="#">61</a>
<b>Grant Recipient:</b> Washington Dry Pea & Lentil Commission (WDPLC)	
<b>Project:</b> Enhancing International and Domestic Trade of Dry Peas, Lentils, and Chickpeas	Page <a href="#">64</a>
<b>Grant Recipient:</b> Washington State University (WSU) Small Farms Program	
<b>Project:</b> Increasing Latino Farmer Specialty Crop Sales	Page <a href="#">74</a>
<b>Grant Recipient:</b> Sustainable Connections (SC)	
<b>Project:</b> Farmer Marketing and Workplace CSA Engagement Initiative	Page <a href="#">85</a>
<b>Grant Recipient:</b> Community Farm Connection (CFC)	
<b>Project:</b> Increasing Access to Wholesale markets for Small and Midsized Farms	Page <a href="#">89</a>
<b>Grant Recipient:</b> Cloud Mountain Farm Center (CMFC)	
<b>Project:</b> Providing Extended Season Education/Technology for Specialty Crop Growers	Page <a href="#">93</a>
<b>Grant Recipient:</b> Seattle Wholesale Growers Market Cooperative (SWGMC)	
<b>Project:</b> Reducing Market Barriers for Sales of Washington and Oregon Floricultural	Page <a href="#">99</a>
<b>Grant Recipient:</b> Greenbank Farm Management Group – Agriculture Training Center (GFATC)	
<b>Project:</b> Increasing Regional Organic Farming Capacity	Page <a href="#">105</a>

<b>Grant Recipient:</b> Cascade Harvest Coalition (CHC) <b>Project:</b> Farmer-Buyer Trade Meetings	Page <a href="#">109</a>
<b>Grant Recipient:</b> Washington State Farmers Market Association (WSFMA) <b>Project:</b> Building Demand for Specialty Crops at Washington State Farmers Markets	Page <a href="#">122</a>
<b>Grant Recipient:</b> Tilth Producers of Washington <b>Project:</b> Educating Washington Organic and Sustainable Specialty Crop Producers	Page <a href="#">135</a>
<b>Grant Recipient:</b> Washington Hop Commission (WHC) <b>Project:</b> Evaluation of Input Residue and Bio Material Impacts Organic Grown Hops	Page <a href="#">145</a>
<b>Grant Recipient:</b> Washington State Department of Agriculture, Pest Program (WSDA) <b>Project:</b> Delimiting survey for tree fruit pests, Cherry Blossom Moth and Grape Tortrix	Page <a href="#">151</a>
<b>Grant Recipient:</b> Washington State Conservation Commission (SCC) <b>Project:</b> Succession Planning tools for specialty crop farmers and their families	Page <a href="#">154</a>
<b>Grant Recipient:</b> Washington State University (WSU) <b>Project:</b> Enhancing Specialty Crop Producer profitability	Page <a href="#">163</a>
<b>Grant Recipient:</b> Washington State Nursery & Landscape Association (WSNLA) <b>Project:</b> Plant Something	Page <a href="#">170</a>
<b>Grant Recipient:</b> Washington State University (WSU) <b>Project:</b> Strengthening food safety management systems for specialty crop production	Page <a href="#">182</a>
<b>Grant Recipient:</b> Washington State Potato Commission <b>Project:</b> Southeast Asia Trade Mission	Page <a href="#">194</a>

**Project Title:** Development of an “early warning” monitoring tool for potato psyllid

**Partner Organization:** U.S. Department of Agriculture – Agricultural Research Service (USDA-ARS)

### **PROJECT SUMMARY**

Potato growers in the Pacific Northwest face two problems in managing zebra chip disease due to uncertainties in knowing when potato psyllid (the vector of the disease) has colonized their fields. (1) The first problem is the lack of a truly effective monitoring tool for detecting first arrival of the insect. Difficulty in monitoring psyllid arrival leads to establishment of the insect in fields well-before the insect is actually detected. (2) The second problem is poor understanding of how late-season arrival affects tuber quality in tubers destined for storage. There has been circumstantial evidence that arrival of the psyllid in fields a few weeks before harvest can sometimes lead to storage of asymptomatic tubers which nonetheless become symptomatic (and unmarketable) during storage. This uncertainty has led to growers applying insecticides almost up until harvest, despite the lack of research actually showing that these sprays are necessary. With better information about the true effects of late-season psyllid attack on tuber quality, growers may be able to eliminate some late-season sprays.

The zebra chip outbreak of 2011 in potato fields of Washington State, Oregon, and Idaho prompted this work. First, scientists with USDA-ARS recognized the need for an improved tool with which to monitor potato psyllid. This need led to a search for volatile compounds that could be used in combination with sticky cards to attract psyllids to the cards. Initial trials focused on tests with a putative sex attractant. However, unanticipated problems with this compound, led to a shift in the project to explore plant (potato)-derived attractants. These compounds would avoid some of the problems found during this project to be associated with the sex attractant, as discussed below. Second, anecdotal observations suggested that asymptomatic tubers at harvest may develop disease symptoms while in storage, and questions arose whether it was late-season infestation of potato fields by the psyllid which led to this situation. Based upon these observations, investigators designed a project in which timing of psyllid infestation (in relation to tuber harvest) and duration of tuber storage were varied to explore whether growers need to control the psyllid almost up to harvest (the current grower tendency), or whether late-season sprays could be eliminated without danger of losing tubers to zebra chip disease in storage.

### **PROJECT APPROACH**

Objective 1: Develop improved monitoring tool

- The targeted sex attractant was synthesized by Co-PI J. Millar. The compound was found to be geographic specific (the compound was identified from Texas psyllids, and was found to be unattractive to Washington psyllids) and was also shown to be of very low volatility, the latter leading to a very small area of activity under field conditions. Field-trials in Weslaco TX conducted by Co-PI Henne with the Texas-derived compound led to psyllid captures approximately 1.7-fold higher than obtained on lure-free traps; however, a similar trial in Washington State failed to demonstrate any improvement associated with use of the Texas-derived attractant. Laboratory olfactometer trials showed that male psyllids from Washington State responded to odors from female psyllids collected in Washington State, but failed to respond to odors from Texas-collected psyllids.
- Investigator focus shifted to an evaluation of potato-derived volatiles. Several target volatiles were identified by Co-PI Landolt. The lead investigator initiated collaboration with chemists at AlphaScents (Oregon) and New Zealand Plant and Food, who provided lures containing the targeted compounds.
- Targeted compounds were field-tested by the lead investigator at locations in Weslaco TX, Hermiston OR, Prosser WA, and Moxee WA. The best performing compounds (currently proprietary) led to trap catch 1.9 (AlphaScents lures) and 2.0 (NZ P&F)-fold higher than captures on lure-free traps.
- The best-performing lures are to be field tested at sites in Weslaco TX and Moxee WA in 2015 to determine optimal concentrations of the targeted compounds.

Objective 2: Determine effects of late-season infection on development of zebra chip in stored tubers.

- Field trials were conducted both in 2012 and 2013 at the USDA-ARS research farm in Moxee, WA
- Nine cultivars (Alturas, Russet Norkotah, Russet Burbank, Ranger Russet, Umatilla, Atlantic, Pike, FL1867, FL1879) were planted into small field cages. Infective psyllids were added to each cage at two weeks and at one week preceding vine kill.
- Tubers were harvested at two weeks following vine kill. A subsample of newly harvested tubers was examined for infection (using frying technique). The remaining tubers were stored at 50 °F and examined for zebra chip symptoms at monthly intervals for 6 months.

- In both years, all cultivars exposed to infective psyllids 2-weeks preceding vine kill had symptomatic tubers at harvest. Four of the nine cultivars exhibited symptoms at harvest when plants were infested 1-week preceding vine kill. However, all cultivars exhibited symptoms in tubers following 3 months storage of tubers.
- Practical implications of results:
  - Tubers destined for fresh market use. Growers may be able to eliminate insecticide applications immediately preceding vine kill for some cultivars.
  - Tubers destined for storage. If infective psyllids are known to be present in the growing region, growers will need to protect their crops right up until vine kill to ensure protection of tubers destined for storage.

Horton:

- Oversight of Washington and Oregon field- and laboratory-assays with the targeted sex attractant Initiated collaboration with chemists at AlphaScents and NZ Plant & Food, who provided lures composed of plant (potato) volatiles
- Field-tested 18 of these compounds or blends of these compounds at sites in OR, WA, and TX
- Identified several blends showing activity, targeted for additional testing in 2015

Henne:

- Oversight of Texas field-trial with targeted sex attractant

Millar:

- Synthesis of pheromone attractant for loading into lures

Landolt:

- Collection and identification of potato-associated volatiles

Munyanza:

- Storage trial: establishment of field cages, harvest of tubers, monitoring of tubers in storage

Horton/Munyanza:

- Co-published an overview of potato psyllid biology in Washington State. The article is a substitute for an article on the pheromone-based lure (promised in the **Update Stakeholders** part of the proposal), due to lack of progress on the pheromone objective. The overview article appeared in the industry newsletter (*Potato Progress*; January 2014).

Scope included only potatoes.

### **GOALS AND OUTCOMES ACHIEVED**

(1) Develop a sex attractant-based lure (Goal) and provide lures to WSU personnel for use in 2014 (Measureable Outcome): the target shifted from development of a sex attractant-based lure to development of a lure composed of potato volatiles. Screening of 18 compounds or blends of compounds led to identification of 3-5 targeted blends, with the best of these showing a 2-fold improvement in trap catch (compared to lure-free traps). Lures were not forwarded to WSU, as optimization (rate studies) of lures has not yet been done (planned for 2015).

(2) Production of a new monitoring tool for potato psyllid (Goal) of sufficient utility to be adopted by growers (Measureable Outcome): the shift from developing a pheromone-based lure to a plant volatiles-derived lure has delayed production of a grower-ready lure.

(3) Develop information that will allow growers to evaluate whether late-season psyllid controls are needed to prevent zebra chip disease in stored tubers (Goal), in an effort to eliminate unnecessary pre-harvest applications of insecticides (Measureable Outcome). Results indicated that presence of infective psyllids in a field puts tubers destined for storage at risk if the psyllid is not controlled right up to vine kill. Current grower practices of applying insecticides right up to vine kill during heavy psyllid years appear to be necessary to prevent ZC development in stored tubers.

(1) Lab-assays of pheromone formulations (timeline Oct. 2012-June 2013)

Completed December 2012; Assays showed that Washington populations of psyllids do not respond to targeted compounds (identified from Texas-collected psyllids and synthesized by Co-PI Millar).

(2) Field-test best candidate pheromone formulations (timeline February 2013; July/September 2013)

Completed March 2013 (Weslaco, TX) and July/September 2013 (Oregon, Washington); Trials showed field attraction to the Texas-derived attractant in the Weslaco trial (1.7-fold increase in trap catch) but no attraction in field tests conducted in Oregon and Washington.

(3) Begin new collaboration with chemists in New Zealand and Oregon to examine plant-derived volatiles (*New Work Plan*) (timeline June/Sept 2013)

Collaboration was initiated in July/September 2013.

(4) Update stakeholders (timeline 2013-2014)

A report on difficulties encountered during the ongoing pheromone work was provided to the Washington State Potato Commission in February 2013 at their annual research review. An article summarizing potato psyllid biology in the Pacific Northwest was published in the industry newsletter (*Potato Progress*) in January 2014, as a substitute for the originally planned article describing the pheromone-based lure.

(5) Provide candidate lures to WSU extension for monitoring of potato psyllid (*New Work Plan* timeline July 2015)

Delayed at least until 2015

(6) Define relationship between psyllid arrival and tuber symptoms (timeline June/Sept [field] and Sept/May [storage]); Completed 2013 – 2014:

- Colonies of infective psyllids were established in October 2012 – March 2013, for eventual release into field cages.
- Field plots were set out in April-May 2013 and 2014
- Infective psyllids were released into field plots July-September 2013 and 2014
- Tubers were harvested and placed into storage in September 2013 and 2014; a subsample of tubers was examined at harvest both years.
- Stored tubers were removed from storage at monthly intervals and examined to monitor disease progression while in storage (October 2012-March 2013; October 2013-March 2014)

(7) Field tests with plant volatile lures were conducted in Weslaco TX (*New Work Plan*) (timeline March 2014)

Completed March 2014; Limited field-assays (4 compounds) in Weslaco TX failed to demonstrate attractiveness

(8) Field tests with plant volatile lures in Washington and Oregon (*New Work Plan*) (timeline July/Sept. 2014)

Completed July/Sept. 2014; Field-trials with 18 compounds or blends of compounds led to the identification of several targeted compounds; the best of these compounds produced 1.9 to 2.0-fold improvement in trap catch of psyllids compared to lure-free traps.

(1) Goal: develop a pheromone-based monitoring tool which is of significant improvement over the currently used generic sticky cards. Benchmark: a generic sticky card is currently being used pest control advisors and by WSU extension. Progress toward goal: Investigators have identified two (plant-derived) compounds found to improve captures two-fold over the generic sticky card. Optimization of lures, including testing of different rates of compounds, will proceed in summer 2015.

(2) Goal: make available to growers a monitoring tool that replaces the currently used generic sticky cards (Benchmark). Benchmark: a generic sticky card is currently being used by pest control advisors and by WSU extension. Progress toward goal: Investigators identified two plant-derived compounds for further testing in summer 2015.

(3) Goal: determine whether growers can safely end insecticide sprays well-before harvest without compromising quality of tubers subsequently stored. Benchmark: growers currently spray almost up to harvest. Progress toward goal: Determined that infestation of plants by psyllids as seasonally late as the week preceding vine kill can lead to production of symptomatic tubers while those tubers are in storage. Current grower practices of applying insecticides right up to vine kill during years of heavy psyllid pressure appears to be appropriate if tubers are destined for storage.

## **BENEFICIARIES**

Scientific community:

- Demonstration that compounds responsible for sex attraction may vary with geographic origin of the potato psyllid (Washington state populations fail to respond to psyllids from Texas, but do respond to odors from Washington-collected psyllids)
- Demonstration that certain potato-derived volatiles may attract both sexes of psyllids under field conditions

Grower community:

- Confirmation that insecticide applications right up to vine kill are needed to prevent zebra chip from developing in storage during years of heavy psyllid pressure.

(1) Attractant lures and trapping results. Field tests with plant-derived compounds at locations in Washington, Oregon, and Texas showed that the best-performing lures from the NZ cooperator led to per trap captures of psyllids of 11.0 psyllids per trap (PP+3 compound), 9.6 psyllids (PP), 8.8 psyllids (PP2 + BC), and 8.4 psyllids (PP+), compared to 5.8 psyllids per trap on lure-free traps (composition of lures is proprietary). The AlphaScents lures led to trap catch of 10.6 psyllids per trap (B1) and 9.8 psyllids (B3) compared to capture rates of 5.2 psyllids per trap on lure-free traps. Lure optimization, including especially comparison of loading rates (concentrations of volatiles in lures), remains to be completed.

(2) Storage study. All nine of the cultivars examined in this study showed symptoms of zebra chip in harvested tubers if plants were attacked by infective psyllids 2-weeks preceding vine kill (= 4 weeks preceding actual harvest). Four of the nine cultivars showed similar results if plants were attacked by infective psyllids 1-week preceding vine kill. For those 5 cultivars which failed to show symptoms at harvest, symptoms began showing up in tubers at 1 month in storage; at 3 months in storage, most tubers in all 9 cultivars showed symptoms of zebra chip. In sum, an absence of symptoms at harvest is not indicative of the actual infection rate of tubers, in that asymptomatic tubers at harvest may develop symptoms during storage depending upon when (relative to vine kill) infective psyllids colonize plants.

## **LESSONS LEARNED**

### Positive:

- Investigators discovered that potato psyllid exhibits geographic and genetic variation in response to female-produced odors. While this information is not of immediate practical significance, it does advance the understanding of the reproductive biology of this species. The observation also raises questions of whether genetic variants of the psyllid are reproductively compatible in geographic regions in which the genetic variants co-occur.
- Some volatile compounds identified in the potato host appear to have sufficient activity to attract potato psyllids to sticky cards.
- Investigators defined how late in the season plants must be kept free of infective psyllids to prevent development of zebra chip in stored tubers. The data were collected for 9 cultivars, including most of the important storage cultivars. These results provide the most complete examination of the relationship between timing of infestation, duration of storage, and development of zebra chip in stored tubers.

### Negative:

- The PI discovered that it was unwise to rely so heavily on approaches used previously by the PI in identifying the sex pheromone of another psyllid species. Methods used in that previous work led to identification of a lure for pear psyllid having modest to good field-effectiveness. However, in hindsight, for the current project the PI should first have examined mating behavior of psyllids from different geographic regions, to ensure that psyllids from Texas (the source of the identified attractant) were indeed attracted to psyllids from the Pacific Northwest. The absence of attraction (as subsequently shown) would suggest that chemical composition of the sex attractant differed between populations.

Discovery that geographic source of psyllids may affect mating behavior and reproductive compatibility of psyllids.

The project failed to lead to the forwarding of a new monitoring tool to the potato industry due to a shift in targeted compounds from psyllid-produced compounds to potato-produced compounds. This shift required a shift in chemistry approaches, the addition of new collaborations (plant chemists from New Zealand and Oregon), and a new series of field tests.

## **ADDITIONAL INFORMATION**

### **YEAR 1**

#### Texas AgriLife (Horton; USDA PI)

Travel to Weslaco to conduct field tests with aldehydes	\$ 7,336.00
Supplies (traps, tanglefoot, stakes, plant and insect rearing supplies)	\$ 2,890.24
IPSC fee	<u>\$ 5,797.00</u>
<b>TOTAL</b>	<b>\$16,023.24</b>

#### Washington State Potato Commission (Horton; USDA PI)

Supplies (replace failing computer, software)	<b>TOTAL \$ 2,681.00</b>
---	--------------------------

#### Texas AgriLife (Millar; UCR Co-PI)

Supplies (chemistry supplies)	\$ 245.52
Salaries and benefits (Yunfan Zou; synthesis of aldehydes for assay)	\$ 9,996.83

Indirect costs	<u>\$ 1,024.23</u>
	TOTAL \$11,266.58
Texas AgriLife (Munyaneza; USDA Co-PI)	
Salaries and benefits	
Sawyer Delp (plant and cage establishment for field tests, harvest)	\$ 5053.84
Francisco De La Rosa (plot maintenance, psyllid release, harvest)	\$ 7721.46
Jacob Dixon (psyllid cultures, PCR to confirm infection)	\$ 5452.26
Supplies (cages, PCR supplies, glassware, primers for PCR)	<u>\$ 1772.44</u>
	TOTAL \$20,000.00
<b>YEAR 2</b>	
Washington State Potato Commission (Horton; USDA PI)	
Supplies (psyllid rearing, stakes for field trials, insect cages, markers)	\$ 4664.92
Salaries and benefits (Gene Miliczky; biology of psyllid haplotypes)	<u>\$ 4557.68</u>
	TOTAL \$ 9,222.60
Texas AgriLife-SCRI Minigrant (Munyaneza; USDA Co-PI)	
Supplies (materials for cages used in storage trial)	TOTAL \$ 8000.00
	<b>TOTAL \$67,193.42</b>

An article planned for the industry newsletter (*Potato Progress*) in which the pheromone-based lure was to be discussed was cancelled due to lack of progress on developing the lure. That article was replaced by an article (Horton, Munyaneza, and others) describing biology of potato psyllid under Pacific Northwest conditions (*Potato Progress*; January 2014 issue).

Photographs from both the Trapping and Storage projects are shown below:



[Empty box for caption]



**CONTACT PERSON**

David Horton  
USDA-ARS  
509-454-5639  
[david.horton@ars.usda.gov](mailto:david.horton@ars.usda.gov)

**Project Title:** Identification of Phytophthora root rot resistant true firs

**Partner Organization:** Washington State University (WSU)

### **PROJECT SUMMARY**

Phytophthora root rot (PRR), caused by several *Phytophthora* spp., is one of the most important diseases of true firs (*Abies* spp.) in Christmas tree plantation, nurseries and landscape situations. This disease has been associated with significant losses in noble and Fraser fir Christmas tree plantations wherever these species are grown and limits the ability of growers to expand the planting of highly desirable species of Christmas trees, such as noble fir. More than eight *Phytophthora* spp. have been reported to cause root rot on true firs that are grown as Christmas trees. Efforts to control this disease in Christmas tree plantations through cultural practices and the use of fungicides have generally been unsuccessful

The identification of Phytophthora-resistant sources of true firs has the potential to significantly reduce loss and enable growers to increase the production of high quality Christmas trees. However, there is a great diversity of *Phytophthora* spp. affecting true firs and interactions among various fir species and the *Phytophthora* spp. causing root rot complicate a clear understanding of the host:pathogen interactions. The objective of this project is to utilize a regional collection of *Phytophthora* isolates from the PNW to conduct histopathological studies of the infection and colonization process of Phytophthora-susceptible and resistant true firs. This information will increase our understanding how we can better utilize resistant species of true firs to minimize losses from this disease.

Christmas tree growers in the PNW have indicated that the identification of true firs with resistance to PRR is a high priority. A survey of noble fir Christmas tree plantations in the PNW found that PRR occurred in almost 40% of the plantations sampled and caused up to 30% mortality (Chastagner and Hudak, 2002). In other areas, such as North Carolina, annual losses due to root rot are estimated at \$6-7 million. Preliminary data on the susceptibility of 14 *Abies* spp. to root rot in one trial found that over 70% of Shasta fir and 60% of noble fir were killed by root rot. White fir (30%) and Fraser fir (23%) were the next most susceptible species. In addition, trials involving *P. cinnamomi* at North Carolina State University have shown high mortality in Fraser fir (100%), Canaan fir (99%), grand fir (98%) and white fir (84%).

Recent efforts in Oregon have been successful in establishing resistance in Port Orford cedar to *P. lateralis*, and the proposed study plans to apply some of these same approaches to investigating resistance in *Abies* to other *Phytophthora*.

There have not been any previously funded SCBGP relating to PRR on Christmas trees. This project compliments a larger, ongoing NIFA multi-state SCRI project related to the development of genetic markers to identify sources of *Abies* that have resistance to PRR and/or have excellent needle retention characteristics.

### **PROJECT APPROACH**

*Collect Phytophthora isolates from a minimum of 15 farms/nurseries in WA and OR and 5 farms/nurseries in ID and identify Phytophthora isolates to species*

Eighteen Christmas tree farms were visited in Washington and Oregon, and 3 farms were visited in Idaho to collect samples of rotted roots in order to isolate and identify *Phytophthora* cultures. Identification of all collected isolates had initially been performed using culture morphology, sequencing of the ITS region, and radial growth rate at three varying temperatures (5°C, 20°C, 35°C). It was subsequently determined that sequencing of the *coxI* region of the mitochondrial DNA was necessary to accommodate recent taxonomic splitting and accurately distinguish between closely related species. During January 2014, all isolates were characterized using *coxI* and phylogenetic trees were constructed using known reference sequences from the literature to positively identify the identity of various isolates.

In Western Washington, *Phytophthora cambivora* was isolated from noble fir and a culture tentatively identified as *P. pseudosyringae* was isolated from Fraser fir seedlings. In Oregon farms, *P. cambivora* was isolated from noble fir, and *P. gonapodyides* and *P. plurivora* were isolated from grand fir. In northern Idaho, *P. megasperma* was isolated from the roots of mature grand fir. The apparent predominance of *P. cambivora* on noble fir in both western Washington and Oregon farms was surprising, as earlier studies have shown a greater diversity of *Phytophthora* on noble fir in the Pacific Northwest. Also, the detection of *P. pseudosyringae* was unexpected, as this pathogen species has never before been described as an associate of *Abies*. Although we have not yet verified *P. pseudosyringae* as a pathogen of Fraser fir via Koch's Postulates, we did verify *P. megasperma* on grand fir in Idaho as a precursor for a first report publication.

### *Stratify seed, grow and maintain seedlings for testing*

The departure of Plant Technician Gil Dermott in early 2012 complicated efforts to grow seedlings from seed, so we worked with the Weyerhaeuser Corporation to obtain all seedlings needed for experimental testing. Seedlings were received as 1-year old plug or bareroot seedlings and subsequently transplanted into consistently-sized seedling cones using a specialized and consistent soil mix. All seedlings were maintained outdoors under shade cloth subsequent to transplanting and were then provided with a 30-day artificial cold period to ensure proper budbreak and leader development prior to inoculation trials.

### *Conduct greenhouse pathogenicity/susceptibility trials*

In preparation for resistance screening studies, the three most virulent isolates from the four most commonly occurring *Phytophthora* species needed to be delineated as per the initial proposal to comprise the 12 isolates that were used in this experiment. In order to test virulence, it was necessary to “pass” all isolates of the four most common *Phytophthora* species through host tissue in order to restore “wildtype” virulence and eliminate persistent contaminants. In June of 2014, isolates were passed through intact, attached noble fir branches on trees in the field. All isolates of a given species were inoculated onto different branches of a single tree in an effort to control the genetic background of the host. Inoculations were allowed to progress for 14 days, after which the pathogen was re-isolated from the margins of the resulting lesions on the host branches. These re-isolated cultures were then used for subsequent virulence testing.

Virulence testing was performed during the period of July – August 2014 to determine the relative aggressiveness of the various isolates within a given species in an effort to choose the three most aggressive isolates for subsequent greenhouse resistance screening inoculations. This testing was carried out on potted 3-year old bare root noble fir seedlings that were obtained from the Weyerhaeuser Aurora, OR Nursery. Seedlings were graded and caliper measurements were taken to try to utilize the most uniform host seedlings to test the various isolates within each *Phytophthora* species. Stem inoculations were made on all seedlings between the second and third year nodes and seedlings were allowed to incubate in the greenhouse for 7 days. Seven days post inoculation, resulting stem lesion lengths were measured for each isolate. Each trial was conducted two times and multiple mean comparison tests were performed to assess statistical differences between the resulting lesion lengths produced by various isolates. Using this information, the three most aggressive isolates within each of the four most commonly occurring *Phytophthora* species were ranked based on the sizes of lesions produced.

### *Conduct controlled root system inoculations and host:pathogen interaction studies*

The first trial of the greenhouse resistance screening study was completed in June 2015. This study employed 7 species of *Abies* including noble, Fraser, balsam, white, Canaan, Turkish, and Nordmann firs. These fir species were challenged with four species of *Phytophthora* including *P. cambivora*, *P. cinnamomi*, *P. taxon kelmania*, and *P. pini*. The three most aggressive isolates of each of the 4 *Phytophthora* species were used in the study to comprise 12 pathogen treatments as well as an uninoculated check in a split-split-plot design. There were 5 replicate blocks in each of 2 greenhouses. Each greenhouse was set to a different temperature to mimic conditions encountered in growing regions around the US. One greenhouse was set to about 65°F and the other to about 85°F. The purpose of this experiment was to attempt to understand all of the various interactions that can take place between combinations of *Abies* and *Phytophthora* species when testing for resistance. Because PRR in *Abies* is caused by so many species of *Phytophthora* that vary regionally around the US, a given host can be perceived to be more resistant in a particular growing region while suffering greater mortality in another area with different *Phytophthora* profiles and temperature conditions. For this reason, when designing a resistance screening study for the ultimate purpose of searching for molecular markers associated with resistance, it is important to understand how temperature and pathogen species may affect the phenotype of the chosen host.

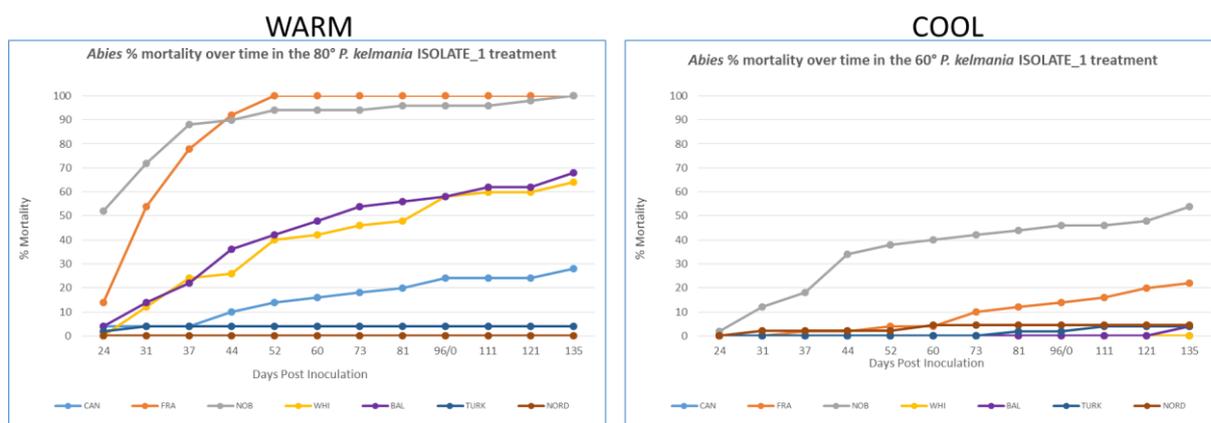
Objectives we were able to address with this experiment include:

- Which *Abies* hosts were more tolerant to PRR?
- Did temperature affect the % mortality of a given species of *Abies*?
- Are Nordmann and Turkish firs suitable as PRR-tolerant alternatives to the highly susceptible noble and Fraser firs?
- Is one *Phytophthora* species more virulent than the others?
- Are there differences between the different isolates used for each *Phytophthora*?

Finally, this study also provided an opportunity to contribute genetic material from individual plants that have a verified phenotype for the purpose of testing molecular markers that will be developed in the future as part of an ongoing NIFA SCRI project we are involved with.

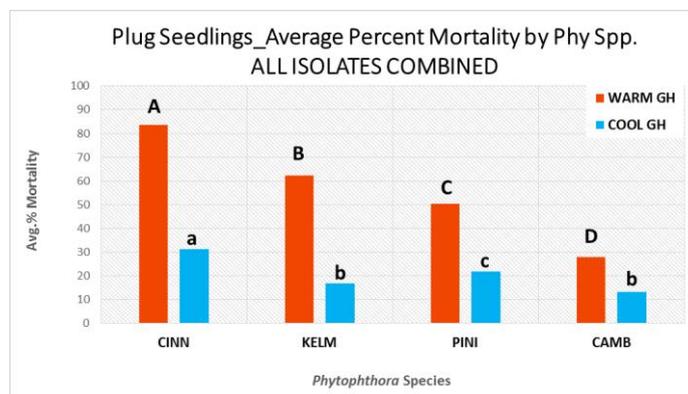
Throughout the course of the 20 week experiment, weekly ratings of plant condition (alive, failing, dead) were performed, and the percent mortality was calculated over time. An example of the graphs that were produced using this information can be seen in Figure 1. Figure 1 depicts just one *Phytophthora* species (*P. taxon kelmania*) and just one isolate of this species (isolate 1), but provides good representation of how the host species ranked generally for susceptibility, how temperature affected mortality, and how much less mortality was suffered by the Nordmann and Turkish as compared to the other host species. In general, noble and Fraser were extremely susceptible, while balsam, Canaan, and white were moderately susceptible. The ranking of balsam, white, and Canaan was dependent on *Phytophthora* species and isolate (not pictured). Nordmann and Turkish were consistently quite resistant. Mortality was clearly greater under warmer ambient conditions than cooler temperatures, but this was an unreplicated variable, so could not be presented statistically.

**Figure 1: Percent mortality of seven species of *Abies* challenged with *Phytophthora taxon kelmania*, isolate 1, under cool and warm temperatures.**

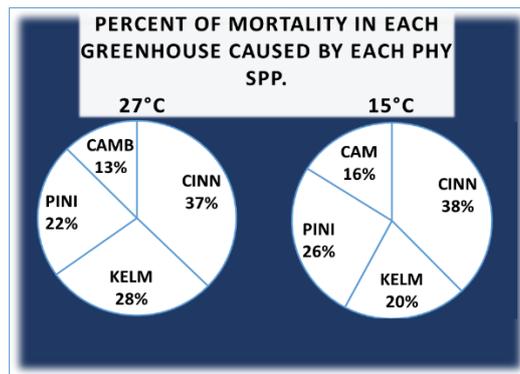


We were also able to assess the virulence of the various species of *Phytophthora* to see if one species was consistently more virulent than the others. *P. cinnamomi* caused greater mortality than the other *Phytophthoras*, followed by *P. taxon kelmania*, *P. pini*, and *P. cambivora* (Figure 2). This figure also illustrates differences in percent host mortality between the warm and cool greenhouses for each *Phytophthora* species. Percent mortality caused by each *Phytophthora* was statistically different between the four species, except between *P. taxon kelmania* and *P. cambivora* in the cool greenhouse. Interestingly, although the overall mortality differed quite markedly between the two temperatures, Figure 3 indicates that the ranking of the percentage of mortality caused by each *Phytophthora* species was very similar in each environment, with *P. cinnamomi* taking the majority, followed by *kelmania*, *pini*, and *cambivora*.

**Figure 2: Percent mortality caused by each *Phytophthora* species in each temperature greenhouse, averaged over all host species and pathogen isolates.**

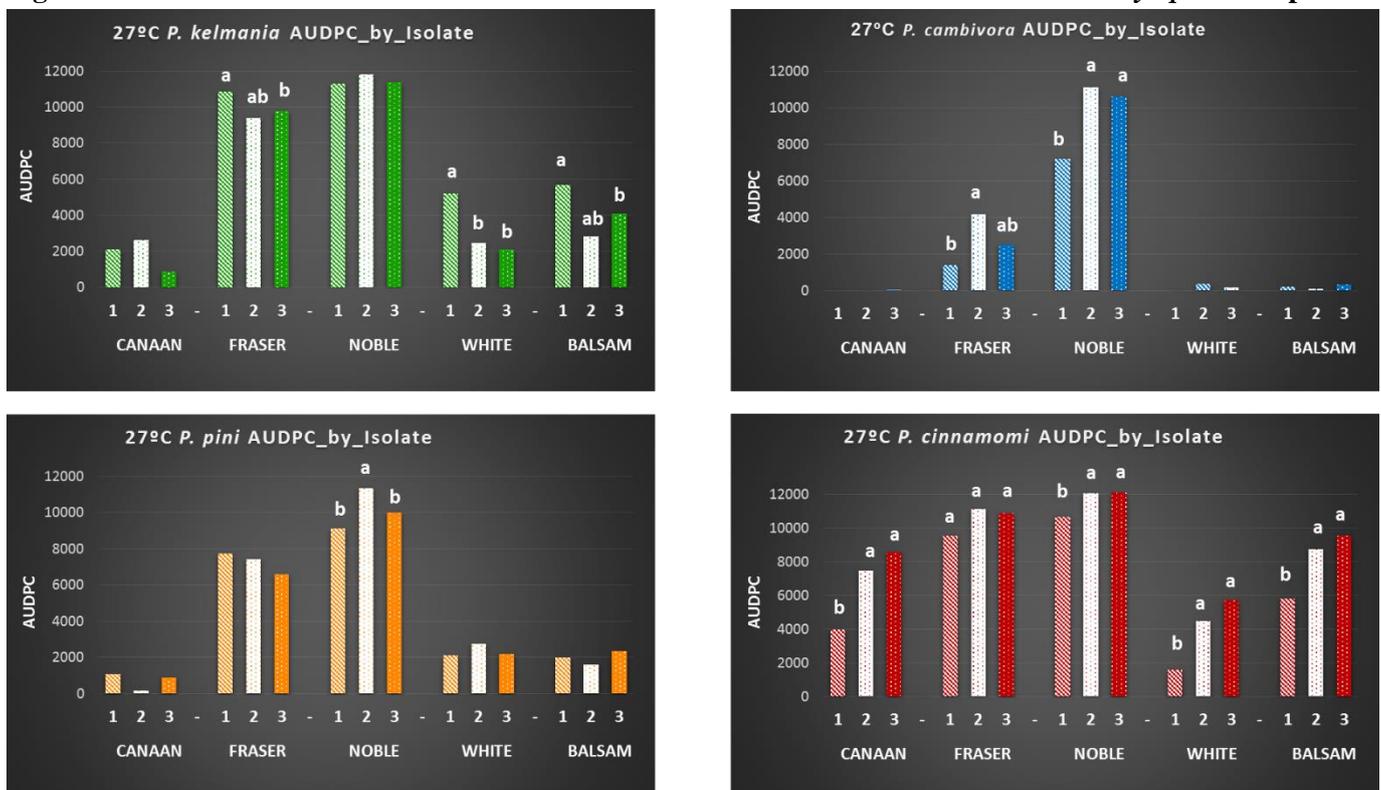


**Figure 3: Pie charts depicting the ranking of the percentage of mortality caused by each *Phytophthora* in the warm greenhouse (27°C) versus the cool greenhouse (15°C).**



Additionally, since we employed three geographically-distinct isolates of each of the four *Phytophthora* species, we were interested in determining if there were any differences in virulence between the three isolates based on the Area Under the Disease Progress Curve (AUDPC). Figure 4 shows AUDPC on the y-axis, with the three isolates (1, 2, 3) on the primary x-axis, and host species on the secondary x-axis. There were no statistical differences between isolates for the Nordmann and Turkish firs since mortality was so low in these species, so they are not included in the graphs in Figure 4. Statistical differences are illustrated in these graphs with the lowercase letters above the bars, indicating that for some *Abies-Phytophthora* combinations, the isolate that was used did indeed have a bearing on disease progress. This result verified the importance of choosing the proper isolate or using multiple isolate when conducting studies for resistance and bolsters the suggestion that host resistance may be somewhat variable by geographical region.

**Figure 4: Assessment of differences between the three isolates used for each of the four *Phytophthora* species.**



In June 2015, trees from this greenhouse study were destructively processed in an effort to collect additional pieces of data that may help to compliment the trends that were observed using percent mortality calculations. During processing, we took a final assessment of top conditions (alive, failing, dead), an estimation of the percentage of rot on the roots, and a determination of root biomass based on oven-dry weight of the root system. Statistical analyses of the data collected in the first trial of this project are underway, and inoculation of the second trial is planned for December of 2015. This ongoing work is being supported by funding from a NIFA SCRI grant.

*Analyze data and prepare progress reports.*

Data obtained from the resistance screening study is still being analyzed. All progress reports have been completed quarterly.

*Presentations at industry meetings and field days* – estimated number of growers in attendance 1,400

- **January 2013:** “Emerging adelgid problem on Nordmann fir and research on Phytophthora root rot” presented by Chastagner and McKeever at the Wilbur-Ellis University Grower Workshops, Auburn, WA..
- **April 2013:** “Overview of new research projects: Nordmann, Turkish and Trojan firs; adelgid; needle necrosis; needle retention and Phytophthora root rot; and more” presented by Chastagner and McKeever at the Inland Empire Christmas Tree Association Annual meeting in Newman Lakes, WA.
- **June 2013:** “Identification of Phytophthora root rot” led by McKeever and “Identification of foliage disease” led by Chastagner at the IPM for Christmas Trees Grower Workshops at Oregon State University North Willamette Research Station in Canby, OR.
- **June 2013:** “Emerging adelgid problem on Nordmann fir and research on Phytophthora root rot” presented by Chastagner and McKeever at the Pacific Northwest Christmas Tree Association Annual Meeting, Portland, OR.
- **June 2014:** “Overview of disease research at WSU Puyallup” presentations by Chastagner and McKeever during the WSU Field Plant Pathology Class, Puyallup, WA.
- **March 2014:** Washington State University Research Overview. Presented by Chastagner at the Pacific Northwest Christmas Tree Association Annual Short Course. Portland, OR.
- **September 2014:** A Review of Christmas Tree Diseases and Management Practices. Presented by Chastagner at the Pacific Northwest Christmas Tree Association Annual Tree Fair. Portland, OR.
- **January 2015:** “An overview of root rotting pathogens of conifers and the current disease resistance screening project” presented by McKeever at the Wilbur-Ellis University conference in Auburn, WA.
- **January 2015:** “Phytophthora root rot research” presented by McKeever to the Pierce County Master Gardener Propagation Group in Puyallup, WA.
- **January 2015:** “Overview of greenhouse root rot study” presented by McKeever at the Puget Sound Christmas Tree Growers Association Annual Meeting in Puyallup, January 24, 2015
- **January 2015:** “Overview of Pacific Northwest Industry trends and research projects” presented by Chastagner at the PA Christmas Tree Growers Association Winter Meeting. New Cumberland, PA.
- **March 2015:** “Key Christmas Tree Research for Northwest Growers” presented by Chastagner at the Pacific Northwest Christmas Tree Association Short Course. Wilsonville, OR.
- **June 2015:** “Management of root rot diseases” presented by Chastagner at the Pacific Northwest Christmas Tree Association Summer Tour, Rochester, WA.

*Prepare one article per year for a grower publication*

- McKeever, K. 2013. Out of sight, but on your mind: A Graduate Student’s Investigation of Phytophthora Root Rot in True Fir Christmas trees. Lookout 46(1).
- Chastagner, G. 2013. Recent Christmas Tree Research Grants Aim to Solve Major Problems for Industry. Lookout 46(1): 25-26.
- Landgren, C. and G. Chastagner. 2013. An update on Turkish/Trojan fir collaborative trial. Lookout 46(1): 27-28.
- Chastagner, G. 2014. Multi-year, Multi-institution Christmas Tree Research Project Gets Underway. Great Lakes Christmas Tree Journal 9(3): 25-28

*Submit paper for publication in scientific journal*

- The manuscript “A Survey of *Phytophthora* Species Associated with *Abies* in U.S. Christmas Tree Farms” was accepted with revisions to the journal “Plant Disease”, September 29, 2015.

The significant contributions and roles of project partners are as follows:

- Chal Landgren, Christmas Tree Extension Specialist at Oregon State University helped coordinated the farm visits and collection of samples in OR
- Tom Leege, Chair of the Inland Empire Christmas Tree Association Research Committee helped coordinate the farm visits and collection of samples in Idaho
- Weyerhaeuser Co. in Rochester, WA has provided seed, seedlings, and some potting media and containers for use in this project.
- Growers in WA, OR and ID have provided access to plantings and helped dig up trees during the farm visits to collect samples.
- John Browning at Weyerhaeuser R&D in Centralia, WA has been instrumental in helping procure the necessary seedlings for use in the host: pathogen interacting studies.

Only specialty crops benefited from this project.

### **GOALS AND OUTCOMES ACHIEVED**

Because efforts to control PRR in Christmas tree plantations through cultural practices and the use of fungicides have generally been unsuccessful, a paramount purpose of this project is to investigate the potential for resistance in true firs. To accomplish this goal, characterization of the various interactions between different species of *Abies* and *Phytophthora* under variable environmental conditions was necessary to understand if and how resistance may be expressed. The execution of the greenhouse phenotype screening study adequately studied interactions and the *Phytophthora* culture collection helped to define and characterize the behavior and habitats of the various species of *Phytophthora* associated with PRR. Preliminary results from the greenhouse screening project have identified proper *Phytophthora-Abies* combinations that can be employed in controlled inoculations on individual roots in order to prepare samples for further histological applications to determine mechanisms of resistance.

A PhD graduate student, Kathleen McKeever, has been responsible for this research and is on track to graduate in 2016.

All stated project goals are underway or have been completed. The second trial of the greenhouse resistance screening project will be initiated in December 2015 and controlled root-system inoculations will run concurrently with the second trial. The completion of these studies is being supported with funding from a multi-state NIFA SCRI genomics project to develop genetic markers to identify *Phytophthora*-resistant *Abies*.

The soilborne *Phytophthora* communities affecting fir in Washington, Oregon, and Idaho have been studied and characterized. It was apparent that the climate and the host species grown in western Washington and Oregon were quite similar, resulting in very similar *Phytophthora* communities and PRR characteristics. In Idaho, they grow host species that are generally less susceptible than the noble fir grown in WA and OR, and have much colder winters and hot, dry summers. Thusly, the PRR issues in Idaho were less severe and *Phytophthora* diversity lower.

Data from the resistance screening study indicate high levels of resistance in Nordmann and Turkish firs and suggest these species as marketable PRR-resistant alternatives to susceptible noble and Fraser firs. Variation in the relative virulence of different species of *Phytophthora* was evident, indicating that some growing regions are faced with more aggressive forms of PRR. Additionally, host mortality was observed to increase in conjunction with high ambient temperatures, indicating that heat and moisture stress may contribute to the expression of above-ground disease symptoms. *Phytophthora* taxon *kelmania* was observed to be a good candidate for use in planned controlled root inoculation studies because it was aggressive enough to cause reliable damage on susceptible host species, but not too aggressive as to cause extensive damage on more tolerant hosts. Also, in contrast to *P. cinnamomi*, it is possible to create a zoospore suspension with ease for individual root inoculations. Other progress toward the root inoculation/histology project includes the acquisition of stratified seed of noble and Nordmann firs from Weyerhaeuser.

### **BENEFICIARIES**

This project has impacted the State's approximately 300 growers involved in producing conifer nursery stock and Christmas trees. It is also benefiting researchers at other locations who are collaborating on a large national NIFA SCRI project that is working on the development of molecular markers to identify *Abies* that are resistant to PRR.

Information from this project has been presented to an estimated 1,400 growers at various industry meetings, workshops and field tours. As growers have increased the planting of *Phytophthora*-resistant species such as

Nordmann and Turkish fir, particularly at small choose and cut farms that are unable to grow noble fir because of poorly drained soils that are conducive to PRR, PNW conifer nurseries are increasing the production of these hosts to meet the increased demand. For example, one large nursery near Puyallup indicated that his nursery has doubled the production of these species in the past 4 to 5 years, but the demand still exceeds what he is producing.

### LESSONS LEARNED

Insight gleaned from this project that may compliment future studies includes reducing the size of the resistance screening study population to assist with logistics, size management, and data analysis (perhaps do a series of smaller studies that can be conducted with a simplified experimental design and statistical analyses). With regard to sampling of *Phytophthora* from farms; more intensive sampling in all regions as well as repeated sampling in consecutive years may provide an opportunity to encounter a greater breadth of host species and may help to account for years with minimal PRR damage. In general, visits to Christmas tree farms were informative for the researchers and engaging for the grower community.

The impact of the economic recession on the nursery industry and the increased demand for *Phytophthora*-resistant Nordmann and Turkish fir has resulted in a shortage of available seedlings of these species from nurseries. The 2013 story by Allen G. Breed, an AP National Writer/Video Journalist on PRR issues in the Christmas tree industry resulted in the widespread national distribution of information about the work done on this project at WSU Puyallup.

Controlled root system inoculations and subsequent histology were not finished in the timeframe of the grant period, but are still currently planned and will be implemented in coming months. Steps have been taken to secure the seed needed for these projects and to identify the proper host-pathogen combinations that will yield appropriate results.

### ADDITIONAL INFORMATION

*Cash Match* - The total cash match that was anticipated on this project was \$10,075. A \$4,129 grant was obtained from the WSU-Puyallup Chicona Endowment Fund for a microscope camera for viewing and capturing microscopic images that were used in morphological studies to identify isolates of *Phytophthora* obtained from diseased trees. A grant of \$7,000 was also obtained from the WSDA Christmas Tree License Program to support work on the identification of disease resistant Christmas trees and the Pacific Northwest Christmas Tree Association provide a total of \$7,754 in support of the virulence and host:pathogen studies.

*In-Kind Match* – The following growers/companies provided in-kind match for this project.

- Ken Scholz at Snowshoe Evergreen in Orting, WA provided 150 wax-coated and 150 uncoated seedling boxes for cold storage/vernalization of seedlings. Estimated value = \$800
- Weyerhaeuser Aurora Nursery in Aurora, OR provided 1,600 seedlings for use in virulence studies. Estimated value = \$1,200
- Weyerhaeuser Rochester Nursery in Rochester, WA provided 1,600 seedlings for use in virulence studies. Estimated value = \$536
- Weyerhaeuser R&D in Centralia, WA provided 20,630 seedlings for use in greenhouse host:pathogenicity studies. Estimated value = \$7,165

#### *Presentations at Professional Meetings*

- **March 2013:** “Screening for Resistance in True Fir (*Abies*) to *Phytophthora* Root Rot & Structure of *Phytophthora* Communities in WA Christmas Tree Farms” presented by McKeever at the 59<sup>th</sup> Annual USDA-ARS Soilborne Pathogens Conference, Corvallis, OR..
- **August 2013:** “Phenotype Screening of *Abies* for Resistance to *Phytophthora* Root Rot & Structure of *Phytophthora* Communities in PNW Christmas Tree Farms” presented by McKeever at the IUFRO International Christmas Tree Research and Extension Conference, Truro, Nova Scotia, Canada.
- **August 2013:** “Seedlot and Species Sensitivity to *Phytophthora* Root Rot...and Host Specificity?” presented by McKeever at the IUFRO International Christmas Tree Research and Extension Conference, Truro, Nova Scotia, Canada.
- **August 2013:** “Nordmann and Turkish fir: *Phytophthora* root rot, CSNN, bud break, and postharvest needle retention evaluations” presented by Chastagner at the IUFRO International Christmas Tree Research and Extension Conference, Truro, Nova Scotia, Canada.
- **April 2014:** “Ornamental Disease Management Research at Washington State University” an invited seminar presented by Chastagner at Huazhong Agricultural University and Henan University of Science and Technology. Wuhan, China.

- **April 2014:** “Ornamental Disease Management Research at Washington State University” invited seminar presented by Chastagner at the College of Agriculture, Henan University of Science and Technology. Luoyang, Henan Province. China.
- **September 2014:** “Regional Variation of *Phytophthora* Species from U.S. Christmas Tree Production Areas” presentation by McKeever at the Western International Forest Disease Work Conference, Cedar City, UT.
- **November 2014:** “Community structures of root-rotting *Phytophthora* species affecting *Abies* in U.S. Christmas tree farms and screening true fir for resistance to *Phytophthora* root rot” presented by McKeever and Chastagner at the IUFRO 7th *Phytophthora* in Forest and Natural Ecosystems Symposium. Esquel, Argentina.
- **March 2015:** “Field assessment of Turkish fir (*Abies bornmuelleriana*) tolerance to five rot Rotting *Phytophthora* species” presented by McKeever at the 61st Annual Conference on Soilborne Plant Pathogens. Riverside, CA
- **May 2015:** “Overview of *Phytophthora* research at Washington State University” presented by Chastagner at the *Phytophthora* in Scandinavia meeting. Malmö, Sweden.
- **August 2015:** “Regional variation of root-rotting *Phytophthora* species from U.S. Christmas tree production areas” presented by McKeever at the American Phytopathological Society Annual Meeting, Pasadena, CA.
- **September 2015:** “Screening *Abies* for resistance to *Phytophthora* root rot” presented by McKeever at the 12th International Christmas Tree Research and Extension Conference. Honne, Norway.

#### *Abstracts and articles in proceedings associated with presentations at Scientific Meetings*

- Landgren, Chal, Gary Chastagner, Ulrick Nielsen. 2014. Results from common source trials of Nordmann and Turkish fir in Denmark and the PNW, USA. P. 32-34. In: MacDonald, M. (Ed). Proceedings IUFRO 11<sup>th</sup> International Christmas Tree Research and Extension Conference. 74 p. August 10-14, 2013. Truro, Nova Scotia.
- McKeever, Kathleen, and Gary Chastagner. 2014. Screening true fir resistance to *Phytophthora* root rot and structures of *Phytophthora* communities from Pacific Northwest Christmas tree farms. P. 26. In: MacDonald, M. (Ed). Proceedings IUFRO 11<sup>th</sup> International Christmas Tree Research and Extension Conference. 74 p. August 10-14, 2013. Truro, Nova Scotia.
- McKeever, K, and G. Chastagner. 2015. A survey of *Phytophthora* species causing root rot on *Abies* in U.S. Christmas tree farms. APS Abstract 134-O.  
[http://www.apsnet.org/meetings/Documents/2015\\_meeting\\_abstracts/aps2015abO155.htm](http://www.apsnet.org/meetings/Documents/2015_meeting_abstracts/aps2015abO155.htm)
- Katie McKeever and Gary Chastagner. 2015. Community structures of root-rotting *Phytophthora* species affecting *Abies* in U.S. Christmas tree farms & screening true fir for resistance to *Phytophthora* root rot Page 163 In: Sutton, W., Reeser, P.W., and Hansen, E.M., tech coords. 2015. Proceedings of the 7th meeting of the International Union of Forest Research Organization (IUFRO) Working Party S07.02.09: *Phytophthoras* in forests and natural ecosystems. 195 p. [http://forestphytophthoras.org/sites/default/files/proceedings/IUFRO\\_Proceedings\\_2014.pdf](http://forestphytophthoras.org/sites/default/files/proceedings/IUFRO_Proceedings_2014.pdf)

#### *Workshops/Field Days/Tours Organized or Co-organized*

- June 2013: Integrated Pest Management for Christmas Trees. OSU North Willamette Research and Experiment Station. Aurora, OR
- June 2013: PMWCTA Summer Meeting Farm Tour. La Center, WA. June 22, 2013.
- March 2015: Pacific Northwest Christmas Tree Association Short Course. Wilsonville, OR.
- June 2015: Pacific Northwest Christmas Tree Association Summer Tour. Elma, WA

#### *News Releases, Media Interviews and Stories*

In addition to this grower publication, a number of media interviews and stories have been done during this project. Interviews have included the New York Time, Los Angeles Times (front page), Chicago Times, The Wall Street Journal, Spokesman Review, Skagit Valley Herald, Washington State Magazine, and Campus Reform. AP, Capital Press, Chemical and Engineering News, Seattle PI.com, Puyallup Herald, Washington State Magazine, Men’s Health, Wordpress.com, AgInfo.net, Onset Computer Corporation Podcast, and Al Jazeera America TV. Radio talk show interviews were also done on Oregon Public Broadcasting, Northwest Public Radio, Illinois Public Media/NPR, New York NPR, the AgInfo Radio Program, CBC Radio in Calgary, Edmonton, Kelowna, and Vitoria, and Radio New Zealand. During the 2013 Christmas season a number of media stories were done specifically relating to *Phytophthora* root rot and the research that is being performed at WSU Puyallup and other collaborators. Allen G. Breed, an AP National Writer/Video Journalist did a story on *Phytophthora* root rot, which included information relating to this project. Following the release of this story on December 2nd, there were about 800 posts of the story within 48 hrs. in other media outlets such as MSNBC, NBC, CBS, Today, USA News, and Huffington Post.

The following are a few examples of some of the media coverage during the period of this project:

- Tortorello, Michael. “Trimming the Tree’s Genes.” *The New York Times* 5 December 2012: D1. Print.  
[http://www.nytimes.com/2012/12/06/garden/building-a-better-christmas-tree.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2012/12/06/garden/building-a-better-christmas-tree.html?pagewanted=all&_r=0)

- Brown, Eryn. “Scientists aim to build a better Christmas tree.” *The Los Angeles Times* 23 December 2012: Print. (Front Page)  
<http://articles.latimes.com/2012/dec/23/science/la-sci-christmas-tree-science-20121224>
- AgInfo Radio Program <http://www.aginfo.net/index.cfm/report/id/Northwest-Farm-and-Ranch-Report-26670>
- Puyallup Herald <http://www.puyallupherald.com/2013/12/04/2928504/advancements-in-christmas-trees.html>
- Capital Ag Press <http://www.capitalpress.com/article/20131202/ARTICLE/131209996>
- MSNBC news <http://www.nbcnews.com/business/national-problem-root-rot-attacking-christmas-trees-2D11674415>
- Oregon Public Broadcasting <http://www.opb.org/radio/programs/thinkoutloud/segment/will-oregons-christmas-trees-be-affected-by-root-rot/>

**CONTACT PERSON**

Gary Chastagner  
Washington State University  
253-445-4528  
[chastag@wsu.edu](mailto:chastag@wsu.edu)

**Project Title:** Assessing the impacts of plow-down and cover crops on field production of tulip

**Partner Organization:** Washington State University (WSU)

### **PROJECT SUMMARY**

Tulip, daffodil, and bulbous iris are grown on about 1,600 acres annually in western Washington with a gross value of over \$12 million. Ornamental bulb crops are poor competitors with weeds because of generally slow early-season growth and shallow root systems and are subject to many diseases. Previous research at WSU Mount Vernon NWREC has shown that weed competition may decrease bulb yield by as much as 41% and reduce bulb size by up to 32%. Significantly, these weedy fields also abundantly produce weed seed, perpetuating the likelihood of weed problems in all subsequent crops. Soilborne diseases, such as gray bulb rot (*Rhizoctonia tuliparium*) and tulip fire (*Botrytis tulipae*) detrimentally affect cut-flower production as well as dramatically reducing yield and quality of harvested bulbs.

Cover crops or green manure plow-down crops are often suggested as a means to reduce competition from weeds and soilborne pathogens while reducing the need for pesticide application. Plow-down crops are usually seeded in late spring or early summer, then killed using cultivation alone or by application of herbicide such as glyphosate (Roundup) followed by cultivation prior to seeding or transplanting field crops or vegetables. Cover crops are normally seeded in late summer or fall, allowed to grow until late fall or early spring, at which time the crop dies from low winter temperatures, or is killed by mechanical means (rolling, crimping, or close mowing) or by herbicide application. Unlike green manures, whose residues are usually buried in the soil, cover crop residue is often left on the soil surface and the subsequent field or vegetable crops are seeded or transplanted through those residues using minimum tillage. Cover crops may include cereals (triticale, rye, oat, wheat, and barley), legumes (pea, vetch, black medic, and clover), and others (buckwheat, rapeseed, and mustard).

Pest management from plow-down crops may occur in two primary ways. First, incidence of certain ornamental bulb diseases may be decreased by growing a non-host crop between bulb crops, which reduces inoculum available to cause infection. A robust cover or plow-down crop can also outcompete many weed species trying to grow at the same time, resulting in poorer weed growth and reduced seed production. Second, allelochemicals produced by the plow-down crop may be released as plant residues decay after soil incorporation. These allelochemicals may detrimentally affect survival of reproductive structures of weeds and pathogens, and potentially reduce weed emergence and disease incidence in the bulb crop grown following the plow-down crop. Like plow-down crops, cover crops may also contribute to weed or disease control in ornamental bulbs. First, weed seedlings are destroyed if the cover crop is killed using glyphosate in late fall or early spring. Provided that the soil is not disturbed after this operation, viable weed seed populations are depleted near the soil surface, reducing germination after emergence of bulb foliage. Second, cover crop residue left on the soil surface may potentially retard germination of remaining weed seed through mulching and/or allelopathic action, and similarly reduce the ability of foliar pathogens to infect bulb leaves as they emerge from the soil in late winter.

Therefore, plow-down and cover crops hold the potential to improve pest management in tulip bulb and cut-flower production. The objective of this project was to evaluate plow-down and cover crops for effectiveness in controlling winter annual weeds and soilborne diseases in tulip, and to aid in nutrient management.

Pest management in bulb crops represents a sizeable investment for growers. Unfortunately, registrations for pesticides in these crops are occasionally lost. In the absence of economical alternative pest control measures, such pesticide cancellations will likely result in reduced field production of tulip bulbs and cut-flowers. It is therefore critically important to discover new methods of managing weeds and diseases. Cover cropping or plow-down crops hold the potential to reduce the cost of ornamental bulb production while increasing its sustainability, for large commercial growers of bulbs and cut-flowers as well as for smaller cut-flower retailers in Washington and throughout the Pacific Northwest.

Reducing production costs will not only enhance the viability of bulb and cut-flower businesses, but benefits will also extend beyond growers. Field production of tulip bulbs in northwestern Washington is highlighted annually during the Skagit Valley Tulip Festival. Conducted since 1984, the Tulip Festival draws an estimated 300,000 visitors and \$65 million in revenue to Skagit County every spring. Other locales sponsor similar celebrations, such as the Puyallup Daffodil Festival. It is not unreasonable to suppose that reduced acreages of blooming bulb crops will result from increased costs of production, a situation that would surely have a negative effect on agrotourism in these regions of the state.

This project had not been previously funded by SCBGP.

## **PROJECT APPROACH**

This project consisted of four trials: 1) the commercial field trial, 2) the field trial at WSU Mount Vernon NWREC, 3) the outdoor container trial, and 4) the forced tulip greenhouse trial. Each is briefly described and pertinent results are presented below.

The **commercial tulip field trial** was conducted in three iterations from May, 2012 to July 2015. The trial each year was located near Sumner, WA, with the same farmer/cooperator, Roger Knutson, for all three iterations. Cover crops (wheat/pea or mustard in 2012, cereal rye/pea or mustard in 2013 and 2014) were seeded in July, then either treated with glyphosate one week prior to tillage in early September, or simply cultivated and buried at the same timing. One plot in each replicate was not seeded to any cover crop to provide a comparison of cover cropping to the standard production practice of no cover cropping. Tulip bulbs were planted into each plot about a month after cover crop incorporation, and plots were monitored for tulip and weed growth and productivity until bulb harvest in July of the subsequent year.

Cover crop and weed biomass was determined at the time of incorporation each autumn. As expected, wheat/pea biomass in 2012 and cereal rye/pea biomass in 2013 and 2014 was the same regardless of whether or not plots were to be treated with glyphosate. Mustard crops, however, differed significantly in their biomass in the second and third iterations, with those plots to be treated with glyphosate producing about 2/3 of the biomass of those plots that were to be incorporated without glyphosate treatment. Cover crop biomass was also much greater in the first iteration (82 and 56 g/quadrat for wheat/pea and mustard respectively) than in the second and third iterations (35 and 26 g/quadrat for cereal rye/pea and mustard in the second iteration, and 4 and 12 g/quadrat for cereal rye/pea and mustard in the third iteration). These differences likely were primarily due to dry soil conditions at the experiment sites during the latter two iterations, particularly in 2014. Weed biomass at the time of incorporation followed roughly the same trend as cover crop biomass, with biomass not differing by cover crop during any year compared to plots where no cover crop was grown. Weed biomass was also much reduced in the second and third iterations (2 and 1 g/quadrat, respectively) compared to weed biomass in the first iteration (31 g/quadrat).

Tulip floral measurements (flower number and stem length) did not differ by cover crop treatment over the three years of the experiment, so these data were pooled and analyzed across treatments for the three iterations. Flower number was greater in the first iteration (69 flowers/plot) than in the second or third iteration (59 and 56 flowers/plot). Conversely, flower stem length was maximized in the third iteration (53 cm/stem) compared to 49 cm/stem in the second iteration and 43 cm/stem in the first iteration. Stem lengths were considered acceptable for use as cut-flowers (> 30 cm) in all three iterations, however. Although not statistically significant, flower number tended to be greater in plots where cover crops were grown, but there were no obvious trends in the flower stem length data.

Neither tulip nor weed above-ground biomass at the time of bulb harvest differed among cover crop treatments in any iteration. Tulip foliar dry weight ranged from 109 to 126 g/m of row when averaged across iterations, with the numerically greatest biomass occurring in plots where no cover crop had been seeded. Weed foliar biomass ranged from 43 to 70 g/m of row, with no clear pattern for the various treatments. Tulip foliar biomass was less in the first and third iterations than in the second (93, 125, and 134 g/m of row, respectively). Weed biomass ranged from 45 to 63 g/m of row, with the numerically greatest foliar biomass found in the third iteration.

Tulip bulb yield was not greatly modified by the previous cover crop in any iteration, so total weight, total number, and average weight of tulip bulbs were pooled across years prior to analysis. Total bulb weight and total bulb number for the various treatments across the three years of the experiment were marginally significant ( $P = 0.06$ ), with tulips following the wheat/pea or cereal rye/pea cover crop treatment that was not killed with glyphosate generally producing fewer bulbs of lesser weight than tulips in plots receiving no cover crop treatment. Average bulb weight did not differ among cover crop treatments. Total weight of harvested bulbs was greatest in the third iteration, while bulb number was greatest in the first iteration. Average bulb weight was 26 g/bulb in the third iteration, compared to 19 and 8 g/bulb in the second and first iterations, respectively.

Marketable bulb percentage in the first iteration was numerically reduced in plots seeded to wheat/pea and not treated with glyphosate immediately prior to incorporation (range of marketable bulbs ranged from 74 to 82%,  $P = 0.09$ ). Marketable bulb percentage was significantly reduced in plots seeded to mustard and treated with glyphosate in the second iteration; marketable bulb percentage did not differ statistically in the third iteration.

The **field trial at WSU Mount Vernon NWREC** was conducted in two iterations from July 2013 through July 2015. Inoculum for two fungal diseases of tulip, tulip fire (*Botrytis tulipae*) and gray bulb rot (*Rhizoctonia tuliparium*), was prepared and selected portions of the plots were inoculated just before to the final seedbed preparation for cover crop seeding. Cover crops (cereal rye/pea or mustard) were either seeded in July (early) or in August (late) and treated with glyphosate one week prior to tillage, either in August (early) or September (late). Cover crops were either incorporated only in the row where tulip bulbs were to be planted (with cover crop residue left on the soil surface outside the tulip row), or entire plots were rototilled. One plot in each replicate was not seeded to any cover crop to provide a comparison of cover cropping to the standard production practice of no cover cropping. Tulip and weed growth and productivity were monitored until bulb harvest in July of the subsequent year.

In the first iteration, cover crop biomass at the time of incorporation (September 2013) was maximized with mustard seeded in July (50 g/quadrat) followed by rye/pea early (32 g/quadrat), and either mustard or cereal rye/pea seeded in August (12 to 17 g/quadrat). At the same timing, weed biomass was nearly zero in early-seeded cover crops regardless of species composition, compared to 9 to 13 g/quadrat in late-seeded cover crops and 43 g/quadrat in bare soil. In the second iteration (September 2014), early- or late-seeded cereal rye/pea and early mustard produced more biomass (29 g/quadrat) than late-seeded mustard (19 g/quadrat). Weed biomass did not differ among cover crop treatments, ranging from nearly 0 to 1 g/quadrat, compared to 55 g/quadrat in plots not seeded to cover crops.

Tulip flower number did not differ among cover crop treatments in 2014, ranging from 30 to 34 flowers/plot. Inoculation with either *Botrytis* or *Rhizoctonia* reduced flower number compared to noninoculated plots. Flower number did not significantly differ by treatment or inoculation in 2015. Flower stem length was reduced in late-seeded full plot-incorporated mustard compared to either early- or late-seeded strip-tilled mustard in 2014. In addition, flower stem length was slightly reduced by *Botrytis* inoculation compared to stem length in noninoculated tulip (36 and 39 cm/stem, respectively). Flower stem length did not differ among cover crop or tillage treatments in 2015, while stem length was slightly reduced by *Rhizoctonia* inoculation (47 cm/stem compared to 49 or 50 cm/stem for noninoculated or *Botrytis*-inoculated tulip). Most flowers among cover crop treatments were considered to be marketable for cut-flowers (> 30 cm), although inoculation with either *Botrytis* or *Rhizoctonia* reduced generally reduced the percentage of marketable tulips, primarily due to mishapen flowers.

While there were several significant differences in tulip foliar biomass at the time of bulb harvest due to cover crop treatments in both iterations, there were few clear patterns in the data. One clear result, however, was that tulip following late-seeded cereal rye/pea resulted in the greatest tulip biomass each year, whether in strip- or fully-tilled plots; tulip following early-seeded mustard showed the next greatest biomass. Tulip produced the least biomass when grown in plots without a preceding cover crop or after late-seeded mustard. In addition, inoculation by *Botrytis* reduced tulip biomass compared to noninoculated tulip by 35 and 4 percentage points in the first and second iterations, respectively. *Rhizoctonia* inoculation did not reduce tulip biomass compared to noninoculated tulip in either iteration. Weed biomass did not differ by cover crop treatment or inoculation.

Total tulip bulb weight in the first iteration was generally greater in plots following cereal rye/pea compared to tulip following late-seeded mustard or plots not seeded to cover crops. Cover crop treatment did not cause clear changes in total bulb number, although late-seeded cereal rye/pea generally increased average tulip bulb size compared to late-seeded mustard or tulips grown in plots not seeded to cover crops. Inoculation by *Botrytis* also reduced total and average bulb weight with the resulting marketable bulb percentage ranging between 66 and 76%. In the second iteration, no measured bulb parameters differed by cover crop treatment. Similarly, inoculation by *Botrytis* or *Rhizoctonia* did not significantly decrease bulb weight, number, average weight, or percentage of marketable bulbs in the second iteration.

The **outdoor container trial** was conducted in two iterations at NWREC from July 2013 through July 2015. Pots were filled with field soil and *Botrytis* and *Rhizoctonia* inoculum was applied to soil prior to cover crop seeding. Cereal rye or mustard were either seeded in July (early) or in August (late) and treated with glyphosate two weeks prior to clipping at the soil level, either in August (early) or September (late). A pot in each replicate was not seeded to cover crop to provide a comparison of cover cropping to the standard production practice of no cover cropping, as well as a pot with no cover crop and with no added inoculum. Cover crop plants were then separated from weeds, and both were dried at 75 °C for at least 3 days and weighed. Three tulip cultivars were planted into each pot, either after cover crop residue was returned to the proper pot and incorporated into the soil, or before placing the cover crop residue on the soil surface. Pots were maintained outside to facilitate disease development, although sawdust was placed around the pots in late fall to reduce the chance of cold injury to the overwintering bulbs. Tulip and weed growth and productivity were monitored until bulb harvest in July of the subsequent year.

There were only minor differences in cereal rye or mustard biomass at the time of cover crop incorporation in the first iteration (September 2013). Cover crop biomass was much lower at the same timing in the second iteration (September 2014), except for early-seeded mustard or cereal rye in pots in which that biomass was to be incorporated. It is not clear why these differences occurred. Weed biomass was low in all pots containing cover crops when compared to pots with no seeded cover crops, especially in the first iteration.

When averaged across the three cultivars, flower number and stem length did not greatly differ, except when compared to tulips in pots with no cover crop and no disease inoculum, in which case no flowers were produced in either iteration. This was unfortunate, and is not considered to be representative of what might be expected when tulips are grown in pots without previous cover crops and no disease inoculation. Flower number ranged from 6 to 9 flowers/pot in both iterations, and flower stem length ranged from 31 to 34 cm/stem. There was no consistent effect of cover crop and inoculation on either variable across the two iterations. When averaged across iterations, cultivars did not differ much in their response to cover crops, except for a slight reduction in stem length in 'Dynasty' and 'Verandi' when grown following late-seeded mustard that was left on the soil surface. 'Ile de France' stem length was numerically reduced by this treatment, but not significantly so.

Bulb production in these pots differed by the interaction of cover crop and inoculation in the first iteration. Most of the difference was observed where bulb number and weight was generally reduced by mustard and cereal rye residues left on the soil surface in pots inoculated with *Botrytis*. This is perhaps primarily due to greater tulip bulb production occurring when tulip was grown in the absence of a preceding cover crop and with no added disease inoculum, especially since those plants did not produce a flower and could put their energy into bulb production rather than into flowers. Tulip responded somewhat similarly in the second iteration, although tulips in the no cover crop and no inoculum treatment did not produce any bulbs. Tulip bulb production was slightly reduced when early- and late-seeded mustard residue was left on the soil surface, especially the number of bulbs produced in those treatments. In both iterations, incorporation of the residue generally improved bulb harvest.

Tulip foliar biomass at the time of bulb harvest did not differ greatly among cover crop treatments when data from pots with no cover crop and no inoculum was included in the analysis, since there was no tulip foliage remaining at harvest in those pots. Tulip foliar biomass ranged from 11 to 13 g/pot when inoculated with *Botrytis* and from 9 to 13 g/pot when inoculated with *Rhizoctonia*. Weed biomass was low regardless of cover crop treatment or inoculum, ranging from 0.2 to 0.8 g/pot.

The **forced tulip greenhouse trial** was conducted in three iterations at NWREC from December 2013 through June 2015. Pots were filled with field soil:sand mix and inoculum (*Botrytis tulipae* and *Rhizoctonia tuliparium*) was applied to soil prior to tulip bulb planting. One bulb each of four tulip cultivars were planted into each pot, either after dried mustard or cereal rye plant residue was added (2, 4, and 8 g/pot of cereal rye and 4, 8, and 12 g/pot of mustard, roughly corresponding to the productivity of these cover crops in the field trials discussed above) and incorporated into the soil, or before placing the cover crop residue on the soil surface. A pot in each replicate did not receive cover crop residue to provide a comparison to the standard production practice of no plant residue, as well as a pot with no residue and with no added inoculum. Pots were maintained in a cold storage unit for four months at approximately 2 °C, after which pots were transferred to the greenhouse (21 to 27 °C). Tulip and weed growth and productivity were monitored until cut-flower harvest.

In the first iteration (begun in November 2013), tulip biomass was generally suppressed by mustard residue, whether incorporated or left on the soil surface, particularly when pots were inoculated by *Rhizoctonia*. This general trend was also apparent in the second (December 2013) and third (December 2014) iterations, although biomass decreases were not as great as in the first iteration. In all cases, tulips grown in pots with no added cover crop residue and inoculated with *Rhizoctonia* produced among the lowest biomass in the trial. When pots were inoculated with *Botrytis*, tulip biomass was also generally reduced by mustard residues, although the magnitude of the differences were not as apparent as in *Rhizoctonia*-inoculated pots. Tulip biomass in *Botrytis*-inoculated pots in the third iteration did not significantly differ. When data were analyzed only according to inoculation treatments, tulip biomass was less with *Botrytis* than with *Rhizoctonia* in all three iterations, although biomass of inoculated tulip was statistically equal to noninoculated tulip.

Tulip stem length was not greatly affected by cover crop residue, particularly in the second and third iterations. In the first iteration, stem length was reduced in pots receiving incorporated mustard residue in comparison to most cereal rye residue treatments. *Botrytis* inoculation reduced tulip stem length compared to tulip inoculated with *Rhizoctonia*, although significantly so only in the second and third iterations. Stem length of *Rhizoctonia*-inoculated tulip was longer than noninoculated tulip only in the first iteration.

Shepherd's-purse (*Capsella bursa-pastoris*) seed found in the field soil used for this trial germinated in most of the pots. Cereal rye residue generally reduced weed density more than mustard residue in the first iteration, but not in subsequent iterations. There was no clear response by this weed species to the different amounts of cover crop residue used in the various pots.

**Overall Recommendations:** It appears from these trials that cover cropping can be successfully implemented into a field-grown tulip flower and bulb production rotation. Cereal rye/pea or mustard cover crops were best established in July rather than in August, although later seeding of cereal rye was adequate for cover crop biomass production. Weed control was maximized in the early-seeded cover crops compared to later-seeded cover crops. Use of glyphosate prior to cover crop incorporation did not negatively affect tulip except for one of the three years of the commercial field trial, where glyphosate-killed mustard reduced the percentage of marketable bulbs. However, glyphosate application was helpful in killing the cereal cover crop so that it did not persist to compete with the subsequent tulip crop, which numerically improved bulb yield in one year of three in the commercial field trial. Cover crop residue did not generally injure the bulb during the winter. Application of mustard residue did reduce tulip foliar biomass in the forced tulip trial, however, although tulip grown without added mustard residue did not generally produce as much biomass as bulbs grown with cereal rye residue. In the outdoor container trial, incorporation of cover crop residue slightly increased the number of tulip bulbs. Cover cropping did not reduce *Botrytis* infection of inoculated tulip in any of these trials. While infection by *Rhizoctonia* was not observed, this probably reflected problems with the inoculum more than suppression of the fungus by cover crops. Cover cropping also did not greatly affect weed control in the tulip crop. However, late-seeded cereal rye/pea resulted in the greatest tulip foliar biomass in each year of the NWREC field trial, whether in strip- or fully-tilled plots, with early-seeded mustard also resulting in increased tulip foliar biomass. Weed control was not noticeably improved using strip-tillage of cover crop residue as compared to full incorporation of cover crop residue. Tulip produced the least foliar biomass when grown in plots without a preceding cover crop or when following late-seeded mustard. There were no meaningful reductions in flower stem length due to cover crop practices, as flower stem length nearly always exceeded 30 cm in length under all tested conditions. Total tulip bulb weight tended to be greater in plots following cereal rye/pea compared to late mustard or plots not seeded to cover crops in one of the two years of the NWREC field trial.

This project was conducted in large part by PhD graduate student, Yushan Duan, and she was unquestionably the staff member who learned the most from this project. She learned how to design and conduct complicated field and greenhouse trials, manage field portions of the project, prepare disease inoculum and recognize and rate tulip diseases, and methodically collect data, as well gaining insight into the physiology of tulip as it responds to cover crop treatments. She has presented findings in scholarly meetings and is currently writing up her data in her final doctoral dissertation.

Much of the field work was accomplished by Carl Libbey, the Research Assistant in the Weed Science Program at WSU NWREC. He worked closely with the graduate student and with Roger Knutson, the grower/cooperator in Sumner, WA. Roger was highly involved in the commercial field trial, being responsible for land preparations, incorporation of cover crops, and tulip planting. Obtaining yield data on grower fields and using their harvest equipment added credibility and insured that other growers could easily believe the results and likely see a similar response on their own fields. Roger was excited about the research, and very interested in seeing the results on his own farm. Without Carl and Roger's activity in this project, it is unlikely that we could have successfully conducted the research reported here.

Seeding timing and species composition of the cover crop mixes tested in this project were developed in earlier trials conducted at WSU NWREC, and how those mixes performed when seeded prior to tulip bulb planting in this project will be of interest to area farmers regardless of the crops they produce. Still, the unusual seasonality of tulip production, from October to July, makes direct use of these data unlikely by growers of typical spring-sown specialty crops and nearly all commodity crops. And given that this project was aimed at determining the ability of these cover crops to control weeds and diseases of tulip bulbs and cut flowers, most of these techniques will be uniquely applicable only to field-grown tulip production. Also, given the short duration of the cover crop growth window (July and August), it is unlikely that growers of many rotational crops can directly benefit from the results from these trials. Greenhouse data generated about cover crop residues and forced tulip production was also focused exclusively on tulip for cut flowers, so only those specialty crops will benefit from those results.

#### **GOALS AND OUTCOMES ACHIEVED**

The performance goals for this project were nearly completely met, in that the trials noted in the proposal were all completed as planned. The PhD student who conducted the research is currently writing up the results with an

expected defense date of May, 2016. The activities that were completed are included in the description of the four trials mentioned above.

One additional test from the commercial field trial is being conducted beyond what was itemized in the proposal. Soil collected from every plot in all three iterations of that trial is being tested and the microbial community is being characterized. It will be of interest to see if cover cropping greatly changes the relative proportions of these organisms and may indicate a preferable level of "soil health" occurring when cover cropping is used. Different profiles by cover crop treatment may also help explain the limited impact of cover cropping on tulip floral, foliar, or bulb production observed in that trial.

Only short- and mid-term outcomes were expected from this project.

The project experimentation was very successful, with most of the anticipated work actually occurring. A few tasks were, however, not successfully accomplished. First, the timing of the grant did not allow us to prepare inoculum for the field trial at NWREC soon enough to conduct the trial in the first year of the project. As a result, the first field iteration at WSU Mount Vernon NWREC was delayed until summer, 2013. Given that a typical field-grown tulip production cycle is from October through July, it was too optimistic to have considered establishing that trial in the first year of this three-year project. Difficulty in growing adequate amounts of disease inoculum in time to meet the required seeding of cover crops contributed to the delayed initiation of this trial. Therefore, only two iterations of this on-station field trial were conducted.

The single remaining task is to conduct the final grower survey, which will occur at the Washington State Ornamental Bulb Commission meeting that is scheduled on January 19, 2016. Initial data was gathered in January 2014 and responses gathered during the 2016 meeting will be compared to the earlier responses to determine if attitudes have changed regarding cover cropping in field production of ornamental bulbs. The target was that 50% of Washington ornamental bulb producers will consider cover cropping options for their production systems of field-grown tulips and tulip bulbs. Direct interaction with these producers was obtained by using audience "clickers", which provided us with anonymous opinions of the producers in attendance at the 2014 meeting. The audience of that meeting accounted for some 90% of all western WA growers, as well as some OR and BC bulb producers. It is anticipated that participation will be similar at the 2016 meeting, and the same questions will be put to the audience using the same "clickers" to gather their anonymous responses. Our goal setting may have been too ambitious in the desire to have measureable results by the end of the project (September 2015). While this portion of the project will be successfully completed, it will not occur for two months.

Some of the more pertinent results from the baseline survey in January 2014 include:

- (1) 81% of survey responders believe that cover crops are capable of controlling weeds before tulip bulb planting and prior to emergence of tulip foliage, while 67% of survey responders think that cover crops are capable of providing some control of soilborne diseases of tulip.
- (2) 90% of survey responders think cover crops will greatly or somewhat improve soil health.
- (3) 48% of survey responders believe cover crops will persist to compete with the tulip crop, while 33% think they won't.
- (4) Responders split on which species would best control diseases (10% think cereals would be best, 52% think mustards would be best, and 33% think both would be helpful) or weeds (19% cereals, 29% mustard, and 48% both).

## **BENEFICIARIES**

The major beneficiary from this project will be the Washington ornamental bulb industry, producers of tulip, daffodil, and bulbous iris flowers and bulbs. Growers in Washington have great interest in this project, as do producers in adjacent Oregon and British Columbia. The majority of ornamental bulbs produced in the US are produced in Washington State. Internationally, tulip production in this region is surpassed only by the Netherlands. Indeed, most of the bulb producers in the Pacific Northwest are of Dutch ancestry, having been farming in this area mostly since the late 1920's.

The represented growers now have data to show that cover cropping does not negatively affect bulb and cut-flower production of tulips in the Pacific Northwest. These data show that cover crops seeded as soon as possible in July, treated with glyphosate to completely kill the crop, and followed by residue incorporation a month prior to bulb transplanting can provide excellent weed control prior to transplanting of bulbs and not reduce either cut-flower quality or bulb productivity. The cover crops tested in these trials do not appear to greatly impact soilborne diseases, unfortunately. Still, growers armed with this knowledge will not rely on the cover crop to assist them with disease

management and they will continue to implement all production recommendations for control of tulip fire and gray bulb rot. Taken together, growers have one more option to consider for managing weeds in their fields prior to planting tulip.

### **LESSONS LEARNED**

The conduct of the 2012-13 commercial field trial near Sumner was a learning time for us in regard to cover crop species and especially concerning establishment timing. Consequently, slight changes to the protocol were made prior to the second iteration (2013-14), including an earlier seeding time for the cover crop (July rather than August) and use of winter cereal rye rather than winter wheat.

Probably the most important lesson learned from this project was in respect to the complexity of forcing tulip bulbs in cold storage and subsequent grow out in the greenhouse. Results from those experiments were definitely impacted by less-than-optimal tulip emergence and flower production. While the data did provide good information regarding effects of cover crop residues on tulip bulbs during the forcing procedure, it would have been beneficial to have experienced less variability in tulip response, which likely resulted from limited ability to fine-tune the low temperatures in the cold-storage units that were available for use at WSU NWREC in response to tulip development during forcing.

In a similar way, the general lack of response of tulip to *Rhizoctonia* inoculation in the field and in containers may indicate that that *Rhizoctonia* inoculum used in these trials was not as virulent as may be desired. This probably resulted from project staff inexperience with that fungus and with inoculum preparation techniques. The *Botrytis* inoculum did appear to result in infection in the various trials, however, indicating that the inoculation techniques utilized in the trials were at least effective for that fungus.

Although not completely unexpected, I believe the grower/cooperator learned much about how to establish and conduct statistically sound research. It is often surprising to first-time cooperators how replication of treatments is required for investigators to generate meaningful data. Perhaps the largest benefit they gain, apart from the results generated on their land, is when they want to test other management practices on their own fields after the experiment is done.

I am a bit baffled as to why we didn't see a greater response in tulip from the preceding cover crop. In particular, I expected to see greater impact of the mustard on the incidence of tulip fire, but suppression of the *Botrytis* pathogen did not occur in any of the trials conducted in this project. As noted above, forcing of tulip also did not result in a fully satisfying result, indicating that we still have much to learn about how to successfully accomplish that task in future experiments. On the other hand, I expected to see some thoroughly negative results due to cover cropping so soon before tulip bulb transplanting. Negative cover crop effects on tulip were generally quite modest, which may result in the favorable outcome that growers will have the confidence to experiment with cover crops in their own ornamental bulb rotations.

I think the incomplete outcome regarding our goal of 50% of ornamental bulb producers considering implementation of cover cropping resulted more from lack of time to than to results not matching expectations. I expect we can meet our goal in light of these data, but that outcome will not be realized until we complete the extension portion of this project. In retrospect, this project was too ambitious in scope in that data analysis and reporting on the findings really couldn't be done in the prescribed timeline. Therefore, future projects need to allow more time for this aspect of project completion.

### **ADDITIONAL INFORMATION**

The Washington Bulb Company, Inc. (Mount Vernon, WA) provided tulip bulbs for transplanting in the field trials at NWREC and in the outdoor container and greenhouse forcing trials. The bulb value was \$80 for each tray of 1000 bulbs: six trays per year, two years of field trials = \$1,200, plus another tray of each of three cultivars for each of the two container trials: three trays per year, two years of trials = \$960, for a total value of \$2,160 from Washington Bulb Company. The second donation was for the commercial field trials conducted near Sumner, WA (Roger Knutson, cooperator). Roger provided land in his production fields and tulip bulbs for large plot cover crop research in tulip each of three years. Each iteration measured a total of 4800 feet of tulip row. Given costs for working the ground two additional times per year for cover crop incorporation and for extra seeding and spraying costs, the value of this donation is estimated as follows: 4800 feet of row = 1/3 acre; two extra tillage operations costs \$100 per acre per year (\$33 for 1/3 acre per year, \$100 total) while spray costs are about \$15 per acre (no herbicide cost included, \$5 for 1/3 acre per year, \$15 total). Extra time for these plot operations compared to standard tulip production is estimated to be

about \$100 per acre per year (\$33 for 1/3 acre per year, \$100 total).  $\$100 + \$15 + \$100 = \$215$ . So the total in-kind donations were \$2,160 for tulip bulbs and \$215 for the commercial field trial, for a grand total of \$2,375.

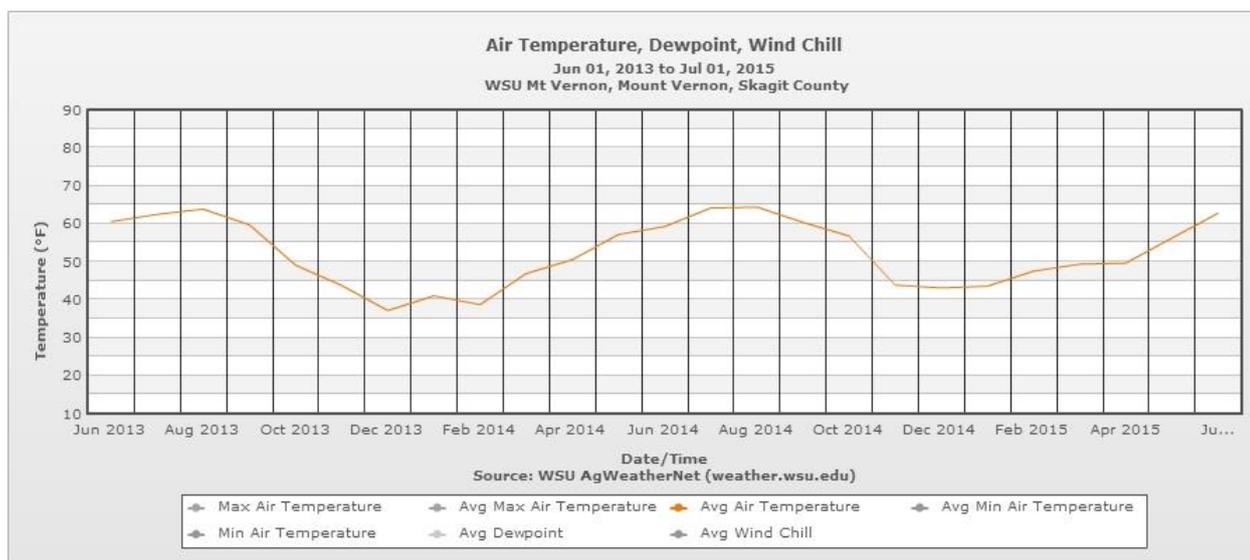
**Abstracts**

1. Duan, Y., C.R. Libbey, and T.W. Miller. 2015, *in press*. Using cover crops for weed management in tulip production. Proceedings, Western Society of Weed Science, Portland, OR.
2. Duan, Y., G.A. Chastagner, A. Debauw, and T.W. Miller. 2015. Effect of green manure and cover crops for weed and disease management in tulip. Weed Science Society of America, Lexington, KY. WSSA Abstracts, CD, Abstract 38.
3. Duan, Y., C.R. Libbey, G.A. Chastagner, I.C. Burke, A.C. Kennedy, M.A. Jacroux, and T.W. Miller. 2014. Effects of plow-down and cover crops for tulip production in western Washington. Proceedings, Western Society of Weed Science, Colorado Springs, CO, p. 8.

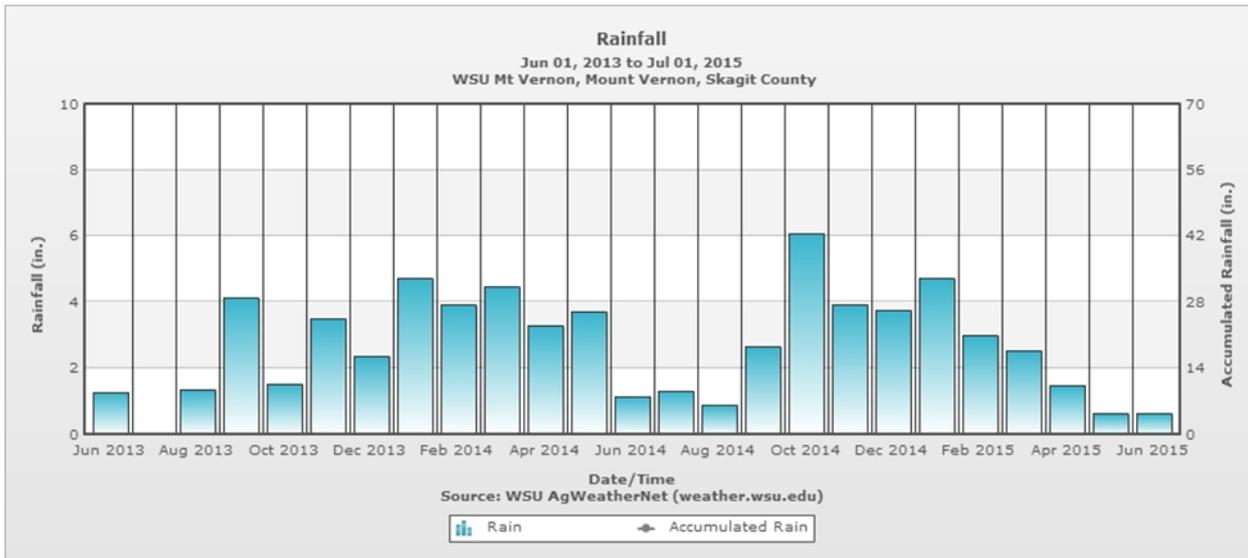
**Presentations**

1. Cover Cropping Options for Tulip Production, Yushan Duan. Wilbur-Ellis Professional Markets Technical Seminar, Section: Bulbs and Flowers, Auburn, WA, January 20, 2015.
2. Effects of plow-down and cover crops for tulip (*Tulipa L.*) production in western Washington, Yushan Duan. Wilbur-Ellis Professional Markets Technical Seminar, Section: Bulbs and Flowers, Auburn, WA, January 22, 2014.

Average Temperature at WSU Mount Vernon from June 2013 to July 2015 (WSU AgWeatherNet).



Precipitation at WSU Mount Vernon from June 2013 to July 2015 (WSU AgWeatherNet).



**CONTACT PERSON**

Timothy W. Miller  
 Washington State University  
 360/848-6138  
[twmiller@wsu.edu](mailto:twmiller@wsu.edu)

**Project Title:** Economic Impacts of Grapevine Leafroll Disease

**Partner Organization:** Washington State University (WSU)

## **PROJECT SUMMARY**

According to the report “[The Economic Impacts of Wine & Wine Grapes in Washington State](http://www.washingtonwine.org/)” released by the Washington State Wine Commission (<http://www.washingtonwine.org/>) in September 2015, the grape and wine industry had an estimated \$4.8 billion impact on Washington State’s economy in 2013. Compared to a \$3.5 billion total state economic impact in 2009, the latest estimate represents a \$1.3 billion increase over a five year period with a compound annual growth rate of 8.5 percent per year. These numbers indicate that prospects are greater than ever for further expansion of the grape and wine industry in the state to produce high quality grapes for making premium wines at affordable price. Virus diseases are amongst the most serious impediments to this trajectory of growth and the long-term sustainability of Washington’s grape and wine industry (*Vinewise* [<http://www.vinewise.org/>] and *The Pest Management Strategic Plan for Washington State Wine Grape Production* [[http://www.ipmcenters.org/pmsp/pdf/WA\\_WineGrape\\_PMSP\\_2014.pdf](http://www.ipmcenters.org/pmsp/pdf/WA_WineGrape_PMSP_2014.pdf)]). They are known to induce a wide range of disorders, vine growth problems, reduced yield, delayed fruit maturity and poor quality of grapes.

Among the virus diseases documented in Washington vineyards, grapevine leafroll disease (GLD), a complex virus disease spread via vegetative cuttings and vectored between vineyards by mealybugs and scale insects, is a major impediment for sustainable growth of the grape and wine industry in Washington State. Despite of its detrimental effects on vine growth, grape yield, and maturity and quality of grapes, no information is available on economic impacts of the disease in Washington vineyards. Since improved understanding of crop losses due to GLD would help growers appreciate consequences of the disease to their income, this project was developed to analyze economic impacts and financial implications of the disease on grape yield and fruit quality and to examine economic benefits of implementing prevention and control strategies. It was anticipated that a clear articulation of financial benefits of GLD management will promote rapid adoption of best management practices by individual growers for sustainable growth of the grape and wine industry in Washington State.

Previous to the commencement of this project, no information was available on income losses due to grapevine leafroll disease (GLD) relevant to Washington's grape and wine industry. Therefore, this project was initiated to generate science-based information on economic impacts of GLD, the most insidious virus disease, to wine grape production in commercial vineyards. Data on grape yield and quality collected from a red grape cultivar in a commercial grower vineyard was used in the Net Present Value (NPV) approach to estimate crop losses and impacts to growers’ operating income. It was anticipated that making growers aware of income losses due to viral diseases and financial benefits accrued from timely management of viral diseases will strengthen industry efforts in advancing clean plants for healthy vineyards and promote sustainable growth of the grape and wine industry in Washington State.

This is a new project and was not supported previously by the WSDA SCBGP or other funding agencies.

## **PROJECT APPROACH**

The overall goal of the project was to estimate income losses due to grapevine leafroll disease in Washington vineyards and project financial benefits of adopting prevention and management strategies. The following is a summary of activities carried out during this first of its kind study to gain a better understanding of impacts of virus diseases to vineyard profitability and sustainability:

- **Performance measure 1: Existing vineyard blocks with grapevine leafroll disease will be identified and data collected on vine productivity (vigor and fruit yield), quality of grapes from four wine grape cultivars during three seasons, and quantity and quality losses assessed in vineyards infected with the disease.**

Grapevine leafroll disease (GLD) is a complex virus disease. GLD produces distinct symptoms in red- and white-grape varieties. Symptoms of GLD are variable between red-grape varieties. Thus, knowledge concerning the responses of different wine grape cultivars to GLD infection is important to assess overall economic impact of the disease. In addition, grapevine exhibits the seasonal variation in yield compared to other crops. Thus, variation in fruit yield across seasons and varietal-specific differences should be considered while analyzing overall impact of GLD.

- i. Yield data collected from healthy and infected vines in a Merlot block during 2008, 2009, 2010, 2011 and 2012 seasons (before initiation of the project) showed a reduction of 17%, 28%, 16%, 21% and 12%, respectively, in fruit yield due to GLD infection. These results indicated that GLD causes significant losses to fruit yield in cv. Merlot with yield losses varying between 12% and 28% during five successive seasons. Similarly, the reduction in fruit

quality, measured as total soluble solids (indicative of total sugar content) in terms of °Brix, ranged between 4% and 8% during these five seasons. This data on yield and grape quality was subsequently used to estimate economic losses due to GLD in cv. Merlot as described in Performance measure 3.

- ii. The project team has collected additional data on fruit yield and grape quality (especially total sugars measured as °Brix) from four additional red-grape varieties, planted in different locations, during 2013, 2014 and 2015 seasons. Fifteen to twenty symptomatic vines and equal number of healthy vines were selected for each variety to measure fruit yield and grape quality. Vines showing typical symptoms of GLD and those without GLD symptoms were tested by molecular diagnostic assays to ensure that symptomatic vines are positive for leafroll virus type 3 and healthy vines are negative for the virus. The following conclusions were made based on a comparison of the data (fruit yield/vine and sugar content of grapes) obtained from healthy and infected vines:

**Cabernet Sauvignon:**

Location 1: GLD infection caused a reduction of 14.18%, 5.0% and 14.3% in fruit yield during 2013, 2014 and 2015 seasons, respectively. Total sugars were decreased by 8.9%, 11.25% and 11.58%, respectively, during 2013, 2014 and 2015 seasons.

Location 2: GLD infection caused a reduction of 23.60% and 17.38% in fruit yield during 2014 and 2015 seasons, respectively. No difference in total sugars was observed between grapes harvested from healthy and infected vines during 2014 and 2015 seasons.

**Syrah:** GLD-affected vines produced less fruit per vine with 11.13% and 6.14% reduction compared to healthy vines in 2013 and 2015 season, respectively. Total sugars were less by 7.32% and 9.39% compared to healthy vines in 2013 and 2015 seasons, respectively.

**Zinfandel:** GLD-affected vines produced less fruit per vine with 18.14% and 16.60% reduction compared to healthy vines in 2014 and 2015 season, respectively. There was no difference in total sugars between infected and healthy vines in 2014 and 2015 seasons.

**Petit Syrah:** GLD-affected vines produced less fruit per vine with 16.08% and no reduction compared to healthy vines in 2013 and 2015 season, respectively. Total sugars were less by 5.74% and 2.78% compared to healthy vines in 2014 and 2015 seasons, respectively.

**Based on these results, it can be concluded that:**

- i. GLD affects fruit yield and quality (especially sugars) of grapes in four red grape varieties examined during this project period. However, impacts of GLD appears to be variable between grape cultivars and across seasons.
- ii. It is also likely that a single grape variety can show site-specific responses to GLD, as observed with Cabernet Sauvignon planted in to distinct appellations.
- iii. Thus, it is important to continue these studies for several seasons involving as many wine grape varieties as possible planted in different appellations for a better understanding of site- and varietal-specific differences in fruit yield and quality to GLD infection. The data from different types of wine grape varieties collected during successive seasons will provide a comprehensive picture of economic impacts of virus diseases in Washington vineyards.

- **Performance measure 2: The current management/control measures used to mitigate grapevine leafroll disease in Washington vineyards will be determined from premium wine grape growers.**

A survey questionnaire “Management and Prevention Practices for Grapevine Leafroll Disease (GLD)” was developed to collect information on current management or control measures used to mitigate grapevine leafroll disease. The project team (Naidu Rayapati and Doug Walsh of Washington State University and Trent Ball and Ray Folwell of Agri-Business Consultants [sub-contractor of the project]) discussed this survey questionnaire during a meeting with a target group of wine grape growers in 2013 and collected relevant information about current pesticide usage (type, dosage, frequency, etc.) to control mealybugs and other management strategies, such as roguing and replanting to reduce incidence of GLD.

The primary conclusions from these discussions with the grower panel were as follows:

- i. GLD spread appears to occur more frequently through cuttings than vectors. So, the quality of planting materials seems to be relatively more important for GLD management than controlling vectors. In recent years, the availability of virus-tested planting materials from certified nurseries is improving. This is enabling growers to access 'clean' planting materials for planting new vineyards, thereby promoting healthy vineyards.
- ii. Most vineyard owners make visual observations for GLD symptoms during the Fall. However, the visual observation for symptoms is applicable only for red grape varieties, since they express typical symptoms of GLD. No such symptoms are visible in white grape varieties. Therefore, growers have begun testing vines for viruses to develop a baseline of infection levels in their vineyards. In this regard, growers seek advice from Rayapati for sampling and virus testing strategies.

- iii. It is economically viable to rogue vines with GLD in older blocks (vines 8 + years old). In contrast, roguing in young blocks may be beneficial in minimizing disease spread. Growers are aware that replacing old blocks with GLD infection is a costly affair and dependent on specific cultivar. For example, complete removal of wine grape varieties from soil is more difficult and costly when compared to removal of Concord grapevines. Thus, cost is an important factor in making decisions with regard to replacing infected older blocks of wine grape cultivars with new plantings.
- iv. Grape yield and sugar concentration (measured as °brix) are the two most important parameters utilized to assess impacts of GLD. These two parameters are also used to determine if a vineyard needs to be replanted. Wineries pay less than contractual price or reject contract if the desired °brix is not met by growers. Some wineries are including specific language in the contractual agreement about the price paid to a grower depending on berry sugar levels.
- v. Growers use pesticides such as imidacloprid for chemigation and Movento or Neuprid for foliar application to control mealybug vectors. Even with an effective pest-management program, the spread of GLD was observed in vineyards.

In addition, the cost to remove GLD vines was discussed as well as the costs to replant with virus-tested certified cuttings or self-propagated vines. This information was used to estimate the costs and income returns for various scenarios associated with GLD management described below.

- **Performance measure 3: The net present value and internal rate of return will be calculated using cultivar, age of the vineyard, and current and expected yield/quality production.**

The study on economic impacts of grapevine leafroll disease (GLD) was published in Good Fruit Grower, an industry magazine with worldwide circulation, in 2015, vol. 66, no. 10, pages 10-11 (see attachment #1). The study was conducted using grape yield and quality data (described in Performance measure 1 above) collected from a commercial vineyard block planted with a red grape variety (Merlot). In consultation with wine grape industry representatives, the following questions were addressed for estimating economic impact of GLD:

- i. How much is lost (in terms of operating returns) when fruit yield is reduced by 10 percent, 20 percent, or 30 percent?
- ii. How much is lost (in terms of operating returns) from a combination of reduced fruit yield and price penalty imposed by wineries when grapes have less than expected sugar levels?

A summary of the study (extracted from the publication in Good Fruit Grower, see attachment #1) is presented below:

A base-line scenario for a Merlot vineyard was created using an average annual yield of 4.5 tons per acre and a three-year average price of \$1,127 per ton. The associated variable costs were calculated using the Northwest Grape Costs of Production Calculator using 2014 prices and production practices for a vineyard in full production. Industry stakeholders participated in discussions and validation of costs estimated for grape production. Annual operating returns (excluding fixed costs) were calculated for a Merlot vineyard that had no virus infection as the base-line scenario. The base-line operating returns of \$2,619 per acre were compared to the operating returns for vineyards managed under various virus infection scenarios of crop losses and reduction in fruit quality, especially sugars measured as Brix. The study used two Brix reduction scenarios - a loss of 0.4° and 1.0° Brix. Assuming a 20-year life span for a healthy Merlot vineyard, the Net Present Value (NPV) approach was used to estimate the operating return that would be lost due to leafroll disease. In the best case scenario, a grower experiencing 10 percent decrease in yield and 0.4° Brix decrease would lose an estimated \$3,005 per acre over the 20-year span of the vineyard. The estimated loss for the worst case scenario of 30 percent yield decline and 1.0° Brix decrease was \$19,800 per acre over the 20-year period.

These analyses have clearly indicated that reduction in fruit yield due to GLD infection has a negative impact on growers' income. Including the price penalty due to decreased fruit quality (i.e. °Brix) further exacerbated economic losses to a grower and negatively impacted a vineyard operation's economic viability in the longer term.

Economic impact of grapevine red blotch disease:

At the recommendation of stakeholder members of the project advisory panel, a comparative study was made on economic impacts of leafroll disease with grapevine red blotch disease. Using the data on fruit yield and quality (sugar content) that Rayapati's team has collected from cv Merlot during 2013 and 2014 seasons, Trent Ball and Ray Folwell of the Agri-Business Consultants (sub-contractors of the project) have generated economic impact of the red blotch

disease in a Merlot block. Subsequently, this data was compared with the data on economic impact of leafroll generated earlier during the current project period.

The estimated Net Present Value of loss per acre over a 20-year period due to grapevine red blotch infection was \$27,021.00 relative to \$16,115.00 loss due to grapevine leafroll disease. This data indicated that both leafroll and red blotch can cause significant losses to grower's income. However, red blotch appears to have higher impact on growers' income than leafroll. It should be noted, however, that the data on red blotch was derived based on fruit yield and quality data from two seasons.

The above results indicated that reduction in fruit yield and quality due to leafroll infection is real, tangible, and significant. Although this study is confined to one cultivar (i.e. Merlot), it is likely that both leafroll and red blotch diseases can cause substantial economic impacts to wine grape growers in the long term. Therefore, studies should be extended to other wine grape varieties to determine economic impacts and financial implications of viral diseases to advance sustainability of the grape and wine industry in Washington State.

- **Performance measure 4: The economic thresholds for various management/cultural practices in the GLD infected vineyards will be determined including non-intervention, roguing individual infected vines, and total vineyard replacement.**

Due to the lack of therapeutic measures to treat virus-infected vines, roguing or removal of infected vines and replacement of diseased vines with healthy vines is recommended to effectively slow grapevine leafroll disease (GLD) spread in vineyards. The benefit-cost ratio of roguing depends on a variety of factors, including overall disease incidence, annual rate of disease spread, age and economic returns of the vineyard. Studies conducted by Rayapati's team on the rate of GLD spread in young vineyards planted with clean cuttings showed that spread of the disease occurs at different rates depending on the location, cultivar, proximity to infected old blocks and weather-related factors.

Using field data on GLD spread in three wine grape cultivars planted in three separate vineyard blocks (Rayapati, unpublished data from another project), the predicted rate of disease spread over a 25-year period was calculated under three scenarios (low, medium, and high disease spread) using the Spillman function ( $Z = M - AR^x$ ) in logarithmic form:  $\log(1 - Z) = \log A + X \log R$ , where  $M = 1$  for a maximum spread rate of 100%.

The data indicated that:

- i. low incidence of GLD during initial stages of a vineyard can lead to slow rate of disease spread with an overall disease incidence reaching upto 20% at the end of 25 years.
- ii. medium incidence of the disease during initial stages of a vineyard can lead to moderate levels of disease spread, leading to an overall disease incidence of about 50% at the end of 25 years.
- iii. high incidence of the disease during initial stages of a vineyard can lead to rapid spread of the disease reaching above 90% within 15 years after planting a vineyard.

The above results were used to calculate operating returns for a Merlot vineyard under the three scenarios of disease spread (low, medium and high) relative to operating returns from a healthy vineyard. Economic impact of these scenarios was subsequently evaluated under three broad disease control/management strategies; namely, non-intervention, roguing of diseased vines, and replanting a vineyard. The non-intervention disease control assumes that a vineyard manager does not remove infected vines, but rather allows the disease to spread uninterrupted. Roguing assumes that a grower removes infected vines and replants with a healthy vine. Replanting involves complete removal of an infected vineyard and replanting with healthy cuttings.

The economic impact of GLD per acre over a 25 year period under low, medium and high incidence scenarios was obtained using the NPV approach by comparing with the base case scenario of no disease in a Merlot vineyard. In the case of a low rate of disease spread with no intervention, there is a \$1,836/acre economic impact to the operating returns of a grower compared to returns from a healthy vineyard. For a 50 acre vineyard, this could translate into nearly \$92,000 in lost returns over a 25-year period due to a low rate of disease spread with no intervention. In an extreme case scenario of high rate of disease spread with no-intervention, the economic impact could reach nearly \$23,000 per acre over a 25-year period due to yield reduction and quality penalty and this impact could reach nearly \$1.143 million in lost returns for a 50 acre vineyard.

Roguing was considered as a practical approach to contain disease spread in a vineyard. If this strategy is implemented during early years of a vineyard (preferably within the first 5 years after planting), it can be a reliable method to

control the spread and minimize income losses to a grower. Roguing includes scouting vines in the fall, marking symptomatic vines, testing symptomatic vines for virus followed by removing virus infected vines and planting virus-free vines. Planting a new vine can be done using a new nursery stock or the multi-year process of layering. Both strategies have been shown to be successful in the Washington, but the method chosen will be site specific. In any case, roguing can cost between \$14 per vine to \$20 per vine (scouting, labor, materials). For this analysis it was assumed roguing would cost \$20 per vine.

Practicing roguing and replanting has economic benefits to growers, even accounting for the additional labor charges for replacing infected vines and costs for buying clean planting stock. Even at the low rate of GLD spread, roguing has an economic savings of \$189 per acre versus the non-intervention approach. However, in cases where the rate of spread may be faster, there is an even greater economic benefit to roguing. In fact, if a vineyard were to experience a high rate of GLD spread, roguing would save the vineyard \$3,060 per acre over a 25-year period, or \$153,000 for a 50 acre vineyard versus the non-intervention management strategy.

For a vineyard infected with GLD at the high rate of spread, it is economical to replace the vineyard when the disease incidence exceeds 40%, compared to leaving the vineyard exposed to continuous spread of the disease and suffering with the decreased economic returns from the lower yield and fruit quality.

#### **Practical considerations for a vineyard:**

- i. If no control measures are implemented (using Merlot as a case study), economic impact of GLD could be from nearly \$1,836 per acre to \$23,000 per acre over a 25-year period, depending on the rate of spread.
- ii. Planting with certified clean plants is a good first step, but this does not prevent risks of new vineyard to GLD infection. There is always the risk of GLD spreading into young vineyards from infected neighboring vineyards, even if everything is done right. Therefore, growers should practice good management practices during post-planting years (viz. monitoring, roguing, insect control, etc.) to contain disease spread.
- iii. Monitoring young vineyards regularly and roguing infected vines during the first five years after planting appears to be more effective in reducing disease spread and maintaining a profitable vineyard.
- iv. A vineyard replacement should be considered when the disease incidence exceeds 40% infection level. The economic benefit of replacing the entire block with healthy vines significantly outweighs risks of keeping an infected block. An infected block will produce poor quality fruit with lower yields and subjected to the risk of rejection or cancellation of contract by a winery. Moreover, a vineyard block with high incidence of GLD can cause collateral damage due to virus spread from the heavily infected block to neighboring healthy plantings.
- v. The higher the value of the fruit, the more important a GLD management plan is, since the price is dependent more on quality and yield.

Results of this study will be analyzed in consultation with key growers and publication of fact sheet is planned in 2016. The fact sheet will be distributed to industry stakeholders via several dissemination pathways for adopting best management practices to manage GLD in grower vineyards.

- **Performance measure 5: Estimates of crop losses, financial benefits of adopting best management practices, and guidelines for reducing the spread of grapevine leafroll disease to new plantings will be disseminated to growers and industry stakeholders through industry-sponsored meetings (including Washington Association of Wine Grape Growers, Washington Grape Society and Washington Wine Commission) and Washington State University websites including the Grape Virology Program (<http://wine.wsu.edu/virology/>) and Integrated Pest Management (<http://ipm.wsu.edu/>).**

The following presentations were made at grape and wine industry stakeholder meetings to disseminate science-based information on negative impacts of virus diseases, with special emphasis on grapevine leafroll disease.

- i. Ball, T. 2014. Economic impact of viruses in Washington vineyards in the technical session “Seeing red: When old prevention techniques result in new disease outbreaks” at Washington Association of Wine Grape Growers 2014 Annual Meeting, Convention and Trade Show, February 5-7, 2014, Kennewick, WA. (Oral).
- ii. Rayapati, N.A. 2014. Tasting – Red blotch & leafroll update. Ste. Michelle Wine Estates 2014 Winemaker Council Meeting. May 28, 2014, Prosser, WA. (Oral).
- iii. Rayapati, N.A. 2014. How to inspect a nursery and look for infected grape plants? WSDA Plant Science Program annual staff meeting. June 17, 2014, Prosser, WA (Oral).
- iv. Rayapati, N.A. 2014. Grapevine virus diseases at WAWGG Summer Tour organized by the Washington Wine Industry Foundation. August 7, 2014, WSU-IAREC, Prosser, WA (Oral).

- v. Rayapati, N.A. 2014. Grapevine virus diseases with emphasis on leafroll disease. WSU's professional certificate program in viticulture. September 14, 2014, Prosser, WA (Oral).
- vi. Rayapati, N.A. 2014. Grapevine leafroll disease. Class lectures in the course "PIP 300: Diseases of Fruit Crops" in Fall 2014 to WSU undergraduate students majoring in Viticulture & Enology.
- vii. Ball, T., Folwell, R., Walsh, D. and Naidu, R.A. 2015. Is 'Grape virus tax' hitting your pocketbooks? Washington Association of Wine Grape Growers 2015 Annual Meeting, Convention and Trade Show, February 10-13, 2015, Kennewick, WA. **(Received First Prize under Professional Category).**
- viii. Rayapati, N.A. 2015. Grapevine leafroll disease. Class lectures in the course "HORT 409: Seminar in Viticulture & Enology" in Fall 2015 to WSU undergraduate students majoring in Viticulture & Enology.
- ix. Rayapati, N.A. 2014. Grapevine virus diseases with emphasis on leafroll disease. WSU's professional certificate program in viticulture. September 20, 2015, Prosser, WA (Oral).
- x. Ball, T., Folwell, R., Walsh, D. and Naidu, R.A. 2015. Is 'Grape virus tax' hitting your pocketbooks? Washington State Grape Society 2015 Annual Meeting & Trade Show, November 12-13, 2015, Grandview, WA.

Rayapati, PD of the project, performed overall management of the project and coordinated project activities, organized meetings with stakeholders, and submitted quarterly and annual progress reports. Assisted by technical personnel in his program, Rayapati collected data on fruit yield and berry quality parameters from two commercial vineyards and provided the data for economic impacts study. Trent Ball and Ray Folwell of the Agri-Business Consultants (sub-contractors of the project) analyzed the data provided by Rayapati and generated the report on economic losses due to grapevine leafroll disease. Ball and Rayapati reviewed project activities and data analyses with industry stakeholders. Walsh, co-PI of the project, participated in group meetings with growers and offered advice pertinent to project activities. Ball made an oral presentation at the Washington Association of Wine Grape Growers annual meeting and trade show in February 2014. Rayapati conducted outreach and education activities disseminating project outcomes to grape and wine industry stakeholders, crop consultants and graduate and undergraduate students pursuing higher education at WSU.

This project is focused on wine grapes in Washington vineyards. Thus, potential benefits from this project are not anticipated to producers/processors of non-specialty crops.

**GOALS AND OUTCOMES ACHIEVED**

During the project period, proposed activities were conducted towards the final goal of generating measurable outcomes on economic impacts of grapevine leafroll disease (GLD).

- i. Data on effects of grapevine leafroll disease on vine productivity (fruit yield) and quality of grapes (especially soluble solids or sugars measured as °Brix) was collected from wine grape cultivars.
- ii. Using a survey questionnaire, baseline information was collected from wine grape growers on disease management practices, including pesticide usage (type, dosage, frequency, etc.) to control mealybugs and other strategies, such as roguing and replanting, to reduce incidence of GLD.
- iii. A study on economic impact of GLD on one red grape cultivar (cv. Merlot) was completed using the yield and fruit quality data obtained in previous years from infected and healthy Merlot vines.
- iv. Using field data on the spread of GLD in three wine grape cultivars, the rate of disease spread over a 25-year period was predicted under three scenarios (low, medium, and high disease spread). This information was used to estimate benefit-cost ratio of implementing disease management strategies in vineyards.
- v. The research-based outcomes of this study was shared with growers and industry stakeholders at industry-sponsored grower meetings for increased awareness of negative impacts of GLD and to encourage growers adopt best management practices, including effective sanitation practices and planting new vineyards with certified planting stock, for better crop yields and higher profits.

In addition to the publication in Good Fruit Grower (May 15, 2015. Vol. 66, No. 10, pages 10-11), it is anticipated that an extension fact sheet will be completed in 2016. A meeting will be held in early 2016 with select number of wine grape growers to review the results generated from this project and to plan for the fact sheet on economic impacts and management of GLD. The extension publication will be distributed widely among the industry stakeholders for implementing best practices to manage GLD in grower vineyards. Funding will be pursued to continue studies on economic impact of virus diseases in Washington vineyards.

Goal: Estimate economic losses due to grapevine leafroll disease and determine financial benefits of adopting prevention and management strategies.

The following activities were conducted during the project period towards reaching the proposed goal:

Project Activity	Timeline	Accomplishments
------------------	----------	-----------------

Determine from grape growers the current management/ control measures used to mitigate GLRD	Nov. 2012-May 2013	Completed this activity in year 1 of the project.
Collect yield data from vineyards; harvest and analyze grapes for biochemical components to assess impacts of GLD	Sept-October 2012, 2013, 2014	Completed this activity for 2012, 2013 and 2014 seasons.
Estimate the costs and returns for various scenarios associated with GLD	Nov.2012-Sept. 2013	Completed this activity in year 1 using the data on yield and fruit quality from one wine grape cultivar (cv. Merlot).
Analyze the costs, revenues, and economic returns from quantity/quality losses resulting from GLD	Nov. 2013-May 2014	Completed as described earlier in this report.
Develop cash flow analysis spreadsheets to carry out the implications of GLD in terms of the net present value and internal rate of return under the scenarios constructed in Year 1	Nov.2013-May 2014	Completed as described earlier in this report.
Share results with industry stakeholders	Throughout the project period	Presented results at stakeholder meetings as listed earlier in this report.
Calculate the net present value and internal rate of return using the spreadsheets developed in Year 2 for situations depending upon the cultivar, age of the vineyard, and current and expected yield/quality production.	June 2014-July 2015	Completed by Agri-Business Consultants in year 3 of the project.
Determine the economic thresholds for various management/cultural practices in GLD infected vineyards including non-intervention, roguing individual infected vines, and total vineyard replacement	June 2014-July 2015	Completed by Agri-Business Consultants in year 3 of the project. The information is being processed for a publication expected in 2016.

Previous to the commencement of this project, no information is available on income losses due to grapevine leafroll disease (GLD) in Washington vineyards. For the first time, the data generated during this project provided reliable estimates of crop losses due to GLD in cv. Merlot and science-based information how this disease can impact growers' income. The project outcomes have met the target goal "Estimate economic losses due to grapevine leafroll disease and determine financial benefits of adopting prevention and management strategies" stated in the proposal.

### **BENEFICIARIES**

Outreach and education activities conducted during the project period benefited grape and wine industry stakeholders and research & extension faculty as well as students with new knowledge about grapevine viruses and their negative impacts to plant health and fruit yield and quality. Significant beneficiaries are listed below:

- The article "Is 'grape virus tax' hitting your pocketbook?" was published in Good Fruit Grower (May 15, 2015, vol. 66, no. 10, pages 10-11, is an internationally renowned industry magazine with subscribers in 50 countries and around 10,500 total circulation. Thus, the science-based information on economic impacts of grapevine leafroll disease published in Good Fruit Grower has potentially reached wine grape growers and industry stakeholders, viticulturists, wine makers, research and extension professionals and students within and outside Washington State.
- Oral and poster presentations at stakeholder meetings such as the Washington Association of Wine Grape Growers (WAWGG) Annual Meeting, Convention and Trade Show (February 5-7, 2014 and February 10-13, 2015, Kennewick, WA) and Ste. Michelle Wine Estates 2014 Winemaker Council Meeting (May 28, 2014, Prosser, WA) and Washington State Grape Society Annual Meeting & Trade Show (November 12-13, 2015, Grandview, WA) provided excellent opportunity to share project results on how grapevine leafroll disease can impact yield and quality of wine grapes and ultimately growers' income. Approximately 250 members of grape and wine grape industry stakeholders (consisting of grape growers, wine makers, crop consultants, vineyard managers and farm workers) and about 30 research and extension faculty and research associates, graduate students and undergraduate students in Viticulture & Enology Program from Washington State University and community

colleges benefited from these presentations. A post-session survey conducted by the WAWGG staff indicated that nearly 50% of survey respondents rated the presentation on economic impacts of grapevine leafroll disease as excellent indicating the value of information presented to stakeholders.

- Presentation at the WSDA Plant Science Program annual staff meeting (June 17, 2014, Prosser, WA) benefited 18 members of the WSDA Plant Science Program in gaining new knowledge about impacts of grapevine virus diseases and the importance of maintaining virus-tested grapevines in certified nurseries.
- Presentation at the WAWGG Summer Tour (August 7, 2014, WSU-IAREC, Prosser, WA) benefited about 50 Spanish speaking vineyard employees in better understanding negative impacts of virus diseases on grape and wine quality.
- Teaching and associated field visits to grower vineyards helped about 60 students (enrolled in WSU's professional certificate program in viticulture) and nearly 80 undergraduate students (enrolled in WSU courses "PIP 300: Diseases of Fruit Crops" and "HORT 409: Seminar in Viticulture & Enology") learn about grapevine virus diseases and their economic impacts on plant health and fruit and wine quality.

As listed above, outcomes of the project were used in education and outreach programs for an increased awareness of negative impacts of virus diseases and income losses to growers due to virus diseases and to promote the critical need of controlling virus diseases by adopting best management practices. Outcomes of the project are directly contributing to two funding priorities of the WSDA SCBGP (Controlling Pests and Diseases and Enhancing Domestic Markets/Reducing Market Barriers) for advancing sustainable growth of Washington's grape and wine industry.

### **LESSONS LEARNED**

The project personnel have pursued participatory approaches with grape and wine industry stakeholders in a "hand-in-glove" approach to generate new knowledge on impacts of grapevine virus diseases. It is important to share the knowledge in a timely manner with stakeholders through various dissemination pathways for increased awareness of crop losses due to virus diseases. The project has further strengthened research-industry partnerships to address key constraints such as virus diseases for maintaining healthy vineyards.

Future studies should focus on analyzing economic impacts of leafroll and red blotch diseases in several wine grape varieties planted in different appellations for a better understanding of site- and varietal-specific differences in fruit yield and quality to virus diseases. This will help to gain a comprehensive picture of economic impacts of viral diseases on sustainability of the grape and wine industry that had an estimated \$4.8 billion impact on Washington State's economy in 2013.

There were no unexpected outcomes or results while implementing this project.

Project activities have been conducted according to the timeline described in the project. This was made possible with excellent team work between project personnel and productive collaborations with wine grape growers.

### **ADDITIONAL INFORMATION- See Attachment A 12-25-B-1495 Grapevine**

In-Kind Match: \$73,883.17

Washington State University (WSU) for partial salary and benefits: \$46,696.33.

WSU Indirect cost charge (Total F&A plus unrecovered F&A): 27,186.

Naidu, R.A. and Walsh, D. 2015. Is 'grape virus tax' hitting your pocketbook? Good Fruit Grower May 15, 2015. Vol. 66, No. 10, pages 10-11.

### **CONTACT PERSON**

Naidu Rayapati

WSU

509-786-9215

[naidu@wsu.edu](mailto:naidu@wsu.edu)

**Project Title:** Assessment of sanitation techniques for tree fruit storage bins

**Partner Organization:** Center for Produce Safety (CPS)

## **PROJECT SUMMARY**

To protect the Pacific Northwest supply of tree fruit, it is important to assess and understand microbial contamination risks and efforts to control them in the production chain. Knowledge gaps exist regarding the ability of current bin sanitation practices to reduce foodborne pathogen risks. The project objective was to evaluate bin sanitation effectiveness for wood and plastic bins. Tree fruit are the leading agricultural commodity in Pacific Northwest. Washington alone produces almost 60% of the apples and 40% of the pears grown in the United States (Smith, 2012). Although literature on minimizing pathogen contamination along the tree fruit supply chain has increased, most of the studies focused on microbial quality, harvesting methods or antimicrobial treatment of tree fruits (Annous, 2001; Beuchat, 1997; Du, 2003; Errampalli et al., 2005; Rodgers et al., 2004; Sapers, 1999; Sapers, 2002; Wang et al., 2007; Wisniewsky et al., 2000). Significant knowledge gaps exist regarding the role of harvesting and storage bins as a potential source of pathogen contamination, and the ability of sanitation practices to reduce potential food safety risks. However, several studies indicate that bins serve as a potential reservoir for numerous plant pathogens that influence fruit quality (Cossentine et al., 2004; Higbee, et al., 2001; Randall, et al., 2011; Sanderson, 2000). Therefore, the potential exists for bins to harbor and transfer foodborne human pathogens such as Shiga-toxin producing *E. coli* (STEC), *Salmonella spp.* and *Listeria monocytogenes*.

Some industry studies on wood and plastic surfaces indicated that traditional sampling methods may not accurately recover and reflect microbial levels, which may have been related to the presence of biofilms (personal communication with industry representatives). Similarly, biofilms were apparently present in a study of cleaned and sanitized plastic cutting boards in a food service setting, which presented challenges in achieving accurate microbial enumeration; both surface scraping and firm swabbing were utilized during the study (Neth et al., 2008). Therefore, sampling methods for removal of biofilms needed to be investigated in this study to achieve accurate results.

Several factors may influence potential food safety risks associated with bin handling, including type of material (wood versus plastic), bin storage design (nested versus non-nested stacking), type of tree fruit being handled and fruit production practices (organic versus conventional). Bruised apples have been shown to support growth of *E. coli* O157:H7 (Digman, 2000). However, the ability of different bin materials to influence fruit injury, and potentially food safety, is unclear. Few differences were observed in final fruit grade between plastic and wood bins (Bollen et al., 2001). Wood bins are subject to weathering, resulting in rough surfaces that can harbor various pathogens, whereas plastic bins have been cited as more resistant to weathering, with surfaces that are easier to clean and sanitize (Waelti, 1992). However, long-term integrity and cleanability of plastic bins has not been thoroughly studied. In a study of acetic acid fumigation of fruit storage bins to control diapausing codling moth (*Cydia pomonella* {L.} ) larvae, an increased pathogen mortality rate was observed in plastic bins as compared with wood bins (Randall et al., 2011). Current bin sanitation is primarily for control of plant pathogens; verification of control of potential foodborne human pathogens with current practices is warranted. Buyer requests for the industry to shift to plastic bin usage are increasing; nevertheless, investment in plastic bins represents a significant economic impact on the produce industry. There is a lack of scientific evidence to prove that plastic bins reduce food safety risks associated with human pathogen contamination.

Assessing pathogen risks associated with tree fruit bins and the effectiveness of bin sanitation is important to protect the supply of tree fruit and other produce. Development of appropriate methods to accurately assess microbial levels and bin sanitation effectiveness is critical. Assessing current bin sanitation methods and providing insight into sampling methods will deliver information for the produce industry to guide best practices to reduce microbial risks associated

Our team's *long-term goal* is to contribute to the assessment of food safety risks for tree fruit. It is critical to collect data to assist in understanding the risks of pathogen contamination and proliferation at each point in the production chain to develop an appropriate risk management plan that spans the farm-to-table continuum. The *purpose* of this project is to assess the effectiveness of bin sanitation practices during tree fruit packing. This project is *important and timely* as outcomes of the Food Safety Modernization Act will require the tree fruit industry to validate prerequisite programs, such as sanitation, and understand pathogen risks. The information will also *increase competitiveness* by assisting growers and packers to meet customer food safety requirements as well as enhance fruit quality and safety. The project team is experienced in working with the Washington apple industry on fruit safety and quality issues through research and extension activities.

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

## **PROJECT APPROACH**

*Industry survey:* An initial survey instrument was prepared, and individual interviews were conducted with three packinghouse food safety managers. Requested information included: prevalence of use for wood and plastic bins, number of years wood and plastic bins are typically used (anticipated useful life), types of bin storage design (nested versus non-nested stacking), bin storage conditions, handling during harvest and transport, use of bin liners, use of recycled bins, and bin sanitation practices in the orchard and at the packinghouse. Results from preliminary interviews indicated that a standardized, written survey was unlikely to result in collection of accurate information. Multiple individuals within a facility (food safety/quality, production, sanitation, orchard managers, among others) needed to be consulted to gain accurate information. Therefore, an initial interview with food safety personnel was performed. Outcomes of this interview were documented, and areas where additional information was needed were highlighted; the respondent was asked to consult with other company personnel and update the document. Individual interviews required more time for data collection, but it is expected that more accurate information was gained. Results of the individual interviews reflect practices with bins associated with the Pacific Northwest tree fruit industry. Individual interviews were conducted with 12 food safety managers representing different packinghouses, and an anonymous poll was taken at an industry food safety meeting where more than 20 packinghouses were represented.

*Laboratory examination of sampling methods:* Two experimental methods assessed three sampling techniques for wood and plastic bin surfaces, and three enumeration methods for generic *E. coli* (ATCC 8739). Experimental method 1 involved establishing biofilms of generic *E. coli* (ATCC 8739) on wood and plastic bin pieces as well as glass as a control treatment; wood and plastic bin pieces were submersed in dilute tryptic soy broth (TSB) and held at room temperature, with agitation, for 6 days, with nutrient addition every other day. Experimental method 2 was more likely to reflect potential bin contamination under commercial conditions and involved inoculation of 200 µl of generic *E. coli* (ATCC 8739) on wood and plastic bin pieces; the pieces are allowed to dry and incubated for up to 6 days at room temperature. In method 2, an examination of nutrient addition on day 4 was also investigated. For both methods, samples were enumerated after inoculation as well as 1, 4 and 6 days after inoculation. Sampling techniques for microbial recovery compared cotton swabs, metal files and 3M Scotch-Brite™ pads. Enumeration methods that were compared included violet red bile agar (VRBA), VRBA with tryptic soy agar (TSA) overlay (for injured cell recovery) and 3M *E. coli*/Coliform Petrifilm™.

*Preliminary industry experiments:* Preliminary experiments were conducted in two facilities, and plastic bins were provided by a third facility. The ability to examine bins that had been exposed to field conditions and contained fruit was examined. Wood bins were categorized by age and condition into four categories (new 2013, 2009–2012, 2004–2008, 1995–2003). Plastic bins were not used at this facility, so another industry partner provided plastic bins for the experiment. The partner confirmed that all of the plastic bins were approximately 12–15 years old (1998–2001), so categories based on condition (undamaged and damaged) were assigned. Wood and plastic bins were sampled at the packinghouse bin storage area and randomly assigned to treatments: rapid return from the orchard and packed immediately; held in the orchard for several weeks and packed immediately; refrigerated storage prior to packing; and controlled atmosphere prior to packing).

Approximately 80 bins were examined throughout the season; in some cases, a single bin was delivered to an orchard to be filled more than once. Bins were sampled for total coliform and generic *E. coli* levels prior to leaving bin storage and after treatment in the dump tank. Empty bins that had been stored in the bin storage lot without shipment to orchards and filling were examined immediately prior to and after dump tank treatment as a control. Based on observation of bin handling practices, it was determined that the entire bin could be considered a food contact surface since the bins are completely submersed in dump tank water.

For each examination of total coliform and generic *E. coli* levels prior to and after cleaning and sanitation practices, bins were sampled at three one-inch<sup>2</sup> locations on surfaces that would be in direct contact with tree fruit as well as at three one-inch<sup>2</sup> locations on surfaces that would contact post-harvest agricultural water, such as water in dump tanks. Total coliform and generic *E. coli* were quantified on VRBA with TSA overlays and 3M *E. coli*/Coliform Petrifilm™ for Facility 1 and on CHROMagar™ ECC and 3M *E. coli*/Coliform Petrifilm™ for Facility 2. It was determined that sampling immediately after sanitation provided more accurate microbial results when compared to sampling 24 hours after bin sanitation.

*Methods for examination of industry bin sanitation practices:* For all cleaning and sanitation practices examined, bins were evaluated for condition and cleanliness. The same sampling sites could not be sampled more than once due to the aggressive nature of the sampling. The sampling team photographed and documented descriptions for each sampling site prior to and after treatment. The sampling team selected six representative sites prior to and after treatment based on visual evaluation in an effort to accurately evaluate the potential for a treatment to reduce microbial levels. Bins were sampled at three one-inch<sup>2</sup> locations on surfaces that would be in direct contact with tree fruit as well as at three one-inch<sup>2</sup> locations on surfaces that would contact post-harvest agricultural water, such as water in dump tanks. Total coliforms and generic *E. coli* were quantified on CHROMagar™ ECC. Time of immersion in water systems is provided in minutes (min) and seconds (sec).

Examination of a chlorinated dump tank and bin washing system: Wood and plastic bins from the facility were categorized into age categories. For wood bins, four categories were identified (2000–2007, 1990–1999, 1980–1989, 1970–1979). For plastic bins, three categories were identified (2007–2009, 2004–2006, 2001–2003). Bins from each category were assigned to one of two treatments (dump tank and bin washer or bin washer only). Bins were sampled prior to sanitation, after dump tank treatment and after bin washer treatment as appropriate. Validation of a CHROMagar™ ECC (see identified challenges below) was also performed. The facility measured chlorine activity using oxidation-reduction potential (ORP) measured in millivolts (mV) and time of submersion was recorded manually. Approximately 65 bins were examined.

Examination of a peroxyacetic acid dump tank system: For wood bins, four categories were identified (new 2014, 2000–2013, 1990–1999, 1980–1989, less than 1979). Plastic bins were not available at this facility and based on the results of one replication, further experiments were not performed. The facility targeted a concentration of 80 ppm peroxyacetic acid in the dump tank system.

Examination of a chlorinated dump tank followed by a heat treatment system: For wood bins, four categories were identified (new 2014, 2000–2013, 1990–1999, 1980–1989, less than 1979). Plastic bins were not available at this facility so another industry partner provided plastic bins; however, the plastic bins could not be accommodated in the dump tank system, so only the heat treatment system was examined for plastic bins. For plastic bins, three categories were identified (2007–2009, 2004–2006, 2001–2003). Facility 3 utilized a chlorinated dump tank followed by a heat treatment. The heat treatment was a separate piece of equipment designed specifically for heat treatment of bins using water immersion with chemical wetting agent targeting 168°F for a minimum of approximately 2 min. The facility measured chlorine activity using oxidation-reduction potential (ORP) measured in millivolts (mV), and time of submersion was recorded manually. Temperature in the heat treatment system was available from a thermometer (°F) and time in the system was recorded manually.

Examination of pressure washing with water alone, as well as pressure washing followed by cleaning and sanitizing. For wood bins, four categories were identified (2000–2007, 1990–1999, 1980–1989, 1970–1979). For plastic bins, three categories were identified (2007–2009, 2004–2006, 2001–2003). Bins from each category were assigned to treatments: pressure washing with water or pressure washing followed by cleaning and sanitizing. Different cleaning strategies were recommended by a partnering chemical supplier. All bins had water applied with a non-pressurized hose prior to cleaning and sanitizing. For wood bins, powdered oxygen bleach was prepared with water in a 2:1 ratio as a cleaning solution. For plastic bins, alkaline cleaner containing quaternary ammonium chlorides was prepared in a 2:1 ratio with water as a cleaning solution. During cleaning, areas that were heavily soiled were brushed. Following cleaning, the bins were rinsed with water and a sanitizer was applied. For both wood and plastic, a peroxyacetic acid (PAA) solution, diluted 1:100 was prepared to yield a target of 1200 ppm, and was prepared as recommended by the product label. Bins were rinsed with water approximately 15 min after application of the sanitizer. Microbial sampling was performed approximately one hour after the final water rinse for post-sanitation samples.

Several industry partners donated staff time and facility resources to conduct research experiments; this involved several planning meetings, use of line time during normal production and troubleshooting efforts. Numerous industry partners contributed to this project with their time to respond to initial and follow-up interviews. Dr. Ines Hanrahan with the Washington Tree Fruit Commission provided insight and was involved in project planning and implementation for bin tracking systems. Dr. Hanrahan and several WTFRC interns were significant contributors and assisted with data collection throughout the study. The Northwest Horticultural Council also provided insight and recommended industry contacts throughout the study.

The overall scope of the program did not benefit other commodities other than specialty crops.

## **GOALS AND OUTCOMES ACHIEVED**

Knowledge was gained from industry interviews about tree fruit bin handling and sanitation practices. Results of the individual interviews reflect practices with bins associated with the Pacific Northwest tree fruit industry. Individual interviews were conducted with 12 food safety managers representing different packinghouses and an anonymous poll was taken at an industry food safety meeting where more than 20 packinghouses were represented.

Further data analysis will be performed to examine the potential influence of bin age and further examine quantitative data from the study.

The objective was to evaluate bin sanitation effectiveness for wood and plastic bins. Laboratory studies identified the optimal sampling technique for removal of biofilms from wood and plastic storage bin surfaces. Preliminary industry studies identified the optimal media for recovery of total coliforms and generic *E. coli* from wood and plastic bins in the presence of background flora. Five bin cleaning and sanitation practices for wood and plastic bins were examined: dump tank treatments using chlorine, dump tank treatments using peroxyacetic acid, heat treatment, pressure washing with water and water pre-rinse followed by cleaning and sanitation compounds. Methods for wood and plastic bin cleaning and sanitation were identified.

*Examination of industry bin sanitation practices:* Total coliforms were used to evaluate the ability of cleaning and sanitation practices to reduce microbial levels on bin surfaces; generic *E. coli* were recovered from bins infrequently and at levels that were too low to evaluate the effectiveness of cleaning and sanitation practices.

### **Examination of a chlorinated dump tank and bin washing system**

Dump Tank Treatment with Chlorine (average 774mV ORP):

Wood Bins: 52% (11/21) had more sampling sites positive for total coliforms, 33% had no change and 14% had fewer sites positive for total coliforms.

Plastic Bins: 56% (9/16) had no change in the number of sites positive for total coliforms, 25% had fewer sites positive and 19% had more sampling sites positive for total coliforms.

Results from this study indicated that immersion in a chlorinated dump tank system did not reduce the number of sites with total coliforms present for wood or plastic bins. Bins ranged from 1 min to 4 min 57 sec in the dump tank treatment. Although a bin washing system was evaluated at this facility, challenges with evaluating this system were encountered due to management practices; therefore, this data was not included in the results. This study examined 65 bins over a 3-month period and ended near the beginning of cherry harvest. Based on these results and results from the preliminary industry experiment above, it was determined that additional practices besides the most common industry practice should be examined. Due to timing and convenience for industry partners, additional experiments could not be performed until the beginning of apple season in August of 2014.

### **Examination of a peroxyacetic acid dump tank system**

Peroxyacetic Acid (PAA) Treatment (target 80 parts per million, ppm) in a Dump Tank:

Wood bins: 72% had more sampling sites positive for total coliforms, 17% had no change and 11% had fewer sampling sites positive for total coliforms. (Plastic bins were not available for testing.)

The use of peroxyacetic acid in a dump tank system did not appear to improve the ability of a dump tank system to serve as a cleaning and sanitizing system for apple storage bins based on one replication; full replications of this experiment were not pursued due to project deadlines. Bins ranged from 1 min 37sec to 4 min 35 sec in the dump tank treatment.

### **Examination of a chlorinated dump tank followed by a heat treatment system**

Dump Tank Treatment with Chlorine\* (average 829mV ORP):

Wood Bins: 45% (12/29) had more sampling sites positive for total coliforms, 41% had fewer sampling sites and 14% had no change. (Plastic bins could not be accommodated in the dump tank system.)

Hot Water Treatment Following Chlorine Treatment:

Wood bins after treatment in a chlorine dump tank system (noted above\*) followed by hot water treatment: 68% had fewer sampling sites positive for total coliforms, 27% had no change and 5% had more sampling sites positive for total coliforms. Treatment in the dump tank system in this experiment ranged from 2 min 16 sec to 5 min 30 sec.

Hot Water Treatment Alone:

Wood bins after hot water treatment alone: 48% (14/29) had no change in sampling sites positive for total coliforms, 41% had fewer sampling sites and 10% had more sampling sites positive for total coliforms.

Plastic bins after hot water treatment alone: 57% had no change in sampling sites positive for total coliforms, 37% had fewer sampling sites positive for total coliforms and 6% had more sampling sites positive for total coliforms.

Hot water treatment warrants further examination as a sanitizing system for wood and plastic bins. Although the highest percentage of wood and plastic bins that received only the heat treatment demonstrated no change in sampling sites positive for total coliforms, the next most frequent response observed was fewer sites positive for total coliforms. In some cases, it appeared that soiled areas may have protected microorganisms during treatment (see photo set 1). Furthermore, for wood bins that were treated with chlorine prior to heat treatment, the majority (68%) had fewer sampling sites positive for total coliforms. Heat treatment ranged from 1 min 15 sec to 3 min 20 sec in the hot water treatment.

It should be noted that several experiments in this project, including this one, indicated that chlorinated dump tank systems did not appear to be effective as a cleaning and sanitation step. In this series of experiments, the chlorinated dump tank system appeared to enhance the ability of the heat treatment system to reduce the number of sampling sites positive for total coliforms on wood bins that received both treatments. There are several possibilities for this observation. Wetting the surface of the bins appears to enhance the recovery of microorganisms, so the exposure to the dump tank system prior to heat treatment may increase the ability of the heat treatment to reach microbial populations. No efforts were made to remove soil from the bins in this experiment; it is also possible that the dump tank treatment removed sufficient amounts of soil from some of the bin surfaces to enhance the effectiveness of the heat treatment. It is also possible that residual levels of chlorine continue to act on the bin surfaces during subsequent heat treatments that were not observed immediately after removal from the dump tank system. For this experiment, 86 bins were sampled over a 3-month period.

#### Examination of pressure washing with water alone, as well as pre-rinse followed by cleaning and sanitizing

##### Pressure Washing with Water:

Wood bins: 90% (9/10 bins) had more sampling sites positive for total coliforms after pressure washing with water.

Plastic bins: 40% (4/10 bins) had no change, 30% had fewer sampling sites positive and 30% had more sampling sites positive for total coliforms after pressure washing with water.

##### Water pre-rinse followed by Cleaning and Sanitizing (average 1043ppm PAA):

Wood bins: 65% (11/17) had fewer sampling sites positive for total coliforms after sanitation while 35% had more sampling sites positive for total coliforms.

Plastic bins: 47% (8/17) had fewer sampling sites positive for total coliforms after sanitation while 29% had no change and 24% had more sampling sites positive for total coliforms.

A water pre-rinse (low pressure) followed by cleaning and sanitation steps were effective in reducing the number of sampling sites positive for total coliforms; this effect was more pronounced for wood bins compared to plastic. Pressure washing with water did not appear to be an effective strategy for wood bins; however, the results for plastic bins not as pronounced, given the limited data set (10 wood and 10 plastic bins examined). The project timeline limited the number of experiments that could be performed for this portion of the study. For this experiment, 54 bins were sampled over a 2-month period, ending in December 2014.

*Data collection focused on establishing a baseline using current practices:* From observation of bin handling practices, it was determined that the entire bin could be considered a food contact surface since the bins are completely submersed in dump tank water and could contribute to microbial levels and organic load in the dump tank system. Most current bin cleaning and sanitation practices observed did not involve efforts to remove heavily soiled areas prior to treatment, which can overwhelm effective cleaning and sanitation practices. This observation makes drawing conclusions about the data collected in industry settings challenging, as some effective treatments may have appeared less effective on individual bins that heavily soiled (see Photo set 1).

The data from this study indicated that a water pre-rinse followed by cleaning and sanitation would be an effective strategy for reduction of total coliforms on wood and plastic bins. Heat treatment appears to be a promising treatment for wood and plastic bins and warrants further investigation.

#### **BENEFICIARIES**

Beneficiaries of the project include produce industries that utilize wood and plastic bins during packing, tree fruit growers and packers, as well as consumers. Currently, in Washington, 59 individual packers of apples alone utilize 500,000 bins to transport and store their fruit. It is anticipated that study results will be shared with at least 1,200

specialty crop producers and packers in the Pacific Northwest as well as distribution of study results nationally through the Center for Produce Safety.

This study was one of the first to examine cleaning and sanitation practices of tree fruit storage bins for produce safety; it is important to establish a baseline by evaluating current practices to determine appropriate action and recommendations. This baseline will assist in directing future research and validation of cleaning and sanitation practices.

#### *Industry survey:*

- The majority of the industry used wood bins for apples and pears; bin liners are primarily used for varieties that are more easily damaged. Plastic storage containers (bins or totes), when used, are more common for use with cherries and soft fruits, like apricots, peaches and plums.
- The most common methods of bin cleaning and sanitation were immersion in a chlorinated dump tank system or hydrocooler, pressure washing or visual inspection with treatment of soiled bins.

#### *Laboratory and commercial examination of sampling methods:*

- For the removal of biofilms from wood and plastic storage bin surfaces, 3M Scotch-Brite™ pads were the most consistent sampling method. Prior to sampling, it is necessary to treat the 3M Scotch-Brite™ pads with ethanol to remove antimicrobials that are present in the 3M Scotch-Brite™ pads.
- Although laboratory studies found that Violet Red Bile Agar (VRBA) with an overlay was the most accurate method compared to VRBA and 3M E. coli/Coliform Petrifilm™; preliminary studies in industry settings found an increased number of false positives with VRBA with an overlay. Therefore, CHROMagar™ ECC was used in the remainder of the industry experiments.
- Methods for wood and plastic bin cleaning and sanitation were identified.
- Most current bin cleaning and sanitation practices observed did not involve efforts to remove heavily soiled areas prior to treatment, which can overwhelm effective cleaning and sanitation practices.
  - This observation makes drawing conclusions about the data collected in industry settings challenging, as some effective treatments may have appeared less effective on individual bins that were heavily soiled (see Photo set 1).
- The data from this study indicated that a water pre-rinse followed by cleaning and sanitation would be an effective strategy for reduction of total coliforms on wood and plastic bins.
  - Wood bins: 65% (11/17) had fewer sampling sites positive for total coliforms after sanitation while 35% had more sampling sites positive for total coliforms.
  - Plastic bins: 47% (8/17) had fewer sampling sites positive for total coliforms after sanitation while 29% had no change and 24% had more sampling sites positive for total coliforms.

A water pre-rinse (low pressure) followed by cleaning and sanitation steps were effective in reducing the number of sampling sites positive for total coliforms; this effect was more pronounced for wood bins compared to plastic. Pressure washing with water did not appear to be an effective strategy for wood bins; however, the results for plastic bins were not as pronounced, given the limited data set (10 wood and 10 plastic bins examined). The project timeline limited the number of experiments that could be performed for this portion of the study. For this experiment, 54 bins were examined over a 2-month period, ending in December 2014.

- Heat treatment appears to be a promising treatment for wood and plastic bins and warrants further investigation.
  - Wood bins after treatment in a chlorine dump tank system (noted above\*) followed by hot water treatment: 68% had fewer sampling sites positive for total coliforms, 27% had no change and 5% had more sampling sites positive for total coliforms. Treatment in the dump tank system in this experiment ranged from 2 min 16 sec to 5 min 30 sec.

### **LESSONS LEARNED**

Education on the difference between cleaning and sanitation is needed to ensure effective communication on food safety issues and implementation of appropriate practices. Increasing knowledge of chlorine chemistry and the importance of microbial control of cross-contamination using chlorine in dump tank systems is warranted. This not only includes facility personnel connected with food safety management, but also individuals connected with production, sanitation and upper management.

Information gained through this project identified that tree fruit storage bins interface with the farming and fruit packing environment. It is reasonable that different standards and expectations for cleanliness and sanitation exist between these two environments. A challenge identified is that cleaning and sanitation currently rests with bin ownership at the packinghouse. However, the potential for collection of additional soil levels in the farming environment is anticipated. The presence of heavy soils on bins returning from the orchard could present challenges for sanitation in the packinghouse environment (storage and packing), challenges to dump tank management with chlorine sanitizers, and challenges with protection of microorganisms during standard bin sanitation practices at the

packinghouse. Adjustments to current cleaning and sanitation practices appear to be warranted. Greater communication and partnership between growers and packers to share responsibility for bin sanitation may also be warranted to address this complex agricultural issue.

The terminology of cleaning and sanitation is not consistent or well understood among industry personnel; this led to challenges in communication during the survey. Several facilities had challenges with dump tank management. These unexpected outcomes were managed through selection of partnering facilities.

For some cleaning and sanitation techniques, increasing the number of bins would have been ideal; however, due to project deadlines additional data collection could not be performed. Allowing no-cost extensions for project would be useful. Delays in data collection occurred due to the need to explore additional cleaning and sanitation practices beyond the most frequent industry practices and alignment with harvest season.

### **ADDITIONAL INFORMATION**

Several industry partners donated staff time and facility resources to conduct research experiments; this involved several planning meetings, use of line time during normal production, and troubleshooting efforts, which amounted to approximately \$50,000. Numerous industry partners contributed to this project with their time to respond to initial and follow-up interviews. Washington Tree Fruit Commission interns assisted with the project to assist with data collection, amounting to approximately \$16,000. The Northwest Horticultural Council provided insight and recommended industry contacts throughout the study.

Publications for peer review and extension publications are being prepared based on project outcomes. Presentations include the following:

Utah State Horticulture Association Annual Meeting. 2015. Spanish Fork, UT. Wood and plastic bin sanitation and other considerations for packinghouse food safety.

Washington State Horticultural Association Annual Meeting. 2014. Richland, WA. Validation of packingline food safety interventions and assessment of sanitation techniques for storage bins.

Great Lakes Fruit, Vegetable and Farm Market Expo. 2014. Grand Rapids, MI. How effective are different sanitation techniques for tree fruit storage bins?

Center for Produce Safety, Annual Symposium. 2014. Newport Beach, CA. Assessment of sanitation techniques for tree fruit storage bins.

Center for Produce Safety, Annual Symposium. 2014. Rochester, NY. Assessment of sanitation techniques for tree fruit storage bins. Poster presented and abstract published in the Center for Produce Safety Symposium Program. 25.

Pacific Northwest Horticultural Council. Food Safety Committee Meeting. 2014. Research Review and Update.

#### Photo Set 1.

*Wood bin, 2014.* All six sampling sites less than 10 cfu/inch<sup>2</sup> prior to treatment; after heat treatment, 1 heavily soiled sampling site had 14,700 total coliforms cfu/inch<sup>2</sup>.

*Plastic bin, 2008.* 5/6 sampling sites had less than 10 cfu/inch<sup>2</sup> prior to heat treatment and one site had between approximately 40 total coliforms cfu /inch<sup>2</sup>. After heat treatment, 5/6 sampling sites had less than 10 total coliforms cfu/inch<sup>2</sup> and one soiled site 14,700 total coliforms cfu/inch<sup>2</sup>.

Both of these bins were classified as having more sampling sites positive for total coliforms after treatment.

2014 Pre- Heat 6/6  
<10 CFU/in<sup>2</sup> coliforms

2014 Post-Heat Treatment  
5 samples <10, 1 sample  
>10,000 CFU/in<sup>2</sup> coliforms



2008 Plastic Bin Pre- Heat  
5 samples <10, 1 sample  
>10 CFU/in<sup>2</sup> Generic *E. coli*

2008 Plastic Post- Heat  
5 samples <10, 1 sample  
>10,000 CFU/in<sup>2</sup> Generic  
*E. coli*



#### References:

- Annous, B. A., G. M. Sapers, A. M. Mattazzo, and D. C. Riordan. 2001. Efficacy of washing with a commercial flatbed brush washer, using conventional and experimental washing agents, in reducing populations of *Escherichia coli* on artificially inoculated apples. *J. Food Prot.* 64:159-63.
- Beuchat, L. R. and J. H. Ryu. 1997. Produce handling and processing practices. *Emerg. Infect. Dis.* 3: 459-65.
- Bollen, A. F., E. J. Timm, and B. T. Dela Rue. 2001. Relation of individual forces on apples and bruising during orchard transport of bulk bins. *Applied Engineering in Agriculture.* 17:193-200.
- Cossentine, J. E., P. L. Sholberg, L. B. J. Jensen, K. E. Bedford, and T. C. Shephard. 2004. Fumigation of empty fruit bins with carbon dioxide to control diapausing codling moth larvae and *Penicillium expansum* link. ex thom spores. *Hortscience.* 39:429-432.
- Digman, D. W. 2000. Growth of *Escherichia coli* O157:H7 in bruised apple (*Malus domestica*) tissue as influence by cultivar, date of harvest, and source. *Appl. Environ. Microbiol.* 66:1077-1083.
- Du, J., Y. Han, and R. H. Linton. 2003. Efficacy of chlorine dioxide gas in reducing *Escherichia coli* O157:H7 on apple surfaces. *Food Micro.* 20: 583-91.

- Errampalli, D., J. Horthwover, L. Skog, N. R. Brubacher and C. A. Collucci. 2005. Control of blue mold (*Penicillium expansum*) by fludioxonil in apples (cv Empire) under controlled atmosphere and cold storage conditions. *Pest. Manag. Sci.* 61:591-596.
- Higbee, B. S., C. O. Calkins, and C. A. Temple. 2001. Overwintering of codling moth (Lepidoptera: Tortricidae) larvae in apple harvest bins and subsequent moth emergence. *J. Econ. Entomol.* 94:1511-1517.
- Neth, K., D. Girard, and J. A. Albrecht. 2008. Determination of biofilms on plastic cutting boards. *Rurals:Review of undergraduate research in Agricultural and life sciences*. Vol. 3: Iss. 1, Article 5. Available at: <http://digitalcommons.unl.edu/rurals/vol3/iss1/5>.
- Randall, P., P. Sholberg, G. Judd, and J. Cossentine. 2011. Acetic acid fumigation of fruit storage bins to control diapausing codling moth larvae. *Hortscience.* 46:1634-1639.
- Rodgers, S. L., J. N. Cash, M. Siddiz and E. T. Ryser. 2004. A comparison of different chemical sanitizers for inactivating *Escherichia coli* O157:H7 and *Listeria monocytogenes* in solution and on apples, lettuce, strawberries and cantaloupe. *J. Food Prot.* 67:721-731.
- Sanderson, P. G. 2000. Management of decay around the world and at home. Proceedings of the 16<sup>th</sup> annual tree fruit postharvest conference, Yakima, WA. Available at: <http://postharvest.tfrec.wsu.edu/pages/PC2000Z> Assessed on: 03/24/2012.
- Sapers, G. M., R. L. Miller, B. A. Annous, and A.M., Burke. 2002. Improved antimicrobial washes treatments for decontamination of apples. *J. Food Sci.* 67:1886-91.
- Sapers, G. M., R. L. Miller, and A.M. Matrazzo. 1999. Effectiveness of sanitizing agents in inactivating *Escherichia coli* in golden delicious apples. *J. Food Sci.* 64:734-7.
- Smith, T. J. 2012. Overview of tree fruit production in the Pacific Northwest United States of America and southern British Columbia, Canada. Available at: [http://county.wsu.edu/chelan-douglas/agriculture/treefruit/Pages/Tree\\_Fruit\\_Overview.aspx](http://county.wsu.edu/chelan-douglas/agriculture/treefruit/Pages/Tree_Fruit_Overview.aspx) Assessed on: 03/24/2012.
- Waelti, H. 1992. Should we use plastic bins? *Tree Fruit Postharvest Journal.* 3:14-17.
- Wang, H., W. Liang, H. Feng and Y. Luo. 2007. Modeling the effect of washing solution flow conditions on *Escherichia coli* O157:H7 population reduction on fruit surfaces. *J. Food Prot.* 70:2533-2540.
- Wisniewsky, M. A., B. A. Glatz, M. L. Gleason and C. A. Reitmeier. 2000. Reduction of *Escherichia coli* O157:H7 counts on whole fresh apples by treatment with sanitizers. *J. Food Prot.* 63:703-708.

#### **CONTACT PERSON**

Bonnie Fernandez-Fenaroli  
 Center for Produce Safety  
 530-757-5777  
[bfernandez@cps.ucdavis.edu](mailto:bfernandez@cps.ucdavis.edu)

**Project Title:** Promoting Healthy USA Pears to Children

**Partner Organization:** Pear Bureau Northwest

### **PROJECT SUMMARY**

This project was proposed to allow Pear Bureau Northwest to enter into a partnership with LazyTown Entertainment that would increase exposure of Northwest pears through promotions with school districts and retailers. The partnership met the need to increase produce consumption by creatively appealing to children through an already popular television show and its characters. The marketing budget of the Northwest pear industry pales in comparison to manufactured food corporations competing for space in the shopping basket and the attention and appetites of children and their influence on their parents. By partnering with *LazyTown*, Pear Bureau Northwest was able to capitalize on a familiarity with characters and positive, health- and wellness-oriented messaging to amplify existing marketing messages and increase awareness and purchases of Northwest-grown pears.

The timeliness of this grant project was made clear by an alarming epidemic: 35 percent of American adults and 1 in 6 American children are overweight or obese today, and the numbers continue to rise. Increasingly large and powerful food companies constantly advertise to this population through television, radio, print, and the Internet. Food policy experts often lament the seeming unwillingness of fresh fruit and vegetable growers, packers, and shippers to market their products “like junk food,” but the reality of the situation is that too often, the financial means to do so simply aren’t there. In addition, pears are a high-impulse item that isn’t always at the top of shoppers’ grocery lists, so innovation is important when marketing pears to a preoccupied consumer base.

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

### **PROJECT APPROACH**

During the project period, Pear Bureau Northwest developed custom point-of-sale and marketing materials featuring LazyTown characters promoting fresh pears. The materials included wobblers for store shelves and/or salad bars and lunch lines, floor signs, single- and double-sided posters, life-size standees, stickers, coloring sheets, and channel cards with recipe pads for distribution to retailers and school districts. The Pear Bureau promoted the partnership by developing a unique landing page on [www.usapears.org](http://www.usapears.org) and through a press release to trade media as well as on social media platforms. The LazyTown landing page received more than 2,600 visits throughout the project period, and visitors stayed on the page an average of two minutes.

Sportacus attended the NBC4 Health and Fitness Expo with Pear Bureau staff in January 2013, interacting with more than 85,000 attendees for photos and to hand out fresh pears. Pear Bureau Northwest Regional Managers also set up events featuring the Sportacus actor at Tops Markets in Rochester and Buffalo, NY in February and March. A national e-newsletter was sent to school districts early in 2013, prompting requests for LazyTown-branded materials from 184 schools across the country that serve breakfast and lunch to more than 135,000 students.

Continued interest in the LazyTown partnership and a slow start to launching promotional programs led the Pear Bureau to expand the timeline of this grant project to extend into the second year. In June 2013, Pear Bureau Northwest sponsored a character tour in North Haven, Connecticut, to visit the district’s elementary schools in celebration of their recent Bronze Award from the USDA’s HealthierUS School Challenge program. The tour reached more than 1,500 students, bringing them LazyTown stickers and fresh pears straight from Sportacus himself. The successful tour earned local media mentions and piqued the interest of Chichester School District outside of Philadelphia, PA, which had also recently been awarded Bronze status from the HealthierUS School Challenge. Chichester SD as well as Denver Public Schools received school visits from Sportacus in the fall of 2014, and these tours reached more than 2,000 elementary school students.

The Denver school tour segued into LazyTown and USA Pears’ participation in the King Soopers Health and Wellness Expo, where Sportacus and Stephanie performed for more than 4,000 consumers, sharing their message of staying active and eating SportsCandy, or fruits and vegetables. USA Pears staff handed out whole ripe pears to consumers throughout the day-long expo.

In 2014, Sportacus again attended the NBC4 Health and Fitness Expo in Washington, D.C. with pear growers Ken and Kelli Newman and Pear Bureau representative Bob Catinella. Sportacus handed out pears and LazyTown materials with the Pear Bureau as well as performed on the main stage throughout the weekend event. More than 75,000 consumers attended this popular health event.

Sportacus also attended the grand opening of two Sam's Club warehouses in San Antonio, Texas. Fresh pears were sampled in each store during the grand openings, coordinated by the Pear Bureau, and Sportacus interacted with shoppers during the weekend.

Due to the popularity of certain LazyTown materials, the Pear Bureau reprinted folder posters, recipe pads featuring "Sportacus Skewers," and wobblers for store shelves. LazyTown materials were featured prominently during a sampling weekend at Redner's Warehouse Markets in Pennsylvania in early summer 2014. Redner's demonstrators served a pear, walnut, and gorgonzola salad to nearly 2,000 shoppers, many of whom said they loved the flavor of the ripe pear and would purchase the salad ingredients.

Further school tours held in late 2014 and the 2015 year reached more than 4,400 students in Wisconsin, Ohio, and Connecticut.

Retail activities in the third year included visits to Tops Markets locations in Buffalo and Rochester, New York, where Sportacus greeted families shopping in the produce department and led kids through an EnergyMeter game that encouraged activity and rewarded kids with fresh pears.

While retailer activity throughout the three-year project tended to be lower than anticipated and harder to quantify, school tours were consistently popular and well-received, allowing for adjustments to accommodate more school and community-focused events.

The overall scope of this project did not benefit commodities other than specialty crops.

### **GOALS AND OUTCOMES ACHIEVED**

In order to reach Expected Measurable Outcomes, Pear Bureau Northwest developed custom point-of-sale materials for school districts and retailers. These materials were then introduced via emails and account visits. Outcomes 1 and 2 focused on the retail sector, and as such, Pear Bureau Northwest regional marketing managers worked with accounts to schedule character visits, sampling events, and POS usage during the project period. POS materials were displayed in stores and handed out to consumers during sampling events.

Outcome 3 focused on school districts, and saw much more success than anticipated, with not just distribution of POS materials, but also character tours to districts in several states, as detailed above. These materials were made available on usapears.org as well as via e-newsletter and email. Materials were distributed to all schools that hosted LazyTown characters, and all students received fresh pears in pear packers.

There were no expected long term measurable outcomes for this project.

While the retail goals established for this project focused on retail sales lifts, specifically through sampling events and POS materials on display, accomplishing these goals took longer than anticipated. With certain retail partners, the Pear Bureau wasn't able to obtain results and sales measurements, so the final results drew on a smaller pool of sales metrics than anticipated. All results obtained from retailers either nearly met or exceeded established goals, as shown below in Expected Measurable Outcomes. The goals set for school outreach were to send branded materials to schools and to schedule school events. These goals were far exceeded, both in amount of materials distributed and in the popularity, publicity, and success of school events and assemblies.

Expected Measurable Outcome #1 was to promote pears to children and adults in the retail setting by using LazyTown events and materials in stores, increasing sales volume. Measurements from Redner's Warehouse Markets show sales increases of more than 50%, surpassing the goal of 15% sales increases. Similar analytics from Sam's Club show a 12.8% increase in fresh pear sales.

Expected Measurable Outcome #2 was to increase purchases of USA Pears through in-store character visits and fresh pear sampling events. In the project's first year, the Pear Bureau gathered data from Kroger stores after sampling events showing a sales lift of 147%, which surpassed the set target of 135%. Measurements from Tops Markets also showed positive sales increases of 24% for the pear category versus overall sales increases of 6% across the entire produce department. In the second project year, the Pear Bureau gathered data from Sam's Club after sampling events showing a sales lift of 200%, which surpassed the set target of 135%.

Expected Measurable Outcome #3 to increase consumption and awareness of USA Pears in school districts by reaching 65 individual schools with LazyTown-branded materials was surpassed in the project's first year, and a new goal of 100 materials requests was set. Pear Bureau Northwest proactively sent out an e-newsletter introducing

districts to the materials. Along with the website promotion, this newsletter prompted requests from 184 individual schools nationwide. Based on appearances at state school shows and materials distributed through the Cool School Café program, the Pear Bureau received requests from an additional 103 schools nationwide in the second year, achieving the new goal. This distribution continued throughout the third year, with a final e-newsletter in the fall of 2015, which accomplished the Pear Bureau’s goal of sending all printed LazyTown materials to school districts.

In addition to this third outcome, the project shifted to a focus on school districts, with several successful events taking place throughout the three-year project period bringing partnership characters and fresh pears to schools in five states across the Northeast and Central U.S.

**BENEFICIARIES**

This project benefited the 1,550 pear growers and 45 independent shippers and packinghouses throughout the Pacific Northwest. Retail activities resulted in sales increases and school activities brought fresh pears to thousands of students while inspiring increased pear usage in the districts’ kitchens. Fresh pear sampling events and custom point-of-sale materials brought pears to life in the produce department with a colorful, kid-friendly approach, leading to more purchases of this high-impulse fruit and more engagement with shoppers tasting ripe varieties of USA Pears.

Retail use of POS materials led to an average increase of 31.4% in pear sales in stores tracking category measurements. Retail sampling events and in-store character events led to an average sales lift of 174% for the pear category. School tours and material distribution reached more than 256 individual schools serving school breakfast, lunch, and snacks to more than 260,000 elementary school students.

**LESSONS LEARNED**

Initially, this project provided insight into the difficulties of rolling out a program on a national scale with specific geographic targets. Upon its launch, this project was targeted to focus on the Northeast, due to population density and a higher rate of pear sales. After the project’s first year, the target was relaxed to have a national focus, due to success and interest in the program in other areas and a lack of resources to get a strong start in the Northeast.

The project had more word-of-mouth success than anticipated, with school districts in particular responding well to the materials at conventions and through emails. Relationships developed out of these interactions that led to new locations for school tours, repeat requests for pear-focused materials and giveaways, and positive experiences ripening and serving fresh pears.

Upon its conclusion, the project stands out as a success for the enthusiasm it created around USA Pears, as well as the positive sales results, response from retail staff and sampling coordinators, and its ability to expose schoolchildren to USA Pears in a positive light.

There were no unexpected outcomes or results from implementing this project.

We completed all activities, goals, and Expected Measurable Outcomes for this project.

**ADDITIONAL INFORMATION – See Attachment B 12-12-B-1496 Pear**

Pear Bureau Northwest made the following cash contributions to this project:

- \$25,000.00 Two-Year Licensing Agreement with LazyTown Entertainment, Inc. for rights to LZT intellectual property and custom material development
- \$3,740.00 payment for video editing done by LazyTown for website use
- \$1,488.00 Sportacus performance fee 6/11/13
- \$1,827.00 Sportacus performance fee 2/23-2/24/13
- \$1,812.00 Sportacus performance fee 3/9-3/10/13
- \$1,716.00 Sportacus performance fee 3/16-3/17/13
- \$2,175.00 Sportacus performance fee 10/1-10/5/13
- \$1,600.00 Sportacus performance fee 11/18-11/20/13
- \$1,750.00 Sportacus performance fee 1/15-1/16/14
- \$1,500.00 Sportacus performance fee 3/4-3/4/14
- \$1,600.00 Sportacus performance fee 10/5/14
- \$1,600.00 Sportacus performance fee 12/11/14
- \$1,600.00 Sportacus performance fee 1/13/15
- \$1,600.00 Sportacus performance fee 2/26/15

\$2,000.00 Sportacus/Stephanie performance fee 3/13/15  
\$1,725.00 Sportacus/Stephanie performance fee 4/3/15  
\$3,000.00 Sportacus/Stephanie performance fee 4/3/15  
\$2,450.00 Sportacus performance fee 6/18/15

TOTAL EXPENDITURES: \$58,183.00

**CONTACT PERSON**

Brittany Wilmes  
Pear Bureau Northwest  
503-652-9720  
[bwilmes@usapears.com](mailto:bwilmes@usapears.com)

**Project Title:** Evaluation of Irrigation Practices for Specialty Crop Risk Reduction

**Partner Organization:** Washington State University (WSU)

### **PROJECT SUMMARY**

Food safety risks present a significant financial threat to specialty crop producers. Irrigation water, especially open surface water, is a major contributing factor to produce outbreaks. Understanding and reducing risk through irrigation water management for specialty crops is a critical agricultural issue in Washington. Project objectives are: 1) evaluate specific irrigation practices (overhead vs. drip irrigation) for reduction of crop contamination and 2) assist producers with irrigation water evaluation. This need is driven by the Food Safety Modernization Act and enhanced buyer requirements for documentation of irrigation water safety. The proposed research is important because critical knowledge gaps exist regarding the ability of intervention treatments to reduce pathogen risk in irrigation water. Moreover, the Food Safety Modernization Act (FSMA) had been passed in 2011, the year this project was funded. This legislation would also impact the need for growers to comply with impending food safety rules by the Food and Drug Administration. The release of the FDA Proposed Standards for the Growing, Harvesting, Packing and Holding of Produce for Human Foods Consumption (referred to as the proposed produce rule) in January of 2013 affected the approach of the remainder of the project.

Food safety risks present a significant financial threat to specialty crop producers, and on-farm production practices are critical for pathogen risk reduction. Irrigation water, especially open surface water, is a major contributing factor to produce outbreaks. Dr. James Gorney, FDA senior advisor for produce safety, recently stated that water, both irrigation and processing, is the biggest flashpoint for produce safety. This need is driven by the Food Safety Modernization Act and enhanced buyer requirements for Good Agricultural Practices (GAPs) documentation of irrigation water safety. The proposed research is *important* because critical knowledge gaps exist regarding the ability of intervention treatments to reduce pathogen risk in irrigation water. The project is *timely* because farmers have immediate need to improve water management practices and documentation.

This project built on the previously funded SCBGP, “Advancing food safety Good Agricultural Practices (GAPs) among Washington specialty crops growers”. This project builds on successful WSU extension efforts involving assessment of pathogen risk and assistance for specialty crop growers. Most project partners had collaborated with the team on previous projects; therefore, solid relationships exist with industry stakeholders to meet the needs of specialty crop producers. Workshops to disseminate the results of this project were well attended, and some participants had attended GAPs extension workshops associated with the previous project.

### **PROJECT APPROACH**

**Description of Activities:** The project team conducted water sampling 4 times in 2013 and 5 times in 2014, and soil samples, potting mix, transplant plug and lettuce top samples were also collected throughout the study. Two lettuce crops were grown each year (2013 and 2014) for sampling (48 samples/harvest). All lettuce plots were amended with composted broiler litter. Four plots per treatment were randomly assigned to 1) untreated overhead irrigation, 2) untreated drip irrigation, 3) chlorine dioxide-treated overhead irrigation, and 4) chlorine dioxide-treated drip irrigation, and four replicates were conducted at Washington State University Puyallup Research Station.

The project team collected water samples from the irrigation water source for the farm, in western Washington including water collected from a free flowing area near the center of the stream (two sampling sites) and collected near the bank with sediment (two sampling sites) prior to irrigating the crops in order to assess initial microbial levels at the irrigation pump site in the creek. For soil plots, the team collected and composited soil samples from nine cores (0-4 inches in depth) for each 20x50 feet plot by using a sterile 2.5cm-diameter soil probe and placed in a sterilized stainless steel bowl. Soil samples were collected from locations randomly selected between the plant rows. For lettuce harvest, each lettuce head was collected cutting the base with a sterile knife, and several heads of lettuce from each treatment plot were pooled in a sterile Whirl-Pak bag. For each treatment plot, outer leaves were removed from all lettuce harvested in the plot and were collected for analysis; removing outer leaves from lettuce heads during harvest is a standard harvesting practice on many farms. All samples would be stored at refrigeration temperatures during transportation to the Food Microbiology Laboratory in Washington State University for microbiological analysis.

**Quantification of indicator organisms.** A 5-tube most probable number (MPN) technique was used to quantify indicator organisms (total coliforms, fecal coliforms and generic *E. coli*). Liquid samples, such as creek and irrigation water and fertilizer, were directly subjected to MPN analysis. For sampling composite sampling was used; lettuce heads (n=3) were cut in half and one half-head from each was composited in a sterile stomacher bag added with equivalent weight volume of 0.1% peptone water for homogenization. The lettuce-peptone water mixers were rubbed

for 1 min, shaken for 30s, and rubbed for 1min. The collected lettuce mixture were subjected to MPN testing. With regard to solid samples, such as soil, potting mix, transplant plug, and compost, 11g of sample were added in 99ml of 0.1% peptone water (Becton, Dickson and Co. MD) and shaken 25 times in a 30cm arc prior to MPN analysis.

For the MPN analysis, for each of 5 serial dilutions, an aliquot of 1ml was transferred to 5 tubes containing lauryl sulfate tryptose broth (LST) with durham tube to capture gas production during bacterial fermentation. LST tubes were incubated at 35°C for 24 ± 2h for development of gas and turbidity. If the tubes did not produce gas, additional 24h of incubation at 35°C was required before recording the results. Confirmation tests were performed on all positive LST tubes that were gas-positive and turbid. A loopful of suspension from each presumptive positive LST tube was transferred to each 9ml tube of BGLB liquid media, EC broth, and EC+MUG liquid media. BGLB and EC tubes were incubated at 35°C and 44.5°C for 24h before examination of gas production, respectively. The tubes without gas production were incubated additional 24h at the same temperature and examined afterwards. All BGLB and EC tubes with gas production (positive) within 48h of incubation were conformed as total coliforms and fecal coliforms positive, respectively. EC+MUG tubes were incubated at 44.5°C for 24 ± 2h, followed by examination of gas production and fluorescence using a long wave UV lamp. EC+MUG tubes with gas production and fluorescence were confirmed as generic *E. coli*.

*E. coli* O157:H7 isolation. For solid samples (soil, potting mix, transplant plug, and compost), 18 g of the sample were transferred into a bottle with 162 ml of tryptic soy broth (TSB) and incubated at 44.5°C for 18-24h. After enrichment, the enriched TSB samples were subjected to immunomagnetic separation assay (IMS). One ml of each enriched sample was mixed with 1ml of PBS tween 20 and 20µl of anti-O157 Dynabeads before analyzing in an automatic IMS BeadRetriever™ instrument. Subsequently, 150µl of the bead-bacteria mixture of *E. coli* O157 was plated onto sorbital MacConkey agar plates supplemented with cefixime and tellurite (CT-SMAC). After plates were incubated at 37°C for 24 ± 2h, typical colonies (colorless to grey) were selected and streaked onto CT-SMAC plates again for colony isolation. Subsequently, a presumptive positive colony was selected to inoculate TSB and EC+MUG broth, and to streak on MacConkey plates (Hardy Diagnostics, CA). The tubes and plates were incubated at 37°C for 24 ± 2h. The enriched TSB with colony that was tested positive on MacConkey (pink color) and negative on EC+MUG broth (gas but no fluorescence) was subjected to *E. coli* O157 latex agglutination test for confirmation. The latex-positive isolates were tested with the presence of *stx1*, *stx2*, *eaeA* and *hlyA* genes using conventional PCR method before sending to Pennsylvania State University for serotyping.

*Salmonella* isolation. For solid samples (soil, potting mix, transplant plug, and compost), 18 g of the sample were transferred into a bottle with 162 ml of buffer peptone water (BPW, Hardy Diagnostics, CA) and pre-enriched at 37°C for 18-24h. Subsequently, aliquots of 0.1ml and 1ml of the enriched samples were inoculated in 10ml of Rappaport-Vassiliadis (RV) and tetrathionate (TT) media broth, respectively. RV broth was incubated at 35°C and TT was incubated at 42°C for 24 ± 2h. Later, a loopful of each of RV and TT was streaked separately on xylose lysine desoxycholate (XLD), hektoen enteric (HE), and bismuth sulfite (BS) agar plates. All plates were incubated at 35°C for 24 ± 2h (XLD and HE) or 48 ± 2h (BS). The selected colonies were streaked for isolation on the same agar again to isolate a pure culture. After incubation at 35°C for 24 ± 2h (XLD and HE) and 48 ± 2h (BS), an isolated colony from each type of agar plate was selected and stabbed individually in triple sugar iron (TSI) agar slants and lysine iron (LIA) agar slants and inoculated in 9ml TSB tubes. The TSI, LIA slants and TSB tubes were incubated at 35°C for 24 ± 2h. For samples with typical reactions on LIA and TSI slants, the corresponding TSB tubes were subjected to *Salmonella* latex agglutination test. The latex-positive isolates were tested with the presence of *invA* and *iroB* and absence of *rfbJ* genes using conventional PCR method before sending to National Veterinary Service Laboratories for serotyping.

**Significant Results and Accomplishments:** In both years of the study, generic *E. coli* levels in the creek near the irrigation pump intake were similar and averaged between 1.5- 2.0 log cfu/100ml (Figure 1), and water treatment with chlorine dioxide significantly reduced generic *E. coli* levels in irrigation water immediately after treatment (Figure 3). Fecal coliform levels were significantly higher (P<0.05) in samples containing sediment by intake compared to samples containing sediment above intake in 2014 but not 2013 (Figure 2). Chlorine dioxide (CLO<sub>2</sub>) treatment on the water introduced from Clarks Creek significantly (P<0.05) reduced generic *E. coli* and fecal coliforms under detection levels by at least 0.6 and 1.4 log CFU/MPN per 100ml, respectively (Figure 3). Additionally, the indicator organisms (generic *E. coli* and fecal coliform) in the water collected at the point of applying irrigation water were not significantly different between drip and overhead irrigation methods (Figure 6).

In this study, statistical analysis indicated that irrigation water treatment was not a factor that significantly influenced fecal coliform or generic *E. coli* levels in soil. However, generic *E. coli* levels in plots with different irrigation systems (drip versus overhead) differed significantly in one year of the study. Soil from overhead irrigated plots in

2013 harbored significantly higher ( $P < 0.05$ ) generic *E. coli* than the drip-irrigated soil samples, while in 2014, generic *E. coli* levels in overhead and drip irrigated plots were similar (Figure 4). However, fecal coliforms were not significantly different between soil samples from drip irrigation and overhead irrigation plots in both years, with fecal coliform levels at approximately 4.20 log cfu/MPN per 100ml.

For generic *E. coli* levels on lettuce, harvest (first or second), harvest year and type of irrigation (drip versus overhead) had a statistically significant interaction; however, trends for generic *E. coli* levels on lettuce in association with type of irrigation were not consistent. For some harvests, drip irrigation appeared to be associated with lower generic *E. coli* levels; however, in others irrigation type did not appear to influence generic *E. coli* levels. The data collected in this study showed that, in 2013, lettuce from the first harvest with overhead irrigation had significantly higher ( $P < 0.05$ ) numbers of both fecal coliforms and generic *E. coli* than those of the drip-irrigated lettuce by approximately 1 log CFU/MPN per 100ml (Figure 5). In 2014, lettuce from the first harvest with overhead irrigation harbored significantly higher levels of fecal coliforms than the drip-irrigated samples, but no differences were observed throughout the season for generic *E. coli* levels between drip-irrigated and overhead-irrigated lettuce (Figure 5). Both fecal coliforms and generic *E. coli* populations were not significantly different between the 2<sup>nd</sup> harvest of the drip-irrigated and overhead-irrigated lettuce samples in both 2013 and 2014 (Figure 5).

In this study, *Salmonella* were only detected prior to planting, in 13.6% (6/44) of commercial potting mix samples and 7.0% (3/43) of transplant plug samples, and all positive samples were from 2014 (Table 2). Regarding *E. coli* O157:H7, 3.9% (6/153) of untreated water samples were positive of *E. coli* O157:H7 which included one sample from a transplant tank, one sample from creek water with sediment, one sample after filtering (before ClO<sub>2</sub> treatment), and three water samples without ClO<sub>2</sub> treatment collected at the application of drip (1) or overhead irrigation (2) (Table 3). No *E. coli* O157:H7 was found in the water samples after ClO<sub>2</sub> treatment. No *Salmonella* were detected at any point in the water delivery system in this study. The data also showed that one soil sample collected in the plot irrigated with untreated (ClO<sub>2</sub>) water, two transplant plug and three potting mix samples was positive of *E. coli* O157:H7.

For percentages associated with pathogen prevalence and lettuce samples, samples associated with lettuce outer leaves were calculated separately from composited lettuce head samples that reflected harvested lettuce that would enter commercial distribution. For harvested lettuce samples (Table 1), 1.6% (4/256) samples were positive for *E. coli* O157:H7; three of those samples were associated with untreated irrigation water (1 with ClO<sub>2</sub>-treated drip irrigation) and three of those samples were associated with drip irrigated plots (1 overhead irrigated). Furthermore, 22.9% (8/35) of outer leaves samples were also positive of *E. coli* O157:H7 (Table 1); these samples were associated with both ClO<sub>2</sub>-treated and untreated irrigation plots as well as from both drip and overhead irrigated plots. Samples associated with outer leaves do not represent harvested, commercial quality lettuce heads; however, these samples were examined to evaluate pathogen prevalence associated with the study plots.

**Conclusions:** The project activities supported specialty crop growers in gaining knowledge about understanding and reducing risk through irrigation water management for specialty crops. The finding of this study indicated that the drip irrigation may reduce microbial levels in soil and on lettuce as compared to overhead irrigation, but the results varied by year and with different harvests within the year. Additionally, chlorine dioxide (ClO<sub>2</sub>) water treatment improved the microbiological quality of open surface water used for irrigation in this study. Therefore, farmers with challenges associated with agricultural water could use chlorine dioxide treatment to reduce food safety risks associated with agricultural water. It is important to acknowledge that water treatment did not prevent other routes of contamination from contaminating lettuce harvested from chlorine-dioxide treated plots; therefore, farmers must carefully manage all potential routes of contamination. These outcomes contribute to the long-term goal of reducing risk for producers of Washington specialty crops, increasing public health and increasing economic impacts for Washington producers.

Project partners actively participated in water, soil, and lettuce sampling and collection at Washington State University Puyallup research Station. Project partners also participated by assisting in disseminating project results to specialty crop producers by incorporating presentations by the project team into annual meetings, promoting the irrigation water management workshops and providing project publications to their memberships. The Washington Red Raspberry Commission worked with the project team to sponsor 2 meetings where project research results were disseminated and discussed. The Washington Tree Fruit Research Commission also worked with the project team to sponsor a meeting in eastern Washington where research results were disseminated and discussed. Other project partners associated in promoting these workshops.

The educational focus involved conducting workshops to help growers evaluate irrigation water monitoring data and understand the outcomes of the research results. Data were collected from participants when they registered for the events and in evaluation tools to ensure that participants were involved in specialty crop production.

### **GOALS AND OUTCOMES ACHIEVED**

*Expected Measurable Outcome:* Specialty crop growers utilize research based information and increased knowledge to guide decisions for irrigation water management to reduce pathogen risks.

*Goal:* 1) Determine if overhead, drip and chlorinated drip irrigation from open surface water differ in pathogen and indicator organism risk reduction to comply with water safety recommendations. 2) Assist growers with irrigation management decisions through distribution of research results and educational outreach.

*Target:* Results will be distributed to more than 1200 specialty crop growers on the WSU GAPs and project partner list servs. Other specialty crop growers will be reached through Extension publications and project partner annual meetings for specialty crop growers.

*Benchmark:* During project workshops, current irrigation water practices and economic impacts will be collected to establish a baseline. Information on pathogen and indicator organism reduction by drip irrigation and chlorination is limited. It is not known if Washington growers change irrigation practices based on water testing.

*Performance measure:* Results of the replicated field experiment will provide growers with information to assess the potential benefits of investing in treatments to reduce pathogen risk and comply with GAPs water safety standards. Research results will be published in the refereed research literature to provide peer-reviewed credibility. Targeted workshops will be conducted to deliver research results and to assist growers in assessing their irrigation water monitoring data. On-line follow-up evaluations will be utilized to determine if the disseminated results and workshops assisted grower decisions about irrigation practices and if growers changed irrigation practices based on provided research data and educational outreach. Evaluations will also assess increases in knowledge among specialty crop growers, implementation of food safety practices related to irrigation water, and economic impacts.

The project team conducted irrigation water sampling 4 times in 2013 and 5 times in 2014, soil sampling 3 times in 2013 and 6 times in 2014, and harvested two lettuce crops in both years. Over 825 agricultural samples were analyzed for microbial indicator organisms and the presence of *Salmonella* and *Escherichia coli* O157:H7. The results show that the fecal coliforms and generic *E. coli* levels in treated irrigation water obtained in 2013 were 0.96 log<sub>10</sub> cfu/100 ml for both indicator organisms, which was significantly lower than untreated water with 2.67 and 1.63 log<sub>10</sub> cfu/100ml, respectively. For irrigation water in 2014, the bacterial levels for fecal coliforms and generic *E. coli* were also significantly lower with respective counts of 1.28 and 1.09 log<sub>10</sub> cfu/100ml. There was no difference between two years soil samples, with approximately 0.8 log<sub>10</sub> cfu/ml of generic *E. coli*.

In this study, *Salmonella* were only detected prior to planting, in 13.6% (6/44) of commercial potting mix samples and 7.0% (3/43) of transplant plug samples, and all positive samples were from 2014 (Table 2). Regarding *E. coli* O157:H7, 3.9% (6/153) of untreated water samples were positive of *E. coli* O157:H7 which included one sample from a transplant tank, one sample from creek water with sediment, one sample after filtering (before ClO<sub>2</sub> treatment), and three water samples without ClO<sub>2</sub> treatment collected at the application of drip (1) or overhead irrigation (2) (Table 3). No *E. coli* O157:H7 was found in the water samples after ClO<sub>2</sub> treatment. No *Salmonella* were detected at any point in the water delivery system in this study. The data also showed that one soil sample collected in the plot irrigated with untreated (ClO<sub>2</sub>) water, two transplant plug and three potting mix samples was positive of *E. coli* O157:H7.

For percentages associated with pathogen prevalence and lettuce samples, samples associated with lettuce outer leaves were calculated separately from composited lettuce head samples that reflected harvested lettuce that would enter commercial distribution. For harvested lettuce samples (Table 1), 1.6% (4/256) samples were positive for *E. coli* O157:H7; three of those samples were associated with untreated irrigation water (1 with ClO<sub>2</sub>-treated drip irrigation) and three of those samples were associated with drip irrigated plots (1 overhead irrigated). Furthermore, 22.9% (8/35) of outer leaves samples were also positive of *E. coli* O157:H7 (Table 1); these samples were associated with both ClO<sub>2</sub>-treated and untreated irrigation plots as well as from both drip and overhead irrigated plots. Samples associated with outer leaves do not represent harvested, commercial quality lettuce heads; however, these samples were examined to evaluate pathogen prevalence associated with the study plots.

The finding of this study indicated that the drip irrigation may reduce microbial levels in soil and on lettuce as compared to overhead irrigation, but the results varied by year and with different harvests within year. Additionally, It is important to acknowledge that water treatment did not prevent other routes of contamination from contaminating lettuce harvested from chlorine-dioxide treated plots; therefore, farmers must carefully manage all potential routes of contamination.

The project goal was to determine if overhead and drip irrigation as well as untreated and treated irrigation differed in microbial risk based on indicator organism levels and pathogen presence. The chlorine dioxide (ClO<sub>2</sub>) water treatment improved the microbiological quality and reduced risk when open surface water was used for irrigation in this study. Results for overhead and drip irrigation varied by year and harvest within year. Therefore, farmers with challenges associated with agricultural water could use chlorine dioxide treatment to reduce food safety risks associated with agricultural water.

This project evaluated the efficacy of overhead, drip and chlorinated drip irrigation to reduce indicator organism levels and naturally occurring pathogens. Similar projects have not been submitted or funded by other agencies. In this study, lettuce was used as research crop that the results would be relevant for all specialty crop producers, not just growing lettuce. The educational focus involved conducting workshops to help growers evaluating irrigation water monitoring data. This project built on successful WSU research and extension efforts involving assessment of pathogen risk and assistance for specialty crop growers. The team established a foundation with previous research projects allowing for seamless transition to continue research and extension efforts and interaction with Washington specialty crops growers.

Long-term dissemination of research results will involve publication of a peer-reviewed research manuscript, extension materials and additional presentation of research results at extension events. These long-term efforts will further the project team's efforts to reach our project target and performance measure for communicating research results.

The project goal was to evaluate the effect of irrigation system (overhead and drip) and water treatment (with or without chlorine dioxide) on pathogen presence (*E. coli* O157 and *Salmonella*) and indicator organism levels (fecal coliforms and generic *E. coli*). For irrigation water treatment, chlorine dioxide was effective in reducing fecal coliform and generic *E. coli* levels in the water samples, with approximately 0.6 and 1.4 log CFU/MPN per 100ml reduction, respectively. As for pathogen isolation, pathogens were not detected in chlorine dioxide water treated samples; however, lettuce and outer leaves from plots irrigated with chlorine dioxide-treated water were sometimes associated with *E. coli* O157:H7 at a low prevalence. Nevertheless, chlorine dioxide water treatment was able to reduce risk of water contamination from open surface water.

Regarding effectiveness of irrigation methods (overhead vs. drip), in 2013, lettuce from the first harvest with overhead irrigation had significantly higher ( $P < 0.05$ ) numbers of both fecal coliforms and generic *E. coli* than those of the drip-irrigated lettuce. The following year (2014), lettuce from the first harvest with overhead irrigation harbored significantly higher levels of fecal coliforms than the drip-irrigated samples, but no differences were observed throughout the season for generic *E. coli* levels between drip-irrigated and overhead-irrigated lettuce (Figure 5). Therefore, results for overhead and drip irrigation varied by year and harvest within year.

This project achieved the goal of assessing the ability of irrigation water treatment to reduce food safety risk for crops through the examination of organic production practices in Washington. While the results for irrigation method (drip versus overhead) were less clear, the study design was sufficiently sensitive. Furthermore, the project reached over 110 specialty crop growers, with more expected through long-term efforts.

Specialty crop growers utilize research-based information and increased knowledge to guide decisions for irrigation water management to reduce pathogen risks.

Baseline Data and Achievement of Target Goals for Reducing pathogens and indicator microorganisms using overhead, drip and chlorinated drip irrigation from open surface water.

The microbiological analysis in this study showed that regardless of irrigation methods (overhead vs. drip) chlorinated water treatment decreased fecal coliform and generic *E. coli* levels by 1.75 and 1 log<sub>10</sub> cfu/100ml in 2013 and by 1.5 and 0.5 log<sub>10</sub> cfu/100ml in 2014. As for pathogen isolation, pathogens were not detected in chlorine dioxide water treated samples; however, lettuce and outer leaves from plots irrigated with chlorine dioxide-treated water were sometimes associated with *E. coli* O157:H7 at a low prevalence. Nevertheless, chlorine dioxide water treatment was able to reduce risk of water contamination from open surface water.

Regarding effectiveness of irrigation methods (overhead vs. drip), in 2013, lettuce from the first harvest with overhead irrigation had significantly higher ( $P < 0.05$ ) numbers of both fecal coliforms and generic *E. coli* than those of the drip-irrigated lettuce. The following year (2014), lettuce from the first harvest with overhead irrigation harbored significantly higher levels of fecal coliforms than the drip-irrigated samples, but no differences were observed

throughout the season for generic *E. coli* levels between drip-irrigated and overhead-irrigated lettuce (Figure 5). Therefore, results for overhead and drip irrigation varied by year and harvest within year.

Results were distributed to more than 110 workshop participants and long-term over 1200 specialty crop growers on the WSU GAPs and project partner list servs. Other specialty crop growers will be reached through Extension publications and project partner annual meetings for specialty crop growers.

### **BENEFICIARIES**

The project outcomes reached several specialty crops of economic importance in Washington.

Washington specialty crop growers benefit from the outcomes of this project, including small to large acreage conventional and organic operations. Impacted crops include tree, small and stone fruits, root crops, leafy greens and other vegetables. All growers utilizing open surface water irrigation will benefit from the outcomes of the research. Research data benefits growers utilizing open surface water irrigation that are high-risk sources for pathogen contamination of crops. Knowledge gained through the project will enhance understanding of ability of drip irrigation and chlorine water treatment systems to reduce pathogen risk.

With the release of the new FSMA rules irrigation water is the area of food safety that is of the most concern for many specialty crop growers that irrigate their crops with surface water. Pertinent research on how to best manage irrigation water in the future is the one most asked about subjects when discussing the new food safety rule. The long term benefits from the continued discussion with growers and future research questions answered.

### **LESSONS LEARNED**

This research showed that chlorine dioxide water treatment effectively increased microbiological quality of open-surface irrigation water by significant decreasing of fecal coliforms and generic *E. coli* under detection levels of the microbiological test used in the lab. Regardless of irrigation methods (drip vs. overhead), similar results were also observed on the lettuce irrigated with chlorine dioxide-treated water. However, the effects of irrigation methods (drip vs. overhead) were not significant on the reduction of fecal coliforms or generic *E. coli* in this study; this could be due to the confounding effects of weather condition or wild animal activities right before harvest.

There was a wildlife intrusion event by geese immediately prior to the first lettuce harvest in 2013. Lettuce was damaged and feces from geese were evident throughout several of the research plots. Efforts were made to separate lettuce samples affected by animal intrusion to minimize effects on the study objectives; however, some samples were collected to compare microbial levels and pathogen contamination for lettuce damaged by the geese.

All Expected Measurable Outcomes were achieved for this project.

### **ADDITIONAL INFORMATION**

In-kind match for this project was \$55,034.00. Indirect costs were waived by Washington State University, which were calculated at 49.5%.

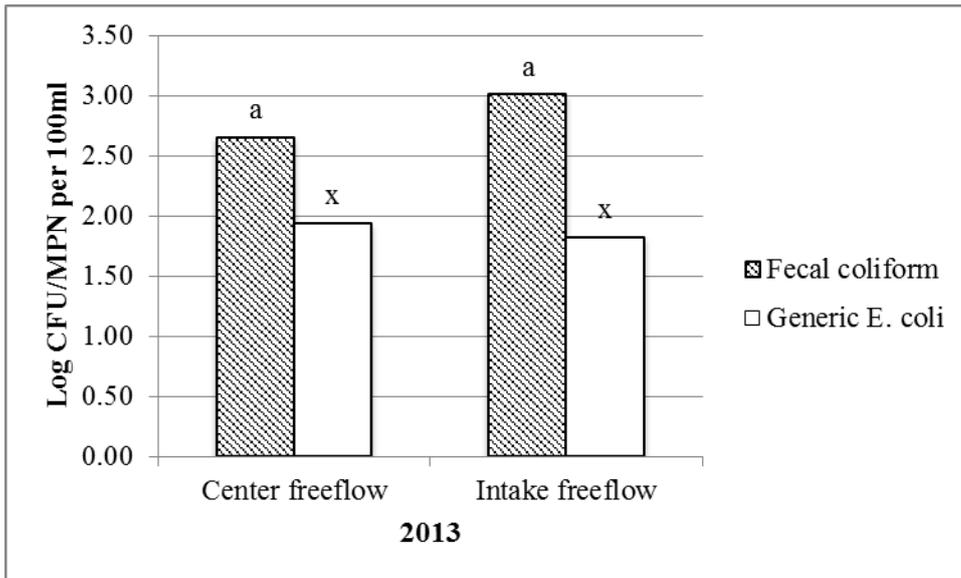
Evaluation data is provided as a component of this report and will be used to generate appropriate publications

### **CONTACT PERSON**

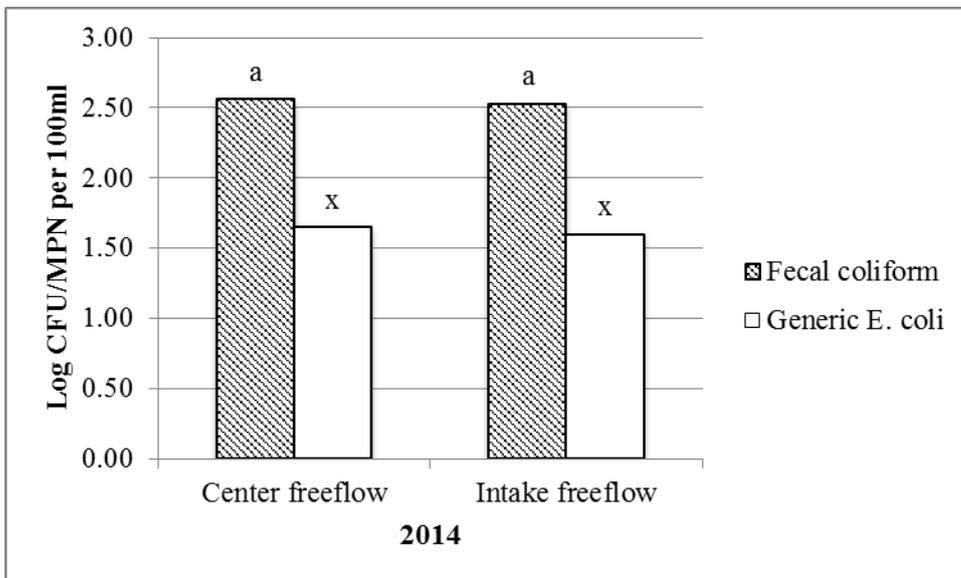
Andy Bary  
WSU  
253-445-4588  
[bary@wsu.edu](mailto:bary@wsu.edu)

**Figure 1. Levels of indicator microorganisms of water samples collected at different sides of the river in 2013 (1a) and 2014 (1b). Statistical analysis was conducted within each year.**

**1a.**



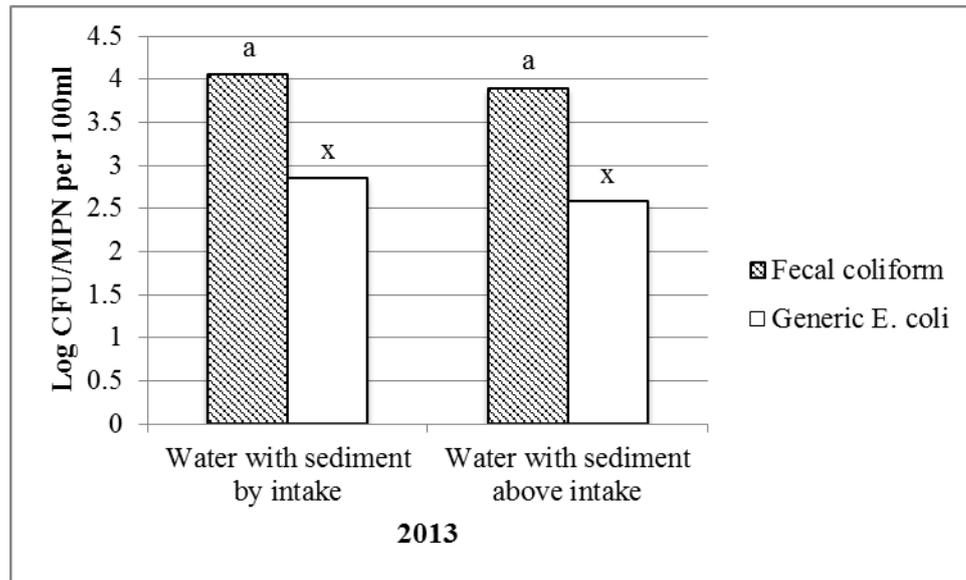
**1b.**



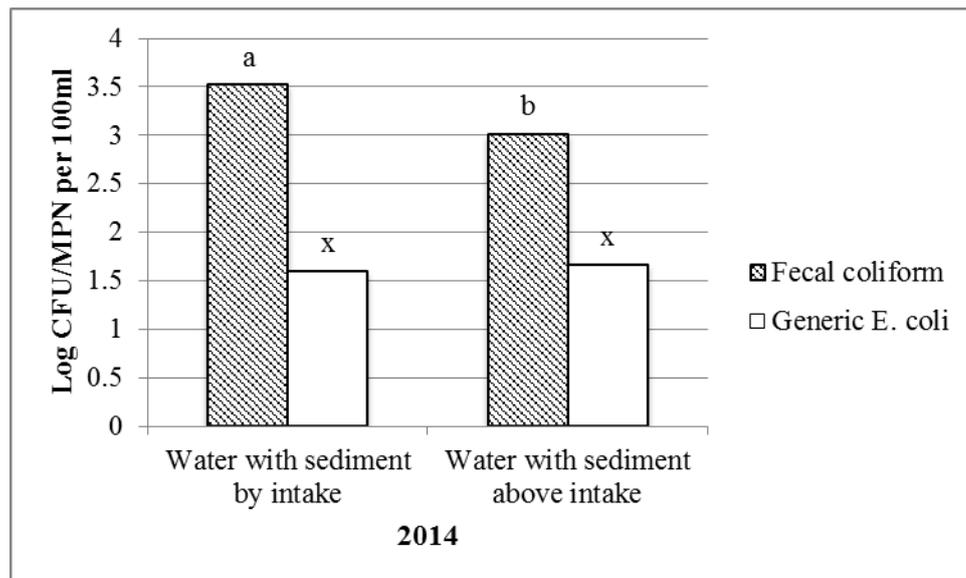
<sup>a</sup>Means sharing a superscript are similar (P>0.05)

<sup>x</sup>Means sharing a superscript are similar (P>0.05)

**Figure 2. Levels of indicator microorganisms of water samples with sediment collected at different sides of the river in 2013 (2a) and 2014 (2b). Statistical analysis was conducted within each year**



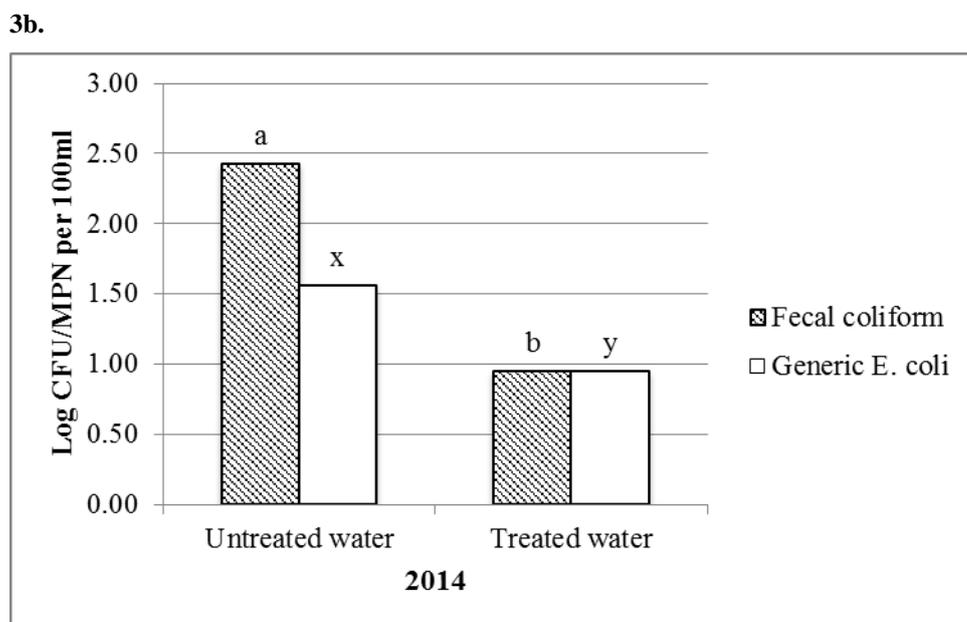
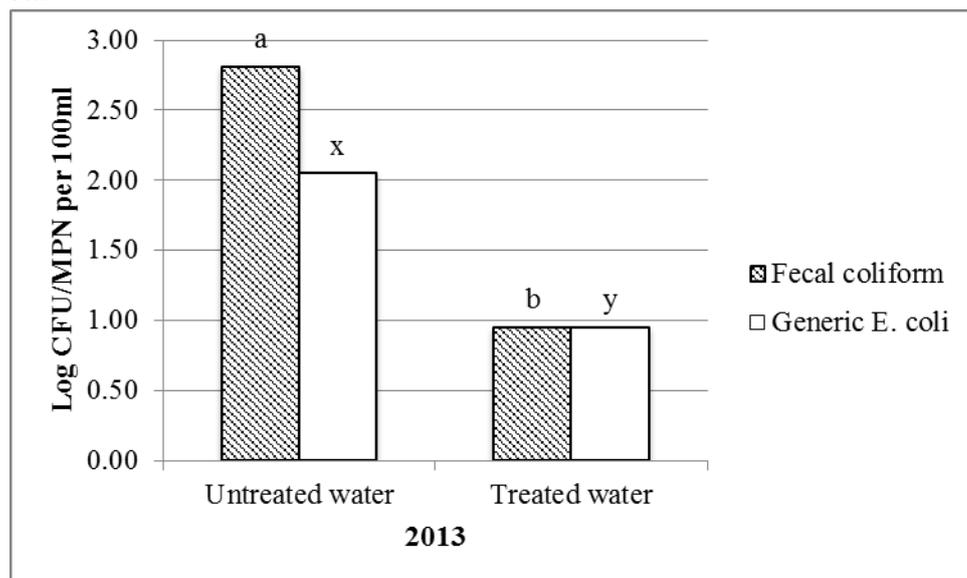
**2b.**



<sup>a</sup>Means sharing a superscript are similar ( $P > 0.05$ )

<sup>x,y</sup>Means without a common superscript differ ( $P < 0.05$ )

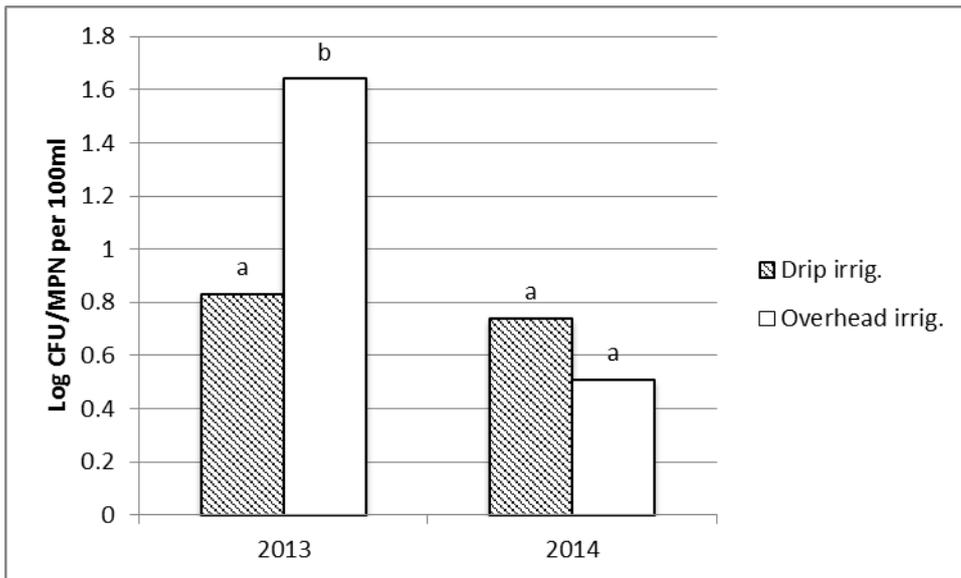
**Figure 3. Levels of fecal coliforms and generic *E. coli* in irrigation water prior to or after ClO<sub>2</sub> water treatment in 2013 (3a) and 2014 (3b). Statistical analysis was conducted within each year**



<sup>a,b</sup>Means without a common superscript differ (P<0.05)

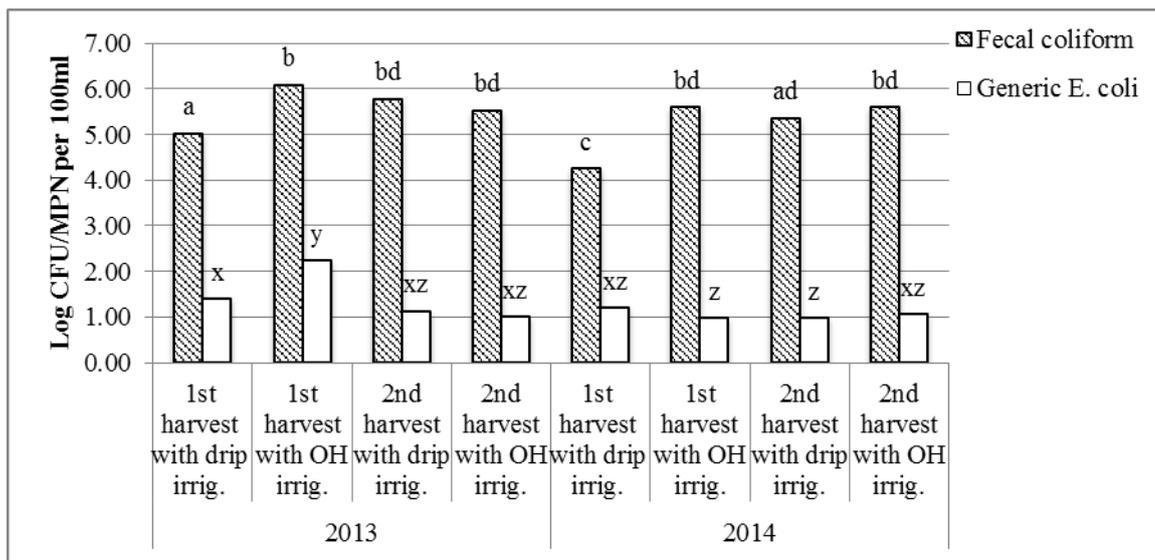
<sup>x,y</sup>Means without a common superscript differ (P<0.05)

**Figure 4. Levels of generic *E. coli* in soil samples irrigated with drip and overhead irrigation in 2013 and 2014. Statistical analysis was conducted over two years.**



<sup>a, b</sup>Means without a common superscript differ ( $P < 0.05$ )

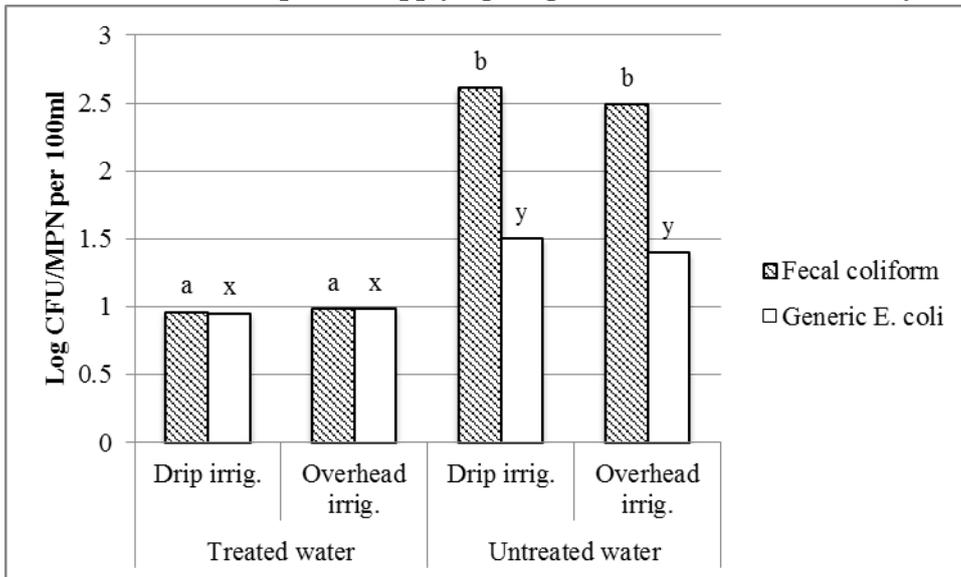
**Figure 5. Effects of irrigation practices on the recovery of fecal coliforms and generic *E. coli* on lettuce of each harvest over years.**



<sup>a-d</sup>Means without a common superscript differ ( $P < 0.05$ )

<sup>x-z</sup>Means without a common superscript differ ( $P < 0.05$ )

**Figure 6. Effects of irrigation methods on the recovery of fecal coliforms and generic *E. coli* in the irrigation water collected at the point of applying irrigation water. Statistical analysis was conducted over two years.**



<sup>a,b</sup>Means without a common superscript differ (P<0.05)

<sup>x,y</sup>Means without a common superscript differ (P<0.05)

**Table 1. Lettuce samples associated with detection of *E. coli* O157:H7\*.**

\*All *E. coli* O157:H7 isolates were positive for at least one *stx* gene as well as *hlyA* and *eaeA* and were serotyped as *E. coli* O157:H7.

<sup>a</sup>Outer leaves (OL) were contaminated with goose feces.

Date	Harvest	IRR System	Treatment (ClO2)
7/30/13	1 (OL)	Drip	Treated
7/30/13	1 (OL)	Drip	Treated
7/30/13	1 (OL)	Drip	Untreated
7/30/13	1 (OL)	Overhead	Untreated
7/30/13	1 (OL) <sup>a</sup>	Overhead	Untreated
7/30/13	1 (OL) <sup>a</sup>	Drip	Treated
7/30/13	1 (OL) <sup>a</sup>	Overhead	Untreated
9/12/13	2	Overhead	Untreated
9/12/13	2	Drip	Untreated
6/19/14	1	Drip	Treated
6/19/14	1	Drip	Untreated
6/19/14	1 (OL)	Drip	Treated

**Table 2. Transplant plug, potting mix and soil samples associated with detection of *E. coli* O157:H7\* and *Salmonella*<sup>a</sup>.**

Date	Matrix	Serovar
<b><i>E. coli</i> O157:H7</b>		
6/24/13	Transplant lettuce top	
6/24/13	Transplant lettuce top	
6/24/13	Transplant plug	
6/24/13	Transplant plug	
7/8/13	Potting mix	
7/8/13	Potting mix	
7/8/13	Potting mix	
6/12/14	Soil untreated overhead plot	
<b><i>Salmonella</i></b>		
3/31/14	Potting mix	Oranienburg
3/31/14	Potting mix	Oranienburg, 6,7:non-motile
5/27/14	Potting mix	Oranienburg
5/27/14	Potting mix	Livingstone
5/27/14	Potting mix	Tennessee
5/27/14	Potting mix	Infantis
6/23/14	Transplant plug	Mbandaka
6/23/14	Transplant plug	Minnesota, Ealing
6/23/14	Transplant plug	Minnesota

\*All *E. coli* O157:H7 isolates were positive for at least one *stx* gene as well as *hlyA* and *eaeA* and were serotyped as *E. coli* O157:H7.

<sup>a</sup>All *Salmonella* isolates were positive *invA* and *iroB* but negative for *rfbJ*

**Table 3. Source and irrigation water samples with detection of *E. coli* O157:H7\*.**

Date	Type of Water	Irrigation Systems	Treatment (ClO <sub>2</sub> )	GE level (Log cfu/MPN per 100ml)
6/24/13	Water from transplant tank	NA	NA	0.95
7/9/13	Water after filter	NA	NA	2.11
7/9/13	Irrigation water	Overhead	Untreated	0.97
5/12/14	Creek water with sediment (above intake)	NA	NA	0.95
7/7/14	Irrigation water	Drip	Untreated	2.34
7/7/14	Irrigation water	Overhead	Untreated	1.26

\*All *E. coli* O157:H7 isolates were positive for at least one *stx* gene as well as *hlyA* and *eaeA* and were serotyped as *E. coli* O157:H7.

**Project Title:** Washington Apple App

**Partner Organization:** Washington Apple Commission (WAC)

### **PROJECT SUMMARY**

With the growing number of varieties of Washington Apples available in export and domestic markets, consumers can be confused and/or overwhelmed by displays at the retail level. Since most of these new varieties are “bi-color”, it can be challenging for a consumer to decipher which Washington apple they are purchasing based on looks alone. While signage does assist consumers in these incidences, it is common for the retailer themselves to misplace varietal signage and point of sale material above the correct variety of apple. Retailers and importers are often reluctant to carry newer varieties or to expand the variety offering because of consumer unfamiliarity with non-mainline varieties. The fear is that these varieties will sit on the shelf, increasing shrink and lowering profits. In order to encourage retailers to stock new varieties and drive consumer demand through increased information, WAC requested funding to develop a mobile phone application that provides in-depth information on Washington apple varieties. Although this mobile phone “app” is targeted at increasing consumer awareness and knowledge of the many different Washington apple varieties, and encouraging purchase of non-mainline varieties, it will also be promoted as an additional demand driver for retailers and support to encourage them to handle other varieties.

The Washington Apple Commission celebrated its 75<sup>th</sup> anniversary during the 2012-13 season, and this mobile phone “app” benefited from the additional exposure this major event generated. It was the perfect opportunity to highlight how Washington apples have been a leader in the fresh produce industry, in the introduction of new and attractive varieties, quality improvements in storage, and creative promotions.

### **PROJECT APPROACH**

After receiving the grant award in October 2012, a Request for Proposal for the web app was issued on November 1, 2012. Proposals were reviewed, analyzed and scored, with North by Northwest awarded the contract. The project start date was January 1, 2013.

The contractor worked with WAC export staff to determine which content from the bestapples.com website to incorporate into the app. Additional content that included new apple varieties was developed in partnership with industry. The contractor also worked to design an attractive, easy to use interface for the app, which won an “Addy” award.

The bestappl.es app was originally planned to be a downloadable app available on different operating systems. However, once the project began, this approach changed. After the initial developing stages, the contractor decided the app would function better as a ‘web-based’ app. Once the framework for this was completed, the translation process began.

With the help of the development company, the opportunity for consumers to “tag” their artistic apple photos on Instagram was made available (<http://bestappl.es/#/en/instagram>). This has resonated well with consumers and to date, there are a total of 112 photos on the page tagged with #BestApples.

Finally, WAC produced promotional materials to support the web app introduction. WAC created a sticker that says, “Go Mobile” which ties into the “Go Healthy” Point of Sale materials. The stickers are being used in conjunction with existing promotional materials at the retail level.

A reusable screen cleaner with the “Go Mobile” message has been distributed as a consumer giveaway at retail stores in Russia, Southeast Asia and Mexico. The stickers and screen cleaners were paid for with WAC contribution dollars.

With the delay in the grant award, and the timing of the Washington apples season, the launch time frame was pushed later as per the revised work plan submitted February 26, 2014. The soft launch for the app occurred in winter of 2014, supported by the materials mentioned above. The formal launch occurred in March of 2014, and press releases were sent to relevant industry publications and industry members. Click through ads on websites were also used to increase trade and consumer awareness of the new site.

The first measurements for benchmarks occurred for the quarter ending June 30, 2014 and were reported in the quarterly report dated July 29, 2014. The second measurement occurred for this final report in October 2014.

### **GOALS AND OUTCOMES ACHIEVED**

As noted above in the project approach, and in the annual report for 2013, the app was changed from a downloadable app to a web-based app to allow better functionality across multiple platforms. Therefore the initial performance

measure for downloads is not applicable and changed to webpage “hits”. At the time of writing this Final Performance Report (Oct. 31, 2014) and since the launch of the site, bestappl.es has been visited overall 2,935 times by 1,881 unique users. There were 9,092 page views and an average of 3 pages viewed per session. 64% of the visits were new users and 36% were returning visitors.

The majority of the visits (49%) were from the target age group of 25-44. They were 54.1% male and 45.9 female.

The Washington Apple Commission’s top 5 markets’ statistics were:

<b>Country</b>	<b># visits</b>	<b>% new sessions</b>	<b>New Users</b>	<b>Pages/ session</b>
India	121	74.38%	90	3.24
Mexico	102	47.06%	48	5.55
China	80	70.00%	56	3.11
Canada	60	85.00%	51	1.83
Indonesia	8	100.00%	8	1.12

Overall, 2,126 visits (72% of the traffic) were via direct referrals, meaning people navigated directly there. The remaining 809 visits (27.6%) were via referrals, meaning they navigated there via another source. The [www.bestapples.com](http://www.bestapples.com) site was the number 1 referral site, Facebook was number 2 and FreshPlaza.com was #3. This provides a good indication of the success in communicating the app existence through promotional materials and activities.

As part of the Bestappl.es launch, FreshPlaza.com published the Bestappl.es press release on their web-based newsletter which was opened 989 times during the reporting period.

We had originally planned on a survey in order to poll the consumers, or app users. We felt this measurable became obsolete once we incorporated the use of the Instagram tagging #BestApples which truly shows the interaction of Washington Apples via bestappl.es and our consumers and mobile app users. To date, there are a total of 112 photos on the page tagged with #BestApples. The Washington Apple Commission approves the tags on a weekly basis to ensure no “inappropriate” pictures are shared on bestapples.

In hindsight, our goals were ambitious given the variability of internet/web access in several of the targeted markets, Mexico, China and Indonesia in particular. In several countries, there is no “unlimited” mobile web access, so the consumer would be charged for accessing the WAC app through their mobile device. As the Washington Apple Commission has all but stopped promotions in Canada, the lower number of visits is probably due to the lack of point of sale materials promoting the app resulting in a lack of consumer awareness. And in China, the direct export of Washington apple discontinued in August 2012 when the Chinese government stopped issuing import licenses due to phytosanitary concerns. With no apples being exported to that market, WAC stopped consumer promotions, so at the time of the app launch, we did not have a good method for getting the word out to consumers as our normal consumer promotional activities were not occurring.

Sales of non-Red Delicious apples increased to Mexico, Indonesia and India overall by an average of 14% during the 3 months following the release of the app. We were not able to obtain individual retailer sales figures (usually these are closely held) and have used industry export numbers from the Wenatchee Valley Traffic Association Report by Variety/Destination. As noted above we could not ship to China so these numbers are not available. Canada is already a predominately non-Red Delicious market (Red Delicious is only 15% of the overall shipments) and the percentage stayed the same after the app as before.

**BENEFICIARIES**

Although the targeted beneficiaries of this project are international consumers of Washington apples, the true beneficiaries are the 1,500 Washington apple growers. The need to develop export markets through education of international consumers regarding the varieties, uses and best handling practices is growing every year. With increased production and a flat US market, these international consumers are critical to the future health and viability of the industry. It is imperative for the Washington Apple Commission to communicate to the “new” Washington apple consumer through media that they use and understand, which means mobile. Entertainment such as Instagram photos and recipe ideas keep

the consumer “engaged” with the Washington apple brand, and help to create “top of mind” recognition in the produce department.

**LESSONS LEARNED**

Never having created an app before, there was plenty to learn. There were many holdups with the translation process (particularly with languages that do not use a roman alphabet) which ended up not only causing delays, but also impacted the budget. Future projects involving multiple languages need to be allocated additional financial resources as well as realistically proposed timelines and completion dates.

However, a perk to being patient is the fact that the contractor, North by Northwest, submitted several recent projects for consideration in the 2014 ADDYs. The ADDY Awards are an annual and nationally judged competition where ad pros from outside the direct market are tasked with judging submissions. The bestappl.es app was awarded Gold ADDY, meaning that it represented the highest mark within its category.

**ADDITIONAL INFORMATION**

<b>WAC Match</b>	Carryover from 12-13 Year 1	3,500.00		
	Year 2 Funding	500.00		
	Designosaur Graphics - Go Mobile Stickers/Web Banner		(800.00)	
	NxNW - Translation Services		(1,800.00)	
	Year 3 Funding	500.00		
	Year 1, 2 & 3 In-Kind Match Funding	3,500.00		Match Completed in FY13-14
	DigiClean Screen Cleaner		(5,400.00)	WSDA confirmed that can use cash match for in-kind budget

**CONTACT PERSON**

Rebecca Lyons  
 509-663-9600  
[rebecca@waapple.org](mailto:rebecca@waapple.org)

**Project Title:** Enhancing International and Domestic Trade of Dry Peas, Lentils, and Chickpeas

**Partner Organization:** Washington Dry Pea & Lentil Commission (WDPLC)

### **PROJECT SUMMARY**

WDPLC, established in 1965, is a group of growers, processors, and traders of Washington grown dry peas, lentils, and chickpeas. WDPLC strives for the advancement, protection, and development of Washingtonians engaged in growing, warehousing, processing, merchandising, peas and lentils, and related activities.

The objective of this project is to further improve market access and development programs for pulses as mainstream ingredients through the training and education of food industry professionals. The WDPLC seeks funds from the WSDA to support an outreach initiative to host an educational, informative and hands-on product/menu development course with the goal of targeting and educating a specific audience in the food industry including product development specialists, nutritionists, and food marketing professionals.

The WDPLC will design a two and a half day course introducing new applications for pulses along with technical demonstrations. In addition, the course will provide information on utilizing dry peas, lentils, and chickpeas and the pulses respective flours and isolates as ingredients to enhance the nutritional value of foods. Key technical information such as product formulations, process flows, the latest nutrition research findings, and marketing considerations for new and traditional high value foods that utilize pulses as raw materials will be presented.

Pulses (dry, edible peas, lentils, chickpeas, beans) are beneficial crops for the Pacific Northwest region's agriculture and are primarily grown in rotation with wheat and cereal crops. Pulses have an excellent nutritional profile; hence the decision by the USDA to list pulses/beans as both a vegetable and a meat in MyPlate. For the last few years, the WDPLC has partnered with various universities and technical food research firms to explore the functionality of pulses in the whole, dry form as well as in the form of processed flours, protein isolates, starch isolates and fiber isolates. The WDPLC believes that domestic trade will increase with continued promotion of pulses as ingredients in value-added foods. Having supported the technical research and product development efforts along with established technical pulse processing methods ideal for commercial food use, the WDPLC now seeks to further educate professionals in the food/foods services industry.

National players in the food manufacturing/food servicing industries are ready and willing to embrace dry, edible beans/pulses as new functional ingredients, yet they need more training in order to fully embrace this new set of ingredients. Novel use applications of pulse ingredients have been featured by the WDPLC at trade shows across the country that have created a stir of interest among value-added producers in the marketplace. Feedback regarding taste and texture of these products has been extremely positive. However, trade shows are not always an appropriate setting for in depth conversations in which to fully educate food industry members on the value of using pulses as ingredients.

Distributing the technical information in its current form as reference material would prove ineffective at prompting the immediate adoption of pulses as ingredients. Utilization of pulses in many of these value-added applications is still a novel concept, so professionals need to be technically educated on how to incorporate them into their processes as ingredients.

The WDPLC is seeking funding support to host a two and a half day training course to help educate food industry members. This course would be hosted at an offsite location equipped with both classroom and kitchen teaching facilities. Participants would be selected from a targeted focus group to include product developers, research chefs, manufacturers and key decision makers from food companies such as Frito Lays, ADM, and JR Simplot (see for work plan for more details on how the participant list will be created). This two and a half day training course will provide the tools they need to move forward with the development of more pulse-based products.

The course would host 30-40 participants. Curriculum developed through the course such as videos, recipe formulations, and technical guidelines will be made available through the WDPLC website and distributed to additional companies unable to attend the course. This will allow the information developed to have a wider reach. Ongoing correspondence with participants and follow-up after the course would also be performed.

The Montana State Department of Agriculture funded a similar course through the FY 2012 Specialty Crop Block Grant. Funding an additional course will not be duplicating funding efforts, it would be complementary, as it aims to educate an additional full class of participants from the food industry who are keenly interested in learning more about the versatility and functionality of pulses as ingredients. Research and development of food products can take several years to come to completion, so continued efforts of education on pulse crops are critical for success of new value-added food products. This course would also address applications of pulse ingredients not previously focused on, such as fiber and starch extracts. WDPLC has had previous participants ask about possibilities to come back again to this course to learn more about pulse versatility and new research and trends with pulse crops.

## **PROJECT APPROACH**

### **Planning**

#### ❖ Venue and Date

The first step was to secure a location for the culinary course. The Culinary Institute of America's (CIA) Greystone Campus in Napa Valley was secured for September 17-19 2013. 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 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.

#### ❖ Program

The final schedule for the course can be found in Appendix 1. The focus of the course was to provide targeted members of the food industry education on how to incorporate pulses into value-added product lines. Therefore, the schedule included experts on:

- Pulse fractions and functionalities
- Applications in baked goods, beverages, extruded snacks, and pastas
- Sensory properties of pulse fractions
- Nutritional properties of pulses and pulse fractions
- Marketing trends for pulse ingredients in value-added food applications.

The course was split into three segments; Day one included a welcome, session overview, basic pulse nutrition and trends in foodservice. Day two focused on technical applications and hands on kitchen sessions. Day three focused on research in pulse retail products, gluten-free labeling rule and panel discussions. Throughout the three day course there were chef demo's strategically placed each day to help break up the day and to show more versatility on pulses.

#### ❖ 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 WDPLC. The course curriculum was also structured to incorporate feedback from a previous course in 2012. 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 beverages, 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 staff at the CIA a 112-page manual was developed containing background information on pulses, technical resources on pulse ingredients and recipes. These manuals were printed for each participant to take home with them as a resource after the course. A copy of the curriculum can be found in Appendix 2.

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 panel discussion. The focus was to have a discussion around formulating with pulses. Participants were able to submit questions prior to the course and during the course to be answered during this portion. The panelists included:

- Robin Leventhal, Crave
- Richard Coppedge, CIA Chef Instructor
- Naggie Jeradechachai, Northern Crops Institute

#### ❖ Speakers

Speakers for the event ranged from technical experts on pulse fractionations to culinary chefs to trends and marketing demand professionals. A list of topics and final speakers is shown below. Each speaker's biography can be found in the Appendix 3 and copy of his or her presentations can be found in Appendix

- **Session Overview and Group Introduction** *Ali McDaniel, MS*  
*USADPLC Food Marketing Manager*
- **Nutritional Value of Peas, Lentils, and Chickpeas** *Amy Myrdal Miller, MS, RDN*  
*CIA Senior Director of Programs and Culinary Nutrition, Strategic Initiatives*
- **Trends in Food Service** *Laura MacPhail, Principal*  
*The Hale Group*
- **Culinary Demonstrations** *Robin Leventhal, Chef*  
*Owner and Operator of Crave*
- **Pulse Flour and Their Uses** *Naggie Jeradechachai, MS*  
*Northern Crops Institute Specialist*
- **Chef Demo- Gluten-Free Baking** *Chef Richard Coppedge CMB*  
*CIA Baking and Pastry Chef*
- **Pulse Starch, Fiber, Protein Uses** *Mehmet Tulbek, Ph.D*  
*AGT's Director of Research, Development, and Innovation*
- **Sensory Dem/Discussion** *Ted Russin and Chef Lars Kronmark*  
*CIA Director of consulting/Chef Instructor*
- **Pulses into Practice: Retail Products** *Steve Berman*  
*Retail Food Industry Consultant*
- **FDA Gluten-Free Labeling Rule** *Marilyn Gellar CEO*  
*Celiac Disease Foundation*

#### Promotion

❖ Website – Prise Design Group designed and managed the URL below.

- The URL [www.pealenticulinarycourse.com](http://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, 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 the WDPLC staff reviewed it for acceptance. All applicants were notified within 5 business days on the status of their application (accept or deny). This allowed the WDPLC time to assess the quality of the applicant. Please see Appendix 5 for the application form.
- The course was also promoted at [www.pea-lentil.com](http://www.pea-lentil.com), where participants were directly linked to the course website, [www.pealenticulinarycourse.com](http://www.pealenticulinarycourse.com).

❖ Save-the-Date Cards and Invitations – Sam Jordan Design designed the save-the-date cards and invitations. The WDPLC staff dispersed these to targeted groups of the food industry such as: product developers, research chefs, manufactures and key decision makers from food companies such as Frito Lays, Con Agra, and General Mills, etc. Dan Best from Best Vantage did an E-Blast for the WDPLC to their private industry contact list. For a copy of the save-the-date please see Appendix 6.

- ❖ Trade Shows – In order to help promote the course, WDPLC attended key industry trade shows throughout the year. Each trade show event had pulse product samples, educational resources, and the culinary course was promoted. The course was promoted at the following shows.

Research Chefs Association	March 6-8, 2013
Natural Products Expo West	March 9-11, 2013
International Association of Culinary Professional	April 5-9, 2013
Protein Trends & Technologies Seminar	April 9-11, 2013
Natural Restaurant Association Show	May 17-21, 2013
Institute of Food Technologist	July 12-16, 2013

- ❖ **Invitations** - Having collected contact list from several trade shows as well previous contacts made by the USADPLC, official invitations to the course were sent out.
  - In order to save on postage, the USADPLC commissioned an electronic invitation be created to send out to industry contacts. This invitation was sent out to the WDPLC's internal database of over 1,000 contacts as well as to contacts collected over the past year.
  - Invitees were directed to the course website for more details as well a registration page. (Registration process is explained above). Applicants filled out a form; a total of 40 applicants were received and 37 were accepted. Of these applicants 3 were unable to attend due to last minute circumstances; these are marked with an asterisks on Table 1. For all subsequent courses the WDPLC plans to implement a policy where participants leaving early or cancelling last minutes will have to pay for their spot in the course (which is currently free), 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 participants. \*Denotes that the person did not attend.

First Name	Last Name	Company	Title
Margaret	Hughes	Best Cooking Pulses, Inc.	Other R&D/Scientific/Technical
Alex	Waite	Mary's Gone Crackers	Director of Research/Tech. Director
Barb	Birr	Truhealth	Other
Kelley	Fitzpatrick	NutriTech Consulting	Nutrition Specialist
Shawn	Pinsky	MXO Gobal Inc.	Corporate Executive Chef
Lidia	Olenczuk	Pacific Atlantic	Nutrition Specialist
Deepa	Deshmukh	Cuminandclove	Nutrition Specialist
Steve	Olenczuk	Pacific Atlantic	Research Chef
NingHong	Li	ConAgra Foods	Food Engineer
Kayla	Holt	Mary's Gone Crackers	R&D, Test Kitchen Chef
Jimbin	Mai	FIT, Inc.	Innovation Director
Jamie	Thomas	Basic American Foods	Other R&D/Scientific/Technical
Carol	Nietz	General Mills	Food Engineer
*Dean	Veurink	Basic American Foods	Innovation Director
Katherine	Nelsen	Basic American Foods	Other
Julie	Ip	Griffith Laboratories	Other
Linda	Malcolmson	Best Cooking Pulses	Other R&D/Scientific/Technical
Jack	Patrick	Basic American Foods	Food Engineer

Grazia	Perrella	N/A	Other
Nancy	Ragozzino	Ragozzino Foods Inc	Innovation Director
Lindsay	Bourre	Cigi	Food Engineer
Erin	Briot	General Mills, Inc.	Other R&D/Scientific/Technical
Bonnie	Chau	The National Food Lab	Food Engineer
Sarah	Wallace	The Good Bean, Inc	Innovation Director
Max	Maxwell	Glanbia Nutritionals	Other
Lisa	Alumkal	Metabar	Other
Christine	Farkas	Pulse Canada	Product Development Chef
Scott	McCarthy	Sodexo	Corporate Executive Chef
Hanns	Heick	Apollo D'Oro Restaurant	Corporate Executive Chef
Gregg	Nevens	Allied Sales & Distribution, Inc.	Corporate Executive Chef
Mark	Sterner	Inland Empire Foods, Inc	Other R&D/Scientific/Technical
Jose	Berrios	USDA	Food Engineer
Kathleen	Dal Porto	Advanced Process Systems	Food Engineer
Jan	Matsuno	Mindful Food Consulting	Food Engineer
Raymond	Valeske	Sodexo	
*Jana	Watts	Decadent Vegan	
*Douglas	Beitler	Decadent Vegan	

### ❖ Significant Contributions

The WDPLC's mission is to promote dry peas, lentils and chickpeas through industry education, market development, research coordination and government affairs. The WDPLC is committed to the development of the pulse industry in the Pacific Northwest region and will show its commitment to this project by providing matching and in-kind contributions totaling \$30,000. (Personnel \$15,000 in-kind, Benefits \$5,000 in-kind, Travel \$3,000 cash match, other \$7,000 cash match) The execution of this proposed project would create economic opportunities for the pulse industry.

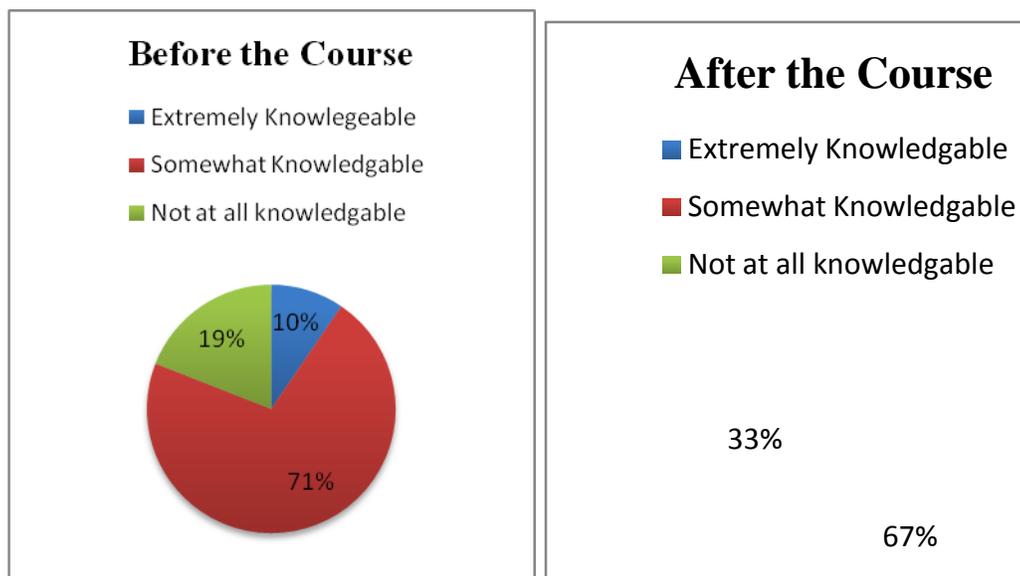
Specialty crops- dry peas, chickpeas and lentils were the only crops highlighted and promoted at the course.

### GOALS AND OUTCOMES ACHIEVED

Overall, the course was very successful at obtaining certain goals and objectives that were set forth by the WDPLC and the project is well on its way to achieving the long-term goals. 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 agreed that they had an increased knowledge of pulse ingredients after the course. This finding is very encouraging and helps the WDPLC to know that the course was indeed successful at achieving its goals. This also shows this type of hands-on course is very effective as being a catalyst for the industry to start incorporating more pulses into their product lines. Several other benchmarks were included to help determine the success of the course and these are outlined below.

### ❖ Goals

- **Goal one- Increased Awareness:** A 50% awareness among participants of how to use dry peas, lentils and chickpeas in value-added products
- **Outcome:** After the course 100% of the participants stated they had an increased awareness on how to use dry peas, lentils and chickpeas in value-added products.



- **Goal two- Industry Promotion:** Increase the number of new domestic and international value-added processor members to the commission.
- **Outcome:** After the course two new value-added memberships have been signed Tolerant Foods and Best Cooking Pulses. One is a success; two is considered a great success! New members joining the WDPLC help expand the reach and knowledge of the industry. When requests are made, the WDPLC looks to its membership for products, samples and knowledge. In the coming months, the WDPLC hopes that more companies from the course will continue to sign up.
- **Goal three- Increased value-added products using dry peas, lentils and chickpeas as ingredients:** At least 50% of participants working on a pulse ingredient project post course.
- **Outcome:** 85.7% of participants said they are working on pulse ingredient projects post course. The other 14.3% said they were still 100% still interested in working with dry peas, lentils and chickpeas.
- **Goal four- Increased request for the dry peas, lentils and chickpeas ingredient supplier list:** A 50% increase in requests for DPLC flour, flakes, starches, fibers, etc.
- **Outcome:** Currently 15 companies have reached out to the WDPLC for dry pea, lentil and chickpea ingredients. Their requests vary from individually quick frozen lentils, chickpeas, precooked yellow pea, lentil and chickpea flour, precooked/dehydrated pulses, pea protein, pea isolates. An interesting finding in the follow up survey, four companies that said they are now using dry peas, lentils and chickpeas in recipe development were not on the list of companies that asked for the WDPLC supplier list. The list of companies can be found in Appendix 8.
- **Goal Five- Increased interaction between industry members and pulse ingredient experts:** Open dialogue between food industry members and pulse experts.
- **Outcome:** Several participants mentioned the interaction as one of the best parts of the course. Participants felt comfortable asking the experts both in the classroom and kitchen settings questions to get direction with recipes or functionalities. To help document this interaction the course was filmed to document the interactions. To see the finalized course video please visit <https://rcpt.hightail.com/2395163331/14d384da053f0cad9dd711adb1c4eb31>

#### ❖ Evaluations Forms, Course Effectiveness, and Post-Course Follow-up

Participants of the course were from some of the top food companies in the United States including companies such as General Mills, Sodexo, The Good Bean, and Basic American Foods (See Table 1 for complete listing).

In order to determine the success of the course and the format, surveys were administered to participants after each day and 2 months after the course. Examples of these surveys can be found in Appendix 9-12.

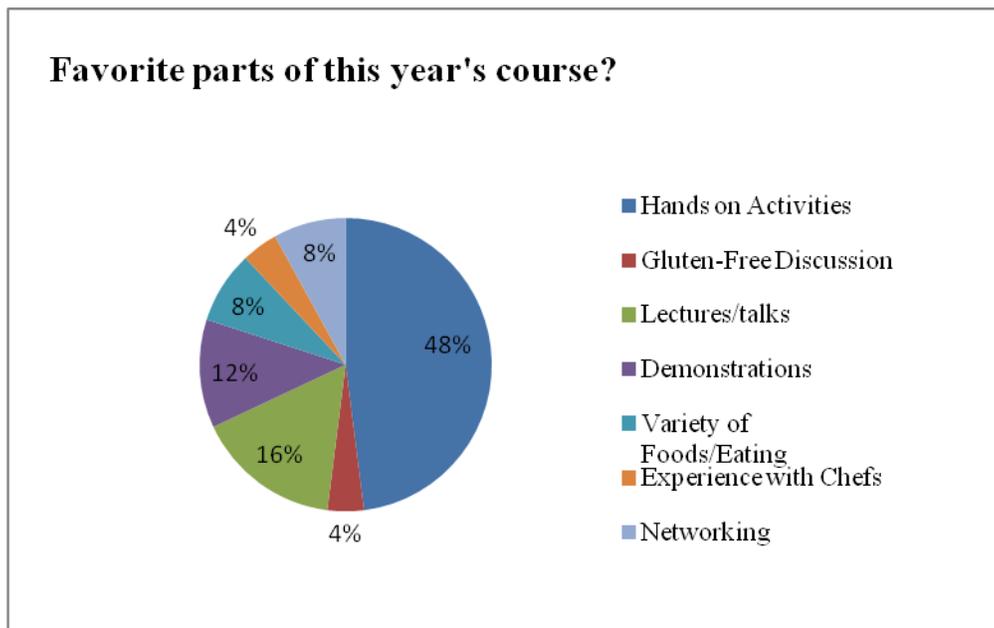
Below are some of the survey findings and participant's comments about the course:

Sample comments on missed topics:

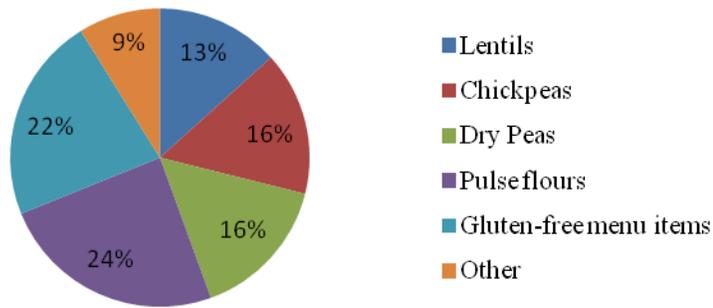
- Growing trends
- Protein combining
- More technical applications
- Create a list of cookbooks and recipes for pulses
- More on nutritional detail
- Commercial food processing
- How pulses work in the diet
- Cost of pulse flours vs. wheat flours
- Availability of the fractionates

Sample comments on how to improve future course:

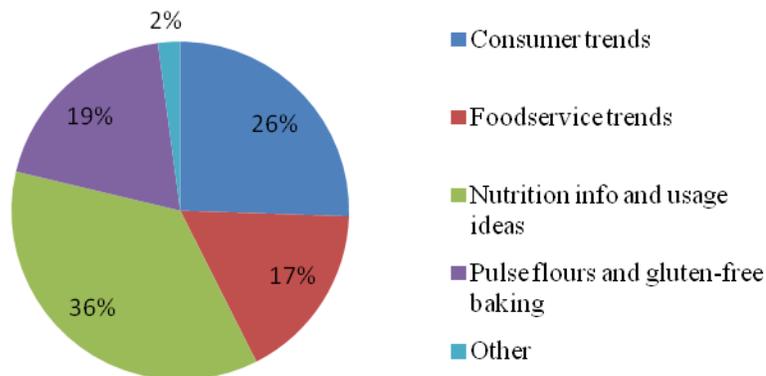
- Increase specific types of lentils and chickpea varieties on display
- More Q&A at the end
- More primary research on consumer A&U or pulses
- More open forums, see and feel the products
- More interaction between participants. I wanted to know about more people interaction with pulses.



**Are there specific Pulse Related Topics you would like to learn more about?**



**Which session topics were found most helpful?**



Based off the collective feedback the courses hands-on portion was by far the most popular of the course. Overall, the results from the surveys and comments expressed to the Culinary Institute of America and WDPLC staff clearly show how effective this course was. The participants did feel that they got the knowledge and resources needed to start utilizing pulse crops as ingredients in the participant’s personal environments.

**BENEFICIARIES**

Pacific Northwest (WA/ID) growers harvested 283,400 acres of dry peas, lentils, and chickpeas in 2011 according to USDA-NASS. The Pacific Northwest region is the second largest pulse producing area in the nation producing 214,323 metric tons of dry peas, lentils and chickpeas in 2011. Production of dry peas, lentils, and chickpeas has doubled in the past 5 years and there is tremendous opportunity for international and domestic market growth. USDA-NASS predicts that total pulse acreage will increase by 28% in 2012. Small chickpeas, which are grown primary in Washington and Idaho, are expected to increase in these states by 125% and 71% respectively. Therefore, moving more pulses into the domestic market would decrease grower and processor transportation costs significantly while increasing profitability to the growers and processors of Washington State.

The continuous expansion of pulse acres has helped the region’s agriculture excel. Pulses serve as excellent rotational crops due to their ability to fix nitrogen in the soil. In addition, pulses break grain disease cycles by increasing the yield of wheat and other major cereals. The primary beneficiaries of this project will be the PNW region’s 1100 pulse farmers involved in growing dry pea, lentil and chickpea crops. These crops represent \$100 million in direct & indirect farm income with the additional benefits of increased yield and the limited use of fertilizer in the rotations.

To date, the pulse crop industry has been successful in marketing the annual production through international food aid and international commercial markets. There is now an added need to improve value-added food/food service markets.

Expansion of these markets would create new opportunities for the pulse crop industry and producers to diversify the marketing of pulse crops with a significantly higher value back to the producer. Moreover, the development of the food service market will create new opportunities for the expansion of value added companies in this region. New value-added companies will create jobs for the producers in the area that will enhance the value of their pulse crops.

The fact that these companies decided to spend money and time to send their employees to this event, tells the WDPLC that they too see 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 that there will be more products than that.

**LESSONS LEARNED**

WDPLC had really positive feedback from the overall course. However, to improve the course in the future, sections on pricing, availability and market analysis will be taken into consideration. By educating in these new areas the WDPLC hope it will help product developers build their case for pulse ingredients within their companies.

One exciting outcome from the course is that the beverage applications were very well accepted. The word has spread about the applications from the course and the WDPLC has had many calls from some big companies asking for the supply and market trends of pea protein isolates and concentrates. This is very exciting for the industry, consumers and all!

**ADDITIONAL INFORMATION – See Attachment F 12-25-B-1495 DryPea**

**Matching**

❖ **Cash**

• **Salaries/Wages**

Ali McDaniel, former Food Marketing Manager, WDPLC dedicated 30% of her time to this project. The budgeted salary cost was \$15,000 (In-Kind).

• **Benefits**

Fringe benefits in the amount of \$5,000 (In-Kind) was dedicated to Ali McDaniel, former Food Marketing Manager, for the WDPLC.

❖ **In-Kind**

• **Other**

The full \$7,000 (cash match) was used by the WDPLC for trade shows listed in the work plan to help promote the usage of dry peas, lentil and chickpeas and to advertise for the two-day course. The funds would be used to cover booth expenses, product sampling and travel for the WDPLC staff to the events.

• **Travel**

Travel for WDPLC Staff \$3,000 (cash match) to coordinate and execute the culinary course at the Culinary Institute of America at the Greystone Campus in Napa Valley, CA.

**Recipes**

**Horchata Protein Drink, Dry Mix**

**Yield: 1 portion**

<b>Ingredients</b>	<b>Amount</b>	<b>%</b>
Vanilla Powder	10 g	41.4
Nonfat dry milk	6.5 g	27
Pea protein	4.4 g	18
Sucralose (Splendid)	2.2 g	9
<u>Cinnamon</u>	<u>1.1 g</u>	<u>4.5</u>
<b>Total Amount</b>	<b>24.9 g</b>	<b>100</b>

**Method**

1. Add all dry ingredients to 8 ounces of milk.
2. Stir/shake vigorously

**Source: Northern Pulse Growers Association and USA Dry Pea & Lentil Council**

## **Yellow Pea Flour Pizza Dough**

**Yield 2 pizza crusts (22 ounces/623.7 grams each); 16 slices**

<b>Ingredients</b>	<b>Amounts</b>
White-wheat flour, high gluten	490 g
Harvest Innovations Yellow Pea Flour	210 g
Instant dry yeast	7 g
Sea Salt	14 g
Granulated white sugar	10.5 g
Olive oil	35 g
Malt syrup	4 g
Water	504 g

### **Method**

1. Blend all of the dry ingredients.
2. Add the olive oil, malt syrup, and water.
3. Mix using the dough hook for 2 minutes on low speed. Increase speed to medium and mix for 7 minutes.
4. Lightly coat the surface of the dough with vegetable oil. Cover with plastic and let rise for 15 minutes.
5. Divide dough into 2 balls, 22 ounces each. Pre-shape into rounds and put into plastic bags. Refrigerate overnight.
6. To prepare pizzas, stretch and toss the dough into 14-inch rounds. Top with sauce, cheese, and toppings as desired.
7. Bake in 450 F oven for 8 minutes.

**Note: Prepare ahead of time.**

**Source: USA Dry Pea & Lentil Council**

### **CONTACT PERSON**

Mackenzie Femreite

208-882-3023

[mfemreite@pea-lentil.com](mailto:mfemreite@pea-lentil.com)

**Project Title:** Increasing Latino Farmer Specialty Crop Sales

**Partner Organization:** Washington State University (WSU) Small Farms Program

### **PROJECT SUMMARY**

The purpose of this project was to provide targeted marketing assistance to the growing number of Latino farmers who sell specialty crops through farmers markets and other direct market channels in Washington State.

Latino farmers have the potential to be increasingly important entrepreneurs and leaders in Washington agriculture. According to the USDA, Washington State ranks 24<sup>th</sup> in terms of overall number of farms. However, Washington ranks *sixth* in terms of the number of Latino farms (USDA Census of Agriculture, 2012). And while the number of all farms in Washington decreased over 5% between the 2007 and 2012 Census of Agriculture, the number of Latino farms grew 14% and the value of their sales grew 68% to over \$367 million (USDA Census of Agriculture, 2012, Table 58). Another sign of their increasing success is that the average net cash farm income of Latino farms is higher than that of any racial category, including white farmers (USDA Race, Ethnicity and Gender Profiles, 2012).

Motivated by the potential higher returns, flexibility, and independence, a considerable number of Latino farms sell directly to consumers. In 2012, Latino farms represent 5% of all farms; however, they represented nearly 8% of all direct sales reported. A 2010 WSU farmers market survey found that 52% of farmers markets had an average of three Latino farm vendors. The research team estimates that there are between 50 to 100 Latino farms that sell through farmers markets in Washington, and that this number is growing. Farmers markets are also an important mechanism for peer-to-peer learning, product development, farm visibility and overall business incubation and development.

Field observations and surveys indicate that the Latino farmers at Washington farmers markets are selling a wide variety of specialty crops, including diversified vegetables, tomatoes, herbs, melons, berries, tree fruit, and even peanuts. This is consistent with national and statewide trends that suggest Latino farms sell a higher portion of specialty crops. In Washington, 45% of Latino farms report specialty crop sales compared to 27% of all farms (USDA Census of Agriculture-Specialty Crops, 2015, Table 13).

Despite the important progress Latino farmers have made, they face unique cultural barriers to successful direct marketing. Three critical problems are: 1) substandard marketing displays, signage, and customer service; 2) misunderstandings about information on vendor applications and market policies, leading to conflicts with market managers and mutual mistrust; and 3) low capacity among market managers and Spanish-speaking vendors to communicate in a cross cultural context, especially in peak season when time is short. Additional cultural differences arise when producers come to largely urban, Westside markets from rural agricultural regions such as Central Washington with different growing conditions, pricing systems, and culinary preferences. Moreover, selling at farmers markets or other direct market venues is highly dependent on direct communication between farmers and customers. “Relationship” marketing is key to sales and can be severely compromised by cultural and language barriers. The consequences can be significant in terms of lost sales, lost market access, and limited growth and profitability.

The motivation for this project came from a combination of observed needs among Latino farmers and requests for assistance from our farmers market stakeholders and community partners. In particular, this project arose from an incident in which a market manager removed a Latino farmer from her market during the peak season. The incident turned out to be less important in and of itself; but more crucially, it was “the straw that broke the camel’s back” after years of unresolved small, accumulated frustrations. The root cause of these frustrations, for both parties, was a classic case of cross cultural miscommunications playing out under the stress of the agricultural season.

The incident made the WSU project team realize the marketing risks Latino farmers faced by letting issues encountered in relationships with market organizers linger unresolved; and, likewise, the team realized just how vital the farmers markets were to Latino specialty crop farmers engaged in direct marketing. Concurrently, there was a clearly expressed interest and strong personal commitment among farmers market organizers to learn how to communicate better and work better with Latino farm vendors.

This project was only possible because the WSU Small Farms Team had preexisting programs, multilingual staff, and past experiences in place to build upon. The project team had been building its knowledge of farmers markets and direct marketing for over a decade, most recently through a three-year USDA NIFA grant to study farmers markets. The WSU Small Farms Program had also been building an immigrant farming program and relationships with Latino and Hmong farmers. This work had been done in partnership with the Viva Farm incubator project in Skagit County, extending the program’s reach.

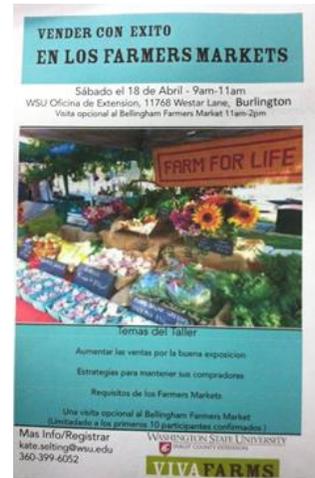
This project was not built on a previously funded SCBGP project.

## **PROJECT APPROACH**

To meet its primary goals, this project engaged in four core types of activities: 1) direct training to Latino farmers who sell specialty crops at Washington State farmers markets; 2) direct training to farmers market managers on how to work cross-culturally; 3) direct support to Latino farmers; and 4) the development of new publications and resources to be used in this project, by project partners, and into the future. Work with farmers and markets in Central Washington was led by Colleen Donovan and Malaquias Flores (WSU Small Farms Program) and work with farmers and markets in Western Washington was led by Sarita Schaffer and Kate Selting (WSU Small Farms Program) and Leigh Newman-Bell (WSU Small Farms Program and Pike Place Market).

### *a. Direct training to Latino farmers:*

- Held workshops on food safety, marketing, and financial management in Mabton, Granger, and Mount Vernon.
- Developed new training materials such as the “¡Venda más! Guía para mejorar su puesto en el Mercado Agrícola” / “Sell More! Farmers Market Vendor Booth Guide”; and “Consulta” or consultation sheet to evaluate farmers’ display and marketing at farmers markets, and set goals for the season. 200 hard copies of the Vendor Booth Guide were printed and distributed; the materials are also available on the WSU Small Farms Team website and have been shared electronically.
- Held workshop and offered consultation in Spanish at the 2013 Tilth Producers conference in Yakima on developing a simple farm website using free technology.
- Recruited farmers to attend the 2013 Yakima Tilth Conference and the WSFMA conferences in Vancouver (2014) and Olympia (2015).
- Offered one-on-one technical assistance on farm and at the farmers markets.



*Demonstrating importance of clean transportation.*



*Demonstrating easy-to-make hand washing station.*



*How to reduce field contamination when harvesting.*



*Keeping product clean during processing and packing.*

### *b. Direct training to market managers:*

- Held workshops on cross cultural communications and working that included 29 vendors in North Bend (March 2014) and Mount Vernon (May 2014). The North Bend participants included farmers market managers from Moses Lake, Sunnyside, Seattle, Everett, Issaquah, Renton, Lake Forest Park, Edmonds, Lynnwood, Yelm, Carnation, Chehalis, Des Moines, and West Olympia. In addition, representatives from the WSFMA, WSDA and DOH FMNP attended. An adapted version of training was also done for the Skagit Valley Farmers Market Coalition in May for representatives of the Mount Vernon, Anacortes, Sedro Woolley, and Port Susan Farmers Markets.

- Annual workshop presentations to 24 participants at the Washington State Farmers Market Association conferences in Vancouver, “The New Farmers Market in a Diverse and Multicultural Society” (2013); and 35 participants in a workshop entitled “Best Practices in Cross Cultural Communication with Latino Farmers” in Olympia (2015).
- One-on-one assistance, education, and problem-solving with 30 core market managers.

c. *Direct support to Latino farmers:*

- Design and printing support for logos, banner design and printing, product signs, websites, and other marketing materials.
- Support for learning about and applying to new markets.
- Creation of 25 “price sign kits” with four copies each of laminated crop price signs for over 75 crops. Each kit came with dry markers, an eraser, and a folder with signage tips and resources.



- One-on-one assistance for 3 farms with Senior/WIC Farmers Market Nutrition Program applications checks at markets; assisted 2 farms in setting up Square, a mobile credit card payment system that will allow them to accept credit cards at farmers markets via their smartphone; assisted farms with completing farmers market vendor applications; and accessing USDA EQIP, FSA, and Organic Certification programs.





Santiago Lozano



d. Developed publications and resources for partners:

1. “Glosario Bilingüe sobre Alimentos Seguros para Agricultores” (Bilingual Food Safety Glossary for Farmers); given the literacy levels of most Latino farmers, it is more likely that this resource will be used by project partners.
2. “Communicating with Latino Farmers: Cultural Aspects and Strategies” by Jose Garcia-Pabon and Marcia Ostrom, a WSU Extension Publication available at: <http://pubs.wpdev.cahnr.wsu.edu/pubs/fs191e/>
3. “Latino Farmer Profile” by Marcia Ostrom and Colleen Donovan (a WSU Extension Publication pending submission).
4. 2014 “WSDA Handbook for Small and Direct Marketing Farms” (Green Book) Translations
  - *Permiso de Operación para Alimentos Caseros (artesanales)* - Cottage Food Permit
  - *WSDA Licencia e Instalaciones para Procesador de Alimentos* – WSDA Food Processor License
  - “Vendiendo Frutas y Verduras Frescas” – Selling Fresh Fruit and Vegetables
5. “Farmers Market Booth Guide for Vendors” in Spanish and English by Colleen Donovan with 22 pages of key tips on how to attract customers to a vendor’s booth, including market day check lists; customer service tips; best practices on displays, signage and banners; booth design; health department reminders on sampling and hand washing stations; accepting FMNP; tracking sales; and a list of other key resources. One hundred copies were printed and distributed in each language with help from the Washington State Farmers Market Association (WSFMA), our project partner. Available at: [www.smallfarms.wsu.edu/marketing](http://www.smallfarms.wsu.edu/marketing)

www.smallfarms.wsu.edu/marketing/ Sell More! Farmers Market Booth Guide for Vendors 2014 (v1)

### Sell More! Farmers Market Booth Guide for Vendors

<b>Market Day Check Lists</b>	<b>Sampling</b>
<b>Customers Expectations</b>	<b>Hand washing</b>
<b>Customer Service</b>	<b>Accepting FMNP &amp; SNAP</b>
<b>Displays</b>	<b>Accepting credit/debit</b>
<b>Signage</b>	<b>Tracking Sales</b>
<b>Banners</b>	<b>Farmers market 101</b>
<b>Booth design</b>	<b>WA State FM resources</b>
<b>Promotions</b>	<b>Have fun!</b>

This guide was created by Colleen Donovan of the WSU Small Farms Program with grant support from the WSDA Specialty Crop Block Grant Program. The best ideas are from Washington State managers and farmers. We especially want to thank Zack Cook, Karen Kinney, Judy Kirkhuff, and Kate Selging for their expertise and edits. Please send suggestions on how to improve this resource to Colleen Donovan (colleen.donovan@wsu.edu). Spanish translation by Leigh Newman-Bell.

WASHINGTON STATE UNIVERSITY  
 Small Farms Program

WSDA  
 Specialty Crop Block Grant Program

## Significant contributions and roles of the project partners.

- a. *Alex Schmidt, Building Bridges of Understanding Group*: Provided expertise, curriculum and delivery of cross-cultural communication workshop.
- b. *Goodwill Industries*: Explored possible partnership with regards to ESL, computer classes in Excel, cashiering, and customer service trainings.
- c. *Farmers Market managers* (various from Western WA and Central WA): Recruiting farmers to attend trainings and training assistance on health department regulations. Provide educational outreach to the Latino farmers at their markets including distributing Vendor Booth Guide in Spanish; one-on-one follow up and ongoing education for farmers and their families/employees. The below markets were especially significant partners:
  - Leigh Newman-Bell who started out on this project working part-time for the WSU Small Farms Program as the Latino Farmer Outreach Coordinator in northwest Washington and later took a job as Pike Place Market's new Farm Development Coordinator, has been a core member of the project team. She has generously served as a liaison with Latino farmers and other market managers; provided interpretation and translation; provided direct training; contributed to project documentation and analysis; and shared her design skills to create new banners, brochures, and business cards for farmers.
    - Chris Curtis from the Seattle Neighborhood Farmers Market Association and Judy Kirkhuff from Seattle Farmers Market Association donated their time to give a tour and overview of the farmers market application process to one farmer from this project.
    - The Port Susan Farmers Market was a great partner in this project. The market manager, Leslie Collings, gave ample time to work to support Latino farmers at her market including helping to find a suitable insurance company for one of the farmers. She also wrote and was recently awarded a federal grant that will help improve the market overall and allow her to open up spaces to more Latino vendors from their community. Port Susan Farmers market is also engaging in writing a bilingual newsletter and advertising in Spanish and English to attract a diverse customer base.
    - Lindsey Nessel and the Carnation Farmers Market were always ready to help, whether laminating price signs for farmers, consulting about the Latino farmers at their market, or reflecting about the hard work of managing a market in a cross cultural environment and brainstorming possible solutions.
    - The Mount Vernon Farmers Market managers were crucial partners in this project for Skagit Valley direct market Latino Farmer support. They were incredibly supportive and encouraging. Next year they plan to offer early season booth sharing opportunities for farms that do not have enough produce for a whole booth early on in the season. Without this partnership it would have been much more challenging for the new Latino vendors to be successful.
- d. The *Skagit Valley Farmers Market Coalition* was an important partner in this project. The SVFMC is comprised of four separate farmers markets in Skagit County including Anacortes Farmers Market, Sedro Woolley Farmers Market, Bow Little Market, and Mount Vernon Farmers Market. As a coalition they not only streamlined communication for this project, but also gave the project team important feedback about our project ideas and how to implement them in the area farmers markets.
- e. *Transformation Sunnyside and the Sunnyside Farmers Market*: A strong supporter of this project through multiple hours of assistance working with Latino farmers in the Yakima Valley. Proofread the translation of the Vendor Booth Guide in Spanish and helped to work with Latino, specialty crop farmers who are selling at their market. Colleen Donovan also helped them to submit a proposal to the USDA Farmers Market Promotion Program and they were awarded a grant to further their farmer educational activities and build their market capacity in the coming years.
- f. *Viva Farms*: Viva Farms was a strong supporter of this project through multiple hours of technical assistance provided to Latino farmers on record keeping, food safety, sales strategies, marketing tips, farmers market applications, and much more. In addition, it was invaluable to have a consistent stream of communication with many of the farmers involved in this project through Viva Farms. More specifically, the WSU Small Farms Program staff in Skagit County have collaborated with Viva Farms to conduct outreach to Latino farmers; direct trainings; carry out baseline data collection, conduct outreach to farmers market managers, and attended Skagit Valley Farmers Market Coalition meetings in order to provide communication about this project.
- g. *Washington State Department of Agriculture*: Provided planning, a trainer, and technical assistance at the food safety workshop held in Mabton.

- h. *Washington State Farmers Market Association (WSFMA)*: Support with statewide outreach to market managers; conference workshop planning and promotion, and distribution of the Spanish and English versions of the “Vendor Booth Guide” to specialty crop farmers throughout the state.
- i. *USDA National Agricultural Statistics Service, Washington Field Office*. Christopher Mertz and his staff have been extremely helpful to the project team in finding the right data, interpretation and analysis, as well as creating custom maps.
- j. *USDA Natural Resource Conservation Service*. One-on-one assistance with the application for the EQIP program is Skagit and Yakima Counties.
- k. *USDA Farm Service Agency*. One-on-one assistance with the application for a farmer loan in Yakima County.

All Latino farmers participating in this project were specialty crop farmers. All materials developed emphasized specialty crops, both visually and in the text.

## **GOALS AND OUTCOMES ACHIEVED**

*Goal #1: Increased specialty crop sales through direct markets by Washington Latino farmers.*

Early in the project the project team conducted “intake” interviews in Spanish with twenty Latino farms that sell specialty crops through direct markets. Through this activity, the team gathered baseline data on specialty crops sold, markets used, gross sales, what training topics most interested the farmers, and planning information (i.e., when farmer would prefer trainings to be scheduled). In addition, the project team partnered with farmers market managers to support farms and to help monitor sales (as they collect market day sales reports). To put this project and these farms into the larger context, the project team also researched the USDA NASS data for Latino farms in Washington State from the 2012 Census of Agriculture and subsequent reports. This work informs a new WSU Extension publication that profiles Latino farmers in Washington State.

*Goal #2: Enhanced marketing and record-keeping skills of Latino Specialty Crop Farmers*

Activities included providing Latino specialty crop farmers with workshop-format and one-on-one training on the principles of marketing, displays, price signs, customer service, and record keeping. A “Vendor Booth Guide” was created in Spanish and English to visually convey best practices, marketing tips, and food safety requirements. To model how to apply marketing principles, the project team designed and produced new banners, business cards, and brochures. In addition, the project team worked with Latino farmers to increase their awareness of new farmers markets (especially in King County) and other market channels (e.g., wholesale and the Puget Sound Food Hub). Latino farmers were also encouraged and supported to attend their first WSFMA conferences in Vancouver and Olympia. Throughout this project, market managers were crucial partners in terms of delivering training, follow up, problem-solving, and outreach to farms.

*Goal #3: Improved cross-cultural communication, trust, and educational outreach by market managers and agricultural service providers.*

The primary training event was a cross cultural communication workshop specifically for market managers, led by Alex Schmidt using the “Building Bridges of Understanding” curricula and featuring an interactive panel with immigrant farming professionals. Leading up to and following this training, the project team led workshops on cross-cultural communication and working with Latinos at the annual WSFMA conferences. The key principles and lessons from Washington formed the core content of a new WSU Extension publication “Communicating with Latino Farmers: Cultural Aspects and Strategies.” Of equal importance to accomplishing this goal, is the time the project team spent with farmers both on farm and in the markets. Being able to follow up on discussions, get to know the families, and build mutual connections with market managers was essential to creating a foundation for trust and understanding.

*Goal #4: Improved food safety practices on Latino farms and at markets*

The project team, WSDA partners, and market manager Christina Martin partnered to provide an on-farm food safety workshop in Mabton. A thick binder of food safety materials in Spanish was created and shared. In addition, a glossary of food safety terms was translated into Spanish and shared. A section on food safety and the department of health requirements was also developed to include in the “Vendor Booth Guide.”

Goals #1-4 above are expected to have long term positive economic outcomes for Latino specialty crop farm businesses both in terms of (1) farmer knowledge gains and improved practices as a result of direct project participation and (2) market manager knowledge gains through the “train-the-trainer” educational activities described above that will enable them to provide long-term coaching and communication to improve the sales of the Latino vendors at their markets.

While the project team needed to adjust its activities and targets throughout the implementation period, the goals established for the project remained the same.

<b>Activities Planned</b>	<b>Actual Accomplishments</b>
Use farmers market vendor survey and focus group results to prioritize Latino farmer marketing needs, establish baseline profile of Latino vendors, estimate economic importance of current vendor sales, and draft outreach materials.	Data analysis and research completed as planned. A new profile of Latino Farms in Washington has been developed and is pending submission to WSU Extension for publication.
Design marketing workshop series: identify guest lecturers; plan farm and market visits; organize logistics.	Completed as planned. However, workshop participation was low and a constant challenge despite trying new approaches. As a result, the project team focused its energy more on one-on-one trainings both on farm and in the markets. Creating new partnerships and trainings for market managers was also crucial because they can provide education and coaching to the farmers every week.
Design cross cultural communication training, contract with Highlander, engage market managers and ag professionals	The workshop was completed and very well received with excellent participation. Unfortunately, the Highlander trainer was not available. However, a local trainer was available and worked out very well.
Outreach to engage Latino farmers	Completed in more ways and in more iterations than imagined. The role of partner markets and organizations such as Viva Farms and Transformation Sunnyside proved invaluable.
Hold workshop series and farm visits for farmers; and collect baseline/seasonal sales data for participants.	Completed. As stated above, the project team focused its energy more on one-on-one farm and market visits due to low workshop participation. Building on materials for a marketing workshop, the “Vendor Booth Guide” in English and Spanish was created and distributed.
Follow-up visits to provide one-on-one technical assistance at farmers markets and on farms	Completed in more ways and in more iterations than imagined. Designed and created marketing materials. Created “price sign kits” for farmers to use at the markets and reiterate best practices.
Hold 2-day workshop for market managers, vendors and ag professionals (with Highlander Education Center trainer)	Did not take place as planned. Created two alternative workshop formats that proved more feasible and accessible to managers.
Offer follow-up cultural competency workshops at the WSFMA conference	Completed.
Publish “best practices” Extension fact sheet in cross cultural communications based on Highlander Training and farmers market research results.	Publication has been published by WSU Extension.
Annual project self-evaluation and document lessons learned, pre- and post-project participant evaluations	Evaluations and documentations have been completed.

*Goal #1: Increase direct market sales of fresh produce by 75 Latino farmer project participants by 5-10% over 3-year project period.*

In Year 1 of the project, “Total sales from direct markets in 2012” data was collected from nine of the twenty-two initial project farms. Collecting actual numbers from farmers has proven to be quite challenging, however, either due to a lack of formal farm record-keeping or a lack of willingness or trust to share. However, when asked “What % of total sales were from direct marketing specialty crops,” farms responded 95%.

*Goal #2: Increase marketing and record-keeping skills of 75 Latino farmer project participants.*

**Customer Service:** While sensitive to address, improved customer service has been identified as a need. Many Latino vendors are somewhat shy about interacting with customers or upselling products when necessary. Many of the farmers initially thought that good customer service just meant offering the customer a low price or a bargain. We have tried to convey our research findings from previous projects showing that market customers are not necessarily looking for the best price, but want quality, an experience, and a relationship with the farmer instead. Some of the farmers seemed receptive to this idea, but others did not.

**Signage:** All of the farmers we have worked with have improved their signage, but there are still many opportunities for further personalizing signage and developing a brand. Almost all of the farmers either have collected and/or are working on collecting the basic information about their farms that the customers want to see. At the onset of this project, many of the farmers were not aware of all the information their customers would be looking for. Now the goal is to develop the signage to a point where customers can get a more authentic and personalized experience and build more loyalty to the farmers through connecting with their values and stories.

**Record Keeping.** In response to our requests, farmers are now keeping better records. However, they still don’t know how to utilize the information from their records to make strategic decisions for their farm such as pricing based on their true cost of production and marketing costs. Further, we wanted to help these farmers analyze and understand which products yielded the highest margins so they can make planting decisions with this information in mind. More basic computer training has been identified as a potential way to enhance these skills.

In a project evaluation survey of market managers, 64% said that they have seen improvements in farmers’ marketing strategies and another 27% said they weren’t sure. In terms of increased specialty crop sales, 36% of market managers had noted improved sales as a result of this project and another 45% was unsure. These results points to two key lessons: one is that it takes time and constant reinforcement to realize the gains of new knowledge; and, two, changes may be dramatic but more often they are harder to discern and measure, especially in the beginning.

*Goal #3: Reach 30 market managers and agricultural professionals with intensive cross-cultural skills training by Highlander Center and 25 additional market managers at the annual WSFMA Farmers Market conference.*

In all 56 market organizers, representing 35 farmers markets, were part of this project. Over 90% of market managers surveyed reported that they had increased their cross-cultural skills in the last three years. In terms of misunderstandings rooted in communicating across cultures, over two-thirds (67%) reported that the number had gone down and the remaining third were unsure.

Twenty-five farmers market managers from Moses Lake, Sunnyside, Seattle, Everett, Issaquah, Renton, Lake Forest Park, Edmonds, Lynnwood, Yelm, Carnation, Chehalis, Des Moines, and West Olympia farmers markets, in addition to representatives from the WSFMA, WSDA and DOH FMNP attended our day-long cross-cultural communication training in North Bend. Among participants, 100% reported that they had “new ideas for more effective cross-cultural communication.”

In addition, an adapted version of training was also done for the Skagit Valley Farmers Market Coalition for representatives of the Mount Vernon, Anacortes, Sedro Woolley, and Port Susan Farmers Markets. The Sunnyside market manager was so inspired by the training that he organized a two-day version in his own community for local leaders.

In terms of the WSFMA conference workshop for market managers, the evaluations and a follow up survey found that more than 90% percent of participants increased their understanding of Latino vendors. Furthermore, over 70% indicated they have improved or are making an effort to improve their working relationships with their Latino vendors. The WSFMA conference coordinator, in a debriefing report, quoted participants evaluating our workshops as: “great coverage

and enlightening”, “would like more about outreaching to bring in minority customers,” “brought out concepts I didn’t know before,” “has excellent, real-life examples to illustrate principles set forth in presentation,” “actively engaged audience in activity and discussion,” and “absolutely necessary.”

The following are direct quotes from market managers:

- *The trainings helped people better understand Latino farmers and ways to communicate in a sensitive and more efficient manner.*
- *This training influenced the core ways that I interact with people. The skills I learned have been very valuable at work and beyond.*
- *It was helpful to learn about the difference in perceptions that Latino vendors have about my role as a market manager and how the market is run. ... It was also important to learn that perceptions may be that I, as manager, make all the decisions concerning who attends the market and how it's run and that I personally keep the weekly stall fees. I welcome all feedback and if the perception is that I am the ultimate decision maker that may create a situation where these vendors feel like they can come to me with concerns or complaints because it may affect their ability to attend market.*

*Goal #4: Reach all 75 farmer project participants with culturally appropriate education and information about safe growing, harvesting, handling, and food marketing practices.*

In partnership with WSDA, a bilingual food safety workshop was held in Mabton at the Alvarez farm in October 2013. Ten participants attended from Yakima area farms. Evaluations were favorable, with the greatest interest in well water sampling; rules on sampling produce at farmers markets; washing trays; and hand washing.

In talking to many of the farmers and visiting their farms it is clear that they are implementing good food safety practices. In some cases they are doing important work to teach other Latino farmers about good food safety practices. To date, most farms involved in this project have attended food safety workshops. In the future, we hope to see further proof of the new knowledge acquired by seeing farmers keep better harvest records or begin to develop recall plans. Food safety record keeping would help these farmers to be accountable for their practices and make sure they are implementing their food safety education.

Malaquias Flores translated a Glossary on Food Safety Terms and a factsheet on the Cottage Food Permit for the 2014 edition of WSDA’s “Handbook for Small and Direct Marketing Farms.” This is now available to any specialty crop farmers interested in selling value-added products (e.g., salsa, pickled vegetables, sweets). The translation was provided to Patrice Barrentine for distribution through WSDA. Handbooks have now been printed and are being distributed across the state by WSDA as well as posted to their website. We have obtained a printed copy of the handbook for distribution, along with the translated food safety sections, to each of the farmers in our project.

## **BENEFICIARIES**

As previously mentioned, the 24 Latino farms and 94 farmers involved with this project all sold a variety of specialty crops through farmers markets and wholesales markets. In addition, they employed over 30 workers. On average, the project farms sold at 4.8 farmers market each. The primary crops for farms in Central Washington include a huge range of diverse vegetables and varieties of these vegetables (especially peppers, potatoes, tomatoes, and tomatillos); herbs, melons; and tree fruit (cherries, apples, pears, and stone fruit). Forty-two percent of the farms are located in western Washington and focused more on berries, greens, and flowers. The greatest concentration of farms (58%) is in the lower Yakima Valley, specifically around Sunnyside and neighboring Mabton, Outlook and Wapato. The project also worked with farms centered in Northwest Washington, facilitated by the work of Viva Farms in Skagit County. These farms are economically marginalized, relying on their creativity, informal arrangements, and off-farm work to survive.

Additionally, each of the 35 farmers market organizations that participated in the project is expected to benefit in multiple ways, including building stronger relationships with vendors, strengthening their capacity to recruit multicultural vendors and customers through improved cross-cultural communication skills, and stronger overall sales as a result of having more successful Latino vendors at their markets.

As stated above, between the 2007 and 2012 Census of Agriculture, the number of Latino farms in Washington grew by 14% and the value of their sales grew 68% to over \$367 million (USDA Census of Agriculture, 2012, Table 58). In the 2012 Census of Agriculture, Latino farms represented nearly 8% of all direct sales reported. It is also known that In

Washington, 45% of Latino farms reported specialty crop sales compared to 27% of all farms (USDA Census of Agriculture-Specialty Crops, 2015, Table 13).

In the future, if educational programs such as this one are successful it is hoped that the number of Latino farms, the average net cash farm income of Latino farms, and the total value of sales from Latino farms will show an upward trend on the 2017 U.S. Census of Agriculture.

### **LESSONS LEARNED**

- a. Farmers market managers were wonderfully receptive to this project, motivated to work more effectively with farmers and learn about cross cultural communication/skills. They are excellent partners. And by reducing the “risk” for market managers to work across cultures, opportunities for Latino farmers are also being created.
- b. Projects working with Latino farmers move at the speed of trust. “Honesty” and the full story get revealed over time as farmers’ trust is earned and more information is gathered (so better questions can be asked). And being on the farm and in the markets, getting to know farmers and their families, is the best way to build trust. However, once the many other needs emerge (farming and non-farming). There may be other available resources to help. In some cases, it becomes unrealistic to focus only on a project agenda when other issues are more urgent. For example, two farmers had young sons die this year due to illness. Sharing information about existing resources and connecting farmers to local opportunities is a significant contribution to their overall success beyond any one project.
- c. Echoing the theme above, building working relationships requires an investment of time and space to do “non-project” activities. Likewise, being consistently “present” (both available and on site) makes a difference in terms of how well you know what’s going on and how people relate to you.
- d. Immigration status presents real challenges to accessing opportunities and shapes daily work.
- e. Translating information from English to Spanish is not always the “answer,” especially given the range of literacy levels and education.
- f. Having interpretation for workshops and other similar occasions should be a “given” and not presented as an option in real time. Needs to be OK and a simple “feature” of the work. People may be embarrassed to say they need interpretation or overestimate their fluency and act like they are understanding more than they really are.
- g. One-on-one technical assistance still seems to be the most effective strategy, even if it is seemly less efficient in terms of time and travel.
- h. When designing new projects, take the time to understand what the farmers’ priorities are before developing the project and proposal.
- i. Use tangible or material “help” (e.g., the farmers market sign kits) at beginning of project to demonstrate that project will deliver and actually is trying to help; build trust and confidence that you are reliable.
- j. Build flexibility into any proposal, perhaps by framing goals and/or activities more generally.
- k. Navigating the organizational terrain is tricky. Multiple organizations have an interest or have received grants to work with Latino and immigrant populations in Washington. Farmers seems to not be clear about the institutional context and “project” concept. They seem most connected with the person they are working with. In other words, for Latino farmers, the relationship building comes first, before “project” or organizational affiliation.
- l. The importance of farmers markets for the livelihoods of these farmers is under-documented and extremely critical, making farmers market farmers a valid and productive focus for future projects.
- m. Farmers who sell at farmers markets are being creative in the face of economic adversity which makes their operations more challenging to describe, document, and fit into business models/rules/templates.

- n. There is no one-size-fits-all approach that will work when developing projects and programs with Latino farmers in Washington State. Latino farmer communities vary widely throughout Washington State; key regions seem to be the Yakima Valley, Skagit or NW WA, North Central WA, and even Columbia River gorge (by Hood River). We cannot paint a broad brush to talk about “Latino farmers” in WA. Likewise, assuming that “Latino farmers” will consider themselves to be one, shared community and collaborate among themselves is not realistic. Level of community cohesion varies due to family feuds, neighborly disputes, rivalry/competition at markets, and accusations of reselling. Some farmers work well together, some cannot be in the same room with each other. Latino farmers may be indigenous Mexicans, some Mexican Americans, some from Honduras or other countries. The Mexican Americans have diverse histories, some being recent immigrants, some with multiple generations in the US, some being internal migrants to WA from other states, with strong differences and hierarchies within.

Serendipitously, this project directly complemented another project working to create a program to ensure the integrity of vendors at farmers markets in Washington. The relationships and understanding created will directly inform the market integrity program.

The national Farmers Market Coalition also has placed the Spanish and English versions of our Vendor Booth Guide in their Resource Library as a featured publication under “Farm Business and Marketing”: <http://farmersmarketcoalition.org/education/resource-library/>.

Colleen Donovan connected with a researcher in the Food Studies program at Syracuse University who is researching Latino farmers in the United States. She is planning a visit to Washington in March and there is a possibility Washington State may be featured as a case study in her future work.

Sarita Schaffer helped to interpret a Salmon Safe certification inspection for one participating farmer and provided follow up assistance with compliance questions. This certification rendered the grower eligible for PCC’s bouquet program which was expected to result in over \$20,000 of direct sales.

For the sign project, we saw the signs at three of our Latino farmer's booths for a few weeks and then they were back to their usual signage. Not sure why they stopped using the WSU provided signs. Overall, we did notice that after the sign kits were distributed that signage/pricing was more visible whether farmers were using the WSU sign kit or not.

### **ADDITIONAL INFORMATION**

Cash Match from WSU:

- 1) Unrecovered indirect costs: **\$40,677**
- 2) Salary and benefits for project personnel Ostrom and Garcia-Pabon: **\$44,975**

Total WSU: **\$85,652**

In-Kind Match from Partners:

- 1) WSFMA Planning, Promotion and Outreach for manager workshops and distribution of Vendor Booth Guide: **\$3,000**
- 2) WSDA Specialist time for materials, planning and implementation of Food Safety Workshop in Mabton: **\$1,500**
- 3) Use of Viva Farms hands-on instructional facilities on farm and at market stand: **\$6,000**

Total In-Kind: **\$10,500**

**Project Title:** Beginning Farmer Marketing and Workplace CSA Engagement Initiative

**Partner Organization:** Sustainable Connections (SC)

### **PROJECT SUMMARY**

With local farmers markets almost perpetually at max capacity many new farmers and vendors face long waiting lists for the opportunity to gain exposure to the public and build a consistent consumer base for their goods. It is crucial that specialty crop producers have alternate means by which they can market their goods to the public and develop new revenue streams.

CSA memberships remain one of the core market development structures for direct market specialty crop producers, particularly for beginning farms. Farmers offering CSAs report the marketplace has changed over the last five years: consumers increasingly value CSAs as a direct source, but are not as interested in engaging with their farm. Member turn-over is most significant the first year of joining, with attrition usually between 30 and 50 percent. Farmers need assistance in how to best communicate and maintain relationships with this new market.

The potential of Workplace CSAs to be a consolidated market outlet for specialty crops producers has yet to be fully realized. The established CSA model needs to evolve in order to fit workplace administrative structures and shareholder preferences for direct buying experiences. Most employers are not familiar with working with farmers, but are enthusiastic about local food and supporting farm-based businesses. Farmers report a need to understand emerging market trends such as these, and greatly value assistance with CSA customer surveys and education. This proposal builds on the momentum and demand for local food (generated through Sustainable Connections' WSDA-funded *Eat Local First* campaign) to address both producer and consumer needs.

This project built previous work done by Sustainable Connections during out 2010-2011 "Workplace CSA Sustainable Business Practice" pilot. During this pilot project we connected farmers with many of Whatcom County's largest employers interested in offering Workplace CSAs. The pilot resulted in 16 businesses joining the Workplace CSA Initiative, generating 295 shares for the 2011 growing season, valued between \$110,000 and \$150,000 in new direct sales for specialty crop producers. Our previous momentum combined with a current project, Food to Bank On, in which new and early phase specialty crop producers are provided with marketing support, training opportunities, education in best practices, and a guaranteed revenue stream for donations of goods to area shelters and food banks. These two projects created a timely environment where workplaces were increasingly interested in expanding CSA access and newly trained specialty crop producers were looking for outlets for their goods and critical new funding streams as they began their businesses.

Though very different, this project built on a previously funded SCBGP three year project, *Increasing demand, production capacity, and competitiveness of NW WA Specialty Crops*, which partially funded the launch of SC's Eat Local First marketing campaign in 2010. The two projects' activities overlapped in timing between October 2012 and September 2013, but do not overlap in use of funds or expected outcomes. The desired objectives of both projects were complementary as they strove to increase demand for, and access to, local specialty crops.

### **PROJECT APPROACH**

Sustainable Connections worked with farmers, businesses and the community to promote Workplace CSA engagement, capture and share best practices, track sign-ups and CSA farmers. The 4<sup>th</sup> and 1<sup>st</sup> quarter of each year, SC staff developed and fielded a CSA census, capturing the # of CSA shares sold, and gathering information to compile the coming season's CSA Farm List. SC developed, updated and shared a Workplace CSA farmer toolkit as well as an Employer Toolkit designed with accessible resources and tips for making selling and receiving a CSA in an office or group setting work with ease. Each February through May, SC staff conducted business outreach, which included hosting a 'Meet the Farmer' Member Luncheon workshop focused around the topic.

Sustainable Connections supported beginning farmers through the Food To Bank On program with business planning workshops, mentorship and business plan support, growing important partnerships, and creating promotional materials for farmers and organizations to utilize. Each fall SC opened the applications for the Food To Bank On program, met with mentor farmers to review and accept new farmers for the coming year, and set plans. SC worked with key beginning farmer training partners like WSU Extension, Cloud Mountain Farm Center and Viva Farms to plan curriculum in order to collaborate where it made sense and co-promote efforts. From January –April each year SC hosted bi-monthly business planning courses with beginning farmers, business planning experts and mentor farmers which culminated in participants

finishing and presenting their business and marketing plans in April. In the summer months, SC created promotional posters featuring beautiful photos of the farms and distributed Eat Local First marketing materials to participants. Summer 2013, Sustainable Connections filmed and produced a “know your farmer” promotional video (opting for 1 longer film instead of 3 shorter) that was and still is promoted and distributed widely.

Working with partners in the beginning farmer realm has served invaluable for Sustainable Connections and for this project in particular. Over the past few years, Sustainable Connections has pulled together beginning farmer support organizations from across Northwest Washington (WSU Extension, Cloud Mountain Farm Center, Viva Farms, Greenbank Farm) to ensure we are strategically working to avoid overlap, promote collaboration and help new farmers navigate a trajectory through the resources available.

Farm partners like Osprey Hill Farm and Cedarville Farm have been steady leaders in promoting and participating in SC’s farmer and business workshops, member lunches and community promotions.

Project Staff worked directly with local farmers and vendors to ensure that program scope was focused primarily on specialty crops. For our Food to Bank On program all but two of the supported farms produce specialty crops exclusively. For the other two farms we used matching funds to support their participation in the program. We observe careful internal accounting to be sure that WSDA reimbursement was only sought for expenses related to permissible farms. Likewise the majority of our participating CSA farms produce only specialty crops and matching funds were used to support those few that produce non specialty crop goods. In any case where there was doubt about exactly what producer would benefit from a program activity we used matching funds to ensure all benefit from WSDA funds would go solely to specialty crop producers.

## **GOALS AND OUTCOMES ACHIEVED**

### **Task A - Workplace CSA Engagement**

- Activity A1 – Develop survey with CSA farmers and workplace admin (Nov 2012 & 2013)
- Activity A2 – Field annual workplace CSA participant satisfaction survey (Nov-Dec 2012 & 2013) Revised: Collect feedback in Mar-Apr 2015
- Activity A3 – Field annual census of CSAs in Whatcom & Skagit County; record # of shares sold (Dec-Jan 2012 & 2013 & 2014)
- Activity A4 – Compile survey data (Jan 2013 & 2014 & 2015)
- Activity A5 – Write annual report on Workplace CSA outcomes; write press release, distribute report via website email (Jan-Mar 2013 & 2014 & 2015) Revised: April 2015
- Activity A6 – Conduct farmer outreach for annual CSA list; update document and website with all farms offering CSAs (Jan-Feb 2013 & 2014 & 2015)
- Activity A7 – Outreach to businesses re: Workplace CSAs, develop member retention strategies, promote signups via newsletter, email, annual event for farmers/employers (Feb-May 2013 & 2014 & 2015)
- Activity A8 – Work with farmers and HR admin to document and implement best practices (ongoing)
- Activity A9 – Develop and publish Workplace Toolkit for employers (Oct-Dec 2013)
- Activity A10 – Produce direct market report on CSAs for farmers; distribute via email, release in print at trade meeting (Feb 2013; March 2014 & 2015)

### **Task B - Beginning Farmer Marketing (Food To Bank On)**

- Activity B1 – Work with WSU Extension and Cloud Mountain Farm Center to plan training curriculum, marketing, and cash flow analysis classes (Oct-Dec 2012 & 2013 & 2014)
- Activity B2 – Meet with mentors, set work plan, accept new FTBO participants (Nov 2012 & 2013 & 2014)
- Activity B3 – Direct marketing, branding, business planning courses with beginning farmers, experts, farmer mentors (Jan-Apr 2013 & 2014 & 2015)
- Activity B4 – Farmer and business workshops on Workplace CSA admin, marketing and best practices (Feb-Mar 2013 & 2014 & 2015)
- Activity B5 – FTBO participants finish and present business plans incorporating improved marketing plans (Apr 2013 & 2014 & 2015)
- Activity B6 – Design and produce farmer posters and materials for FTBO farmers to use in their marketing plans (Jul-Oct 2013 & 2014)
- Activity B7 – Film and produce three ‘know your farmer’ promotional videos for farmer and employer use (Jun-Oct 2013)
- Activity B8 – Distribute and promote videos (Sept 2013-2015)
- Activity B9 – Present project outcomes at Tilth Producers Conference and trade meeting (Feb 2013 & 2014 & 2015; Nov 2013)

All of our Expected Measurable outcomes were observed within the grant period.

SC was able to fulfill majority of the activities and goals established for the project. There were some changes with lessons that we learned such as:

Workplace survey – this concept worked well in 2012, but in 2013 SC staff found collecting data challenging from participating businesses. In 2014, SC incorporated many survey questions into outreach in order to gather feedback – most of which mirrored what was found in 2010-2012 surveys.

Workplace CSA #s stayed at around 400 shares total, though the number of businesses did increase to 32 participating businesses by 2014.

Target: 32 businesses and 600 shares by the end of 2014

Baseline: 16 businesses and 295 share in 2011

Current numbers: 35 businesses and 400 shares at the end of 2014

Target: 50% of all participating businesses offering payroll deduction by end of grant period

Benchmark: 31% businesses offered payroll deduction in 2011

Current numbers: 54% of businesses offered payroll deduction in 2015, 19 out of 35 businesses

Target: 3 workshops with speakers and associated business planning curriculum

Baseline: No benchmark existed

Current numbers: 3 workshops with speakers and associated business planning curriculum for new farmers: increasing marketing skills, knowledge and tools for beginning farmers. 3 workplace/farmer luncheons

Target: 5 farms participating in Workplace CSA Sustainable Business Practice in 2012, 6 in 2013, 8 in 2014.

Benchmark: 4 farms in 2011

Current numbers: 12 farms in 2012, 12 farms in 2013, 8 in 2014

Target: Present annual Workplace CSA Initiative reports and outcomes of FTBO marketing education

Benchmark: 2011 Workplace CSA Executive Report published January 2012 presented at March 2012 NW WA Farm-to-Table Trade Meeting, Tilth Producers conference

Current: Workplace CSA Best Practices reports shared at Trade Meetings and Tilth Producers Conferences from 2012-2014

## **BENEFICIARIES**

Those who have benefited from the projects and accomplishments are farmers, workplaces/businesses, and individuals.

Workplace CSA #s stayed at around 400 shares total, though the number of businesses did increase to 32 participating businesses by 2014. Approximately \$450,000 worth of CSA shares were sold during the scope of the project.

## **LESSONS LEARNED**

In March 2015, Sustainable Connections held a CSA Fair to help drum up support and awareness for CSA farmers and sign-ups. This free public event was held at our local brewpub's outdoor beer garden on a sunny afternoon with live music and 8 participating farmers showcasing their wares. Over 200 attendees picked up a CSA passport and got stamps for visiting each farms' booth for a chance to win a CSA share. Farmers were pleased with the turnout and format of the event and we hope to continue its success in future years.

Individuals who participated in Workplace CSAs noted that they tried a wider variety of produce items and ate more vegetables as a result of participating in the CSA

One challenging aspect of the project was retention of workplace champions, or the leaders within the businesses who took the lead on organizing a CSA within their organization. With staff turnover, we saw many participating businesses fall off after their "champion" left.

Many farmers are so busy growing and producing food that they don't leave a ton of time for marketing or education. Through this project, SC was able to support the marketing end of CSAs. SC found however, the farmer education as far as providing a CSA newsletter with recipes, etc, often fell off their plates. This was the biggest piece of feedback we also heard from Workplace CSA participants: that newsletters and recipes were important! It is a disconnect that SC will

continue to educate and support farmers through. Consumer education is key!

One common question that comes up for potential CSA participants is the price. Many folks note the large cost upfront (even with payroll deduction, that \$400 amount seemed overwhelming). In 2014, Sustainable Connections conducted a price comparison survey and priced out what might be in a typical CSA box in July compared with the cost of the same organic produce items at the Bellingham Farmers Market, Community Food Co-op, and Haggen stores. We found that for that box, the CSA was about 25% less expensive than shopping for comparable products in these stores.

SC found it challenging to collect survey data from employer participants. Sent to the Workplace Champion with the intention of them sending it out to employee participants, there was often little follow-through. In the future, SC would ask for the contact info of the employees involved ahead of time, so as to send the surveys directly to the participants at various businesses.

### **ADDITIONAL INFORMATION**

A total of \$28,835 in matching funds was utilized for the project. These funds were obtained through private donors, business sponsors of the program and projects, and a complementary USDA grant for farmers market promotion.

Of these funds \$17,928.30 was used to pay for farmer training through the Food to Bank on Program.

\$ 8,032.39 was used for promotion of workplace CSA's to boost sales by local specialty crop producers.

\$2,874.31 was used to fund distribution of knowledge gained through this program including production of printed materials, video creation, and attendance and presentation at the annual Tilth Conference.

### **CONTACT PERSON**

Sam Gearhart

Sustainable Connections (SC)

360-647-7093

**Project Title:** Increasing Access to Wholesale markets for Small and Midsized Farms

**Partner Organization:** Community Farm Connection (CFC)

### **PROJECT SUMMARY**

This project was proposed to work at multiple levels of the supply chain to increase farmer profitability and access to growing wholesale markets, including restaurants, cafeterias, and retail outlets. By simultaneously growing consumer demand, farmers' ability to meet that demand, and infrastructure needed to effectively aggregate small and mid-sized farmers' produce into appropriate marketing channels, CFC proposed to expand and stabilize Central Washington's sustainable food system and consumers' access to healthy, local food.

CFC would develop marketing and promotional materials to build consumer demand in wholesale outlets and invest in educational resources to help farmers produce for these markets. It would work to increase sales of specialty crops by linking growers directly to purchasers through a series of Farmer-Buyer networking meetings and with specialized technical assistance for both buyers and growers. It would also grow Farmhouse Table, its regional food hub, to increase aggregation and distribution of locally-grown products as demand and supply increase.

At the conclusion of this project, CFC's improved materials, resources, and role as regional food hub would provide specialty crop producers with the confidence needed to expand operations into previously untapped wholesale markets. It would also provide a replicable model for other rural regions throughout the Northwest.

Direct sales of farm products are rapidly expanding in Washington State and across the country, due in large part to growing consumer demand. According to the 2007 Census of Agriculture, 13.8% of Washington farms do some form of direct marketing, which is over twice the rate found in the U.S. as a whole. However, most small and mid-sized farms require a variety of sales outlets in order to be profitable. An increase in mid-sized, wholesale purchasers would provide an additional market outlet for specialty crop producers of various sizes in North Central Washington.

Many small to mid-sized specialty crop growers in North Central Washington do not have access to wholesale markets due largely to difficulties establishing and maintaining relationships with wholesale buyers, lack of perceived demand on the part of purchasers (despite data indicating otherwise), and challenges in product aggregation and distribution. Similarly, many wholesale purchasers have experienced actual or perceived barriers to buying more from regional farms, despite expressed interest in purchasing locally-grown food. This project aimed to reduce these barriers to connecting small and mid-sized producers with regional wholesale markets through education, marketing, and the further development of Farmhouse Table, a regional food aggregation and distribution hub (and program of CFC).

First, the program would target consumer demand for locally-grown specialty crops in wholesale markets - restaurants, cafeterias, and retail outlets in NCW. Second, it would simultaneously increase small and mid-sized farmers' capacity to meet that demand. Third, it would increase buying relationships between growers and these emerging niche and institutional markets, specifically those that require off-farm coordination to develop. Through education, technical assistance, and improved product aggregation and distribution, Community Farm Connection would increase access to previously inaccessible markets, providing stability and increased market capacity for specialty crop producers in North Central Washington.

### **PROJECT APPROACH**

Cascade Harvest Coalition/Farm-to-Chef Trade Meeting, Stacy Carkonan partnered in planning and attended.

The Community Food Assessment was distributed and data gathered for analysis. The program's structure, based on a Wholesale Buyer Survey, was being developed.

### **GOALS AND OUTCOMES ACHIEVED**

Outcomes for the project:

- Community Food Assessment to measure need for an increase in demand for local food in restaurants.
- Design work for window decals and brochures for participating chefs.
- Conducted round table and individual discussions for local chefs, restaurants and local farmers to brainstorm how the Farm-to-Chef program could meet the needs of all groups.
- Farm-to-Chef Trade Meeting, held in May, partnered with Cascade Harvest Coalition.

- Farm-to-Chef agreement to set standards for participating wholesale buyers to hold them accountable to goals of the programs.
- Seasonality chart, crop by crop and specific to NCW, for menu planning.
- Conduct and analyze Community Food Assessment (compared with data from 2007) (goal 1a).
- Accomplished the writing and translation into Spanish, distribution, and gathering of results for the Community Food Assessment. Began analysis of the data, but did not finish.
- Design marketing campaign based on 2012 CFA data (goal 1a).  
 CHC designed an initial marketing campaign based on the goals of the program, and round table discussion with interested chefs and farmers. The marketing campaign would have been tailored to analysis of the results of 2012's Community Food Assessment, but as stated above, analysis was incomplete.
- Create and distribute survey for wholesale buyers (goal 1b). *Accomplished*
- Analyze data from wholesale buyers survey (goal 1b). *Accomplished*
- Develop promotional materials for restaurants, retailers, and cafeterias to market purchasing of local produce (goal 1b).  
 Partly accomplished; Working with Gibbs Graphics, staff developed a logo for the program to be used on all print and digital promotional materials for Farm to Chef. After analysis of the Wholesale Buyer Survey, and feedback from the chef round table discussion, staff ordered window decals featuring the Farm to Chef logos to distribute to participating restaurants, institutions, and retail spaces. Staffs were developing a weekly fresh sheet for participating wholesale buyers, featuring produce from the local farms that CFC already works with and orders from. The fresh sheet featured the logo designed by Gibbs Graphics, and was slow in development, due to the unforeseen technical difficulty of designing an itemized fresh sheet to reflect the available quantities of crops and prices of crops from nearly 20 different farms. Other promotional materials, such as brochures for wholesale buyers, were incomplete, but in development as the program took shape.
- Plan, promote, and conduct educational workshops for purchasers on working with small farmers and seasonally available produce (goal 1b).  
 Accomplished in part- CFC conducted all scheduled educational workshops that were on the schedule for the 1st and 2nd quarters of 2013.
- Plan, promote, and conduct educational workshops on selling to institutions as part of annual *Around the Farmhouse Table* workshop series (goal 2).  
 Accomplished in part- CFC conducted all scheduled educational workshops that were on the schedule for the 1st and 2nd quarters of 2013.
- Develop printed 'Tip Sheets' for farmers and purchasers based on information provided at educational workshops; distribute through partners and through various online outlets (goal 2).  
 Not accomplished. "Tip Sheets" were in development as the program took shape and as CFC planned to redesign and streamline its website.
- Plan, promote, and conduct Farm-to-Table Trade Meetings (goal 3a).  
 Accomplished, in part- In May 2013, CFC conducted the first Farm-to-Table Trade Meeting according to schedule.
- Use evaluations from Farm-to-Table Trade Meetings to target new approaches for facilitating buyer/seller connections (goal 3a).  
 Accomplished in part- CFC gathered evaluations during the first Farm-to-Table Trade Meeting in May. The analysis of the evaluations showed that both farmers and wholesale buyers found value in the networking at the Trade Meeting. However, evaluations also pointed to the problem of tight budgets for buyers, and farmers' difficulty transporting restaurant's small produce orders in a timely and cost-effective manner. In regards to those cost and transportation difficulties, the evaluations did not inspire any new approaches.
- Production of weekly 'Fresh Sheets' for wholesale purchasers, indicating availability of products, pricing, and sources of locally-grown specialty crops (goal 3b).  
 Accomplished in part- The fresh sheet featured the logo designed by Gibbs Graphics, and was still in development. Rudimentary versions of weekly fresh sheets were created and distributed to interested restaurants. Due to the unforeseen technical difficulty of designing an itemized fresh sheet to reflect the available quantities of crops and prices of crops from nearly 20 different farms, it quickly became easier for wholesale buyers to contact farmers directly, rather than wait for CFC to compile the data from farmers, input the data into a "Fresh Sheet" template, and send it to the buyers.
- Streamline purchasing, marketing, and distribution practices at Farmhouse Table regional food hub (goal 3b).  
 Not accomplished. Although great effort was put toward streamlining the ordering process at Farmhouse Table, particularly in light of Farm-to-Chef's goal of increasing wholesale orders, cost and time effective purchasing continued to be a challenge. Many of the cornerstone farms from which CFC orders are difficult to reach, several of

those farms do not use email and must be reached by phone. Ordering for a retail shop, CSA and several small wholesale buyers from 20 different farmers by phone, with phone calls often coming at odd hours continued to be a challenge; In spite of experimentation with new methods and schedules for communication with farmers, the ordering process continued to be time and cost ineffective.

Efforts were also made to streamline marketing: to clarify messages about CFC's five different programs in the minds of local consumers. This continued to be a challenge with many programs and a small staff, juggling many tasks. Distribution continued to be incredibly difficult. With farms as far as two hours away to the north, and one hour away to the south, east, and west, the burden of distribution weighed heavily on CFC. Although Wenatchee Valley College generously provided the use of a large passenger van, the cost in gas and staff time to pick up produce from farms and deliver it to businesses and personal homes throughout Chelan and Douglas Counties was, in short, unsustainable. Simply raising the price of a delivery fee would price the produce out of the margins for many local wholesale buyers and personal households.

- Project evaluation including measurable and anecdotal outcomes.

As the project was cut short, there are few measurable outcomes to weigh. However, anecdotally, the project succeeded in beginning a community conversation between small scale farmers and small scale restaurateurs and retailers. CFC was unable to sustain the needs of the project, as the project took more time than the small staff was able to give while maintaining CFC's other programs. The staffing and financial needs of a project of this scale were, perhaps, quite seriously underestimated by CFC.

While consumers, farmers, and wholesale buyers showed interest in the project, the cost of locally grown produce continues to be a stopping block for many local restaurants and institutions. The small scale farmers burdened with the cost of growing and transporting the produce, are unable to simply cut the price of the food they grow. CFC was unable to solve these problems by becoming a hub, as restaurants most often needed delivery of the product. CFC's limited staff was unable to make those time sensitive deliveries while maintaining its other programs. Additionally, the cost of the staff time and vehicle expense to deliver the produce was not easily solved by an increase in delivery fees, as the buyers' margins were incredibly tight.

The most sustainable way for CFC to facilitate wholesale buying of local produce was through a wholesale discount for small-scale buyers in the Farmhouse Table Local Foods Market. Additionally, CFC was able to put interested buyers directly in touch with local small scale and midsized farms. Creating weekly fresh sheets, distribution, and transportation proved inefficient.

- Encourage project replication in other rural regions of the Northwest

Goal 1a: Increase consumer demand for locally-grown specialty crops in a range of outlets.

2007 CFA was used as benchmark data. 2012 CFA showed similar data. Program terminated before further data could be acquired.

Goal 1b: Increase purchasing of regionally produced specialty crops by wholesale purchasers.

Little data was available as benchmark.

Goal 2: Increase small and mid-sized growers' capacity to sell to regional wholesale markets through education and distribution of 'Tip Sheets.'

CFC found that most small and mid-sized growers in the region are quite well educated on the local wholesale market. In fact, farmer interviews revealed that most of the 20 farms that CFC works with already sell into local restaurants and schools. The farmers were unmotivated to increase those sales due to the tight margins of local wholesale buyers, and the smallness of orders. CFC found that the local wholesale buyers were unable to budge on the margins.

Goal 3a: Facilitate networking and regional trade meetings between specialty crop producers and potential institutional buyers in order to increase larger volume specialty crop sales in the region.

The project had some success in this area. The Farm-to-Table Trade Meeting in May resulted in at least four new buy/sell relationships between farmers and buyers. No other hard data is available. As the sales predominantly happened through direct buyer/farmer relationships, it is not possible to provide exact figures on any increase in sales for small-scale farms.

Goal 3b: Increase the aggregation, distribution, and sales of locally-produced foods in NCS's regional hubs.

No data is available, as the project did not get far enough to even establish a baseline.

## **BENEFICIARIES**

Although the project was not completed, the program succeeded in connecting wholesale buyers with local farms thus creating new business for those farms.

At the Farm-to-Chef trade meeting, CHC knows of 4 buying relationships that were established. It was too early in the program to quantify the rest.

CHC was working to devise an effective way of accurately measuring the program's benefit to producers, but since that had not yet been figured out, all measurements of benefits were anecdotal, not quantifiable.

## **LESSONS LEARNED**

Some of the major difficulties of being an intermediary include different schedules for farmers/buyers, communication, transportation cost and time.

The trade meeting was a very encouraging format for establishing new wholesale buyer connections. The dedication and commitment to quality of the farmers for the buyers was found to be compelling. As far as the role that Farm-to-Chef would play in those relationships after they were established, it was inefficient and not cost effective for Farmhouse Table to be an intermediary in sales. This is where the program became a burden to the organization. One order required the work of more than one person and was more time consuming than expected. Nor did it fit into the ordering system already in place for the other programs.

## **ADDITIONAL INFORMATION**

Income generated by the program was minimal, and immediately reinvested into paying for gas for the delivery van, and additional employee time spent picking up produce from farm sites, and delivering produce for wholesale orders.

## **CONTACT PERSON**

Lara Hays, Board President

Community Farm Connection

[lara@communityfarmconnection.org](mailto:lara@communityfarmconnection.org)

**Project Title:** Providing Extended Season Education and Technology for Specialty Crop Growers

**Partner Organization:** Cloud Mountain Farm Center (CMFC)

### **PROJECT SUMMARY**

Leafy greens are a high-value crop with year-round demand and can contribute to improved farm profitability especially when produced in the spring and fall seasons. However, access to local and regional markets for the majority of Whatcom County specialty crop producers has been limited by lack of information regarding variety suitability and affordable small-scale mechanization. This project provided research and educational resource information to enable producers to overcome the market barriers of seasonality and pricing by: identifying more cold hardy varieties that offer consumer acceptance; extending the harvest into shoulder seasons of spring and fall; developing cropping strategies that utilize more automated equipment than what is currently being utilized; developing farm plans and becoming Good Agricultural Practices (GAP) certified; and developing institutional and wholesale markets that were not accessible because of pricing and production restrictions.

This project was designed to increase domestic markets for Whatcom County specialty crop growers and to serve as a model for other counties by determining effective season extension production technology, suitable varieties for extended season production of leafy greens, and processing techniques to ensure year-round availability. Cloud Mountain Farm Center (CMFC), a 30-year farm recently converted to a nonprofit training center, provided leadership for training and education for new as well as experienced farmers in the region. Matching support from the Community Food Co-op for consumer testing, Nooksack Valley farmers for farmer participation, and Whatcom Community Foundation's Sustainable Whatcom Fund provided funds to purchase large-scale hoop houses and a new specialty seeder and automated harvester. Crop cultivars were tested using certified organic production methods, and CMFC attained Good Agriculture Practices (GAP) certification under this project.

This project was not previously funded by WSDA-SCBG.

### **PROJECT APPROACH**

Ten different leafy greens cultivars were evaluated in replicated field trials in fall 2012 and 2013, and spring 2013 and 2014 at WSU Northwestern Research and Extension Center (NWREC) and Cloud Mountain Farm Center (CMFC). Data included yield, productivity, weed density, and postharvest shelf life. Mechanized production trials were carried out at CMFC to increase proficiency in producing leafy greens using mechanical equipment. Over the course of the project, eight on-farm trials occurred throughout Whatcom County. These trials allowed specialty crop producers to utilize the mechanized seeding and harvesting equipment, trial identified varieties and types, and provide feedback on the production system. In 2014 and 2015, 5068 lbs. of leafy greens were sold into local markets. Sixty-seven trial beds of leafy greens were planted in farm field trials where key production components were identified and evaluated for optimal methods for field preparation, fertilization, irrigation, weed management, seeding density, and harvest and post-harvest practices through these trials.

Results are highlighted in the Appendix (Fig. 1-3, production budget), and have been published in two peer-review journal articles, a WSU Extension Manual, six regional or national conferences, and two newsletter articles. Field day events were held at NWREC (spring 2014) and CMFC (fall 2012, spring 2013, fall 2014) with a focus on GAP certification, varietal selection, small-scale mechanization, weed management, and marketing. A total of 286 participants were present during oral presentations, 106 participants attended field days, and an estimated 1200 were reached via newsletter articles. Through 7/1/15, 2,206 website hits and 649 visitors visited the newly developed website that houses the majority of the information derived from the project. A survey was developed to be administered to wholesale produce purchasers in Whatcom County to collect information on wholesale market demands and logistical requirements of wholesale markets within the region. This project was developed with the understanding that FSMA rules would be released in January of 2013. The scope of the project was partially directed at helping market farmers that rely on leafy green production navigate the food safety issues they were going to face. Part of this focus was on better production methods that have been established. If there is an irony here, it is that the first FSMA rules were published in the last month of this project.

NWREC assisted to organize and host presentations and field day events. CMFC provided field space and labor for carrying out variety and production trials, transportation of equipment, and equipment used for variety trials and for production trials at CMFC and 8 other participating farms. CMFC also hosted a leafy green consumer testing where we surveyed over 40 participants at the CMFC Fall Harvest Day. WSU Whatcom County Extension (WSUE) assisted with field work, seeding, data collection and harvesting at CMFC, data entry and analysis, video development, coordination of outreach events, GAP training, and preparation of outreach materials. WSU NWREC carried out field trials at that

location, including seeding, harvesting, data collection and analysis, and publication of journal articles and Extension manual.

Funds were used solely to enhance the development of leafy greens as a specialty value added crop.

### **GOALS AND OUTCOMES ACHIEVED**

We developed an experimental design for field trials to test varieties for spring and fall production, and we carried out field experiments for two years at two locations (CMFC and NWREC). We routinely evaluated, measured, and recorded results for variety trials, and analyzed data. We worked with participating farmers to review GAP standards and protocols, develop farm plans, and reviewed GAP certification requirements. We trained participating farmers on new production equipment operations and limitations, and health and safety issues. We designed and carried out on-farm production trials for two years with participating farmers, including utilizing new small-scale equipment purchased specifically to support this project. We created a marketing plan and systems tracking plan for participating growers, and we carried out a consumer evaluation test at our local Bellingham Community Food Co-op. We disseminated results from this project to other WSU extension offices and ag-support nonprofits through on-farm trial site field day events and equipment demonstrations at CMFC and NWREC. We published the results from this project in a new WSU Extension manual for baby-leaf salad production and a website <http://vegetables.wsu.edu/LeafyGreens.html>. We developed a lecture that was used in a WSU undergraduate class (Hort 320 Olericulture). We presented results from this study at regional small farms conferences (i.e. Northwestern Washington Sustainable Agriculture Conference, Tilth Producers, and Oregon Small Farms Conference) to provide a new production and market development model for other specialty crop producers throughout Washington.

Our project did not include any long term Expected Measurable Outcomes.

Three goals were established for this project and include: 1.) *Specialty crop producers will gain needed skills by participating in a research project to develop new cropping strategies necessary to successfully cultivate, harvest, and safely market leafy greens through an extended season (April through December), 2.) Data and methodology obtained from this research will be prepared as curriculum and published in WSU Extension facts sheets, web based and conference presentations, and online videos, in order to provide an educational opportunities to specialty crop producers throughout Washington. There is an ongoing, dynamic, and “real time” component to this goal as educational information will be accessible throughout the project through farm walks, routine publication of new web-based information, and other presentations. This project will take advantage of everyone “learning together”, and 3.) Create three new markets and increased purchases of Whatcom-grown leafy greens by converting a portion of their purchases to locally produced greens*

The first goal was achieved through performing variety and production trials in the spring and fall at CMFC, NWREC, and on-farm with farmer collaborators. On-farm trials provided a venue for specialty crop producers to experience the new production methods and varieties as well as see the process of research. Additionally, we implemented consumer testing of products at CMFC harvest event in the fall and at the Bellingham Food Co-op. This helped the project refine the recommended varieties for production in this region.

The second goal was obtained by compiling and analyzing all variety trial data and publishing results in scientific journals, publishing a new production WSU Extension manual for baby-leaf salad greens, and presenting results at farm field days at CMFC and NWREC, American Society of Horticultural Science Conference, Center for Sustaining Agriculture and Natural Resources BIOAg Symposium, Master Gardener State Conference, a lecture in the Washington State University class Hort 320 Olericulture, inclusion of a narrated PowerPoint into the WSU Extension Cultivating Success Beginning Farmer curriculum that is offered statewide, and at the Annual Tilth Producers of Washington Conference. This multi-pronged approach effectively disseminated project results through all available avenues.

Efforts to meet the third goal focused on better understanding leafy green purchasing requirements from supermarket, restaurants, and institutional buyers. This includes everything from consumer taste preferences to logistical needs from purchasers. Multiple meetings and face to face discussions occurred with nine different institutional purchasers to identify specific industry and food safety requirements. A detailed survey was designed to document requirements from purchasers, but several purchasers did not/were not willing to participate in this survey. This left us short of providing results to producers and may delay the ability to reach this goal.

Our first goal was to provide specialty crop producers with skills needed to successfully cultivate, harvest, and market leafy greens in the spring and fall seasons. The benchmark was 0 producers in Whatcom County were meeting this goal,

our target was 10 producers, and over the course of this project, eight specialty crop producers directly participated in the evaluation of new leafy green varieties and with a mechanized planting and harvesting system. These individuals participated in trials on their farms that allowed them to see the scientific process, evaluate the crops under their individual production systems, and utilize equipment needed to reduce production costs.

Our second goal was to publish data and methods obtained from this research as a curriculum, production guide, webpage and on-line videos, and conference power point presentations, in order to create the tools for educational institutions and nonprofit organizations to offer this opportunity to other specialty crop producers in the region. The benchmark was 0 producers in Whatcom County were meeting this goal, our target was 440 producers, and over the course of this project, 286 specialty crop producers directly participated in our outreach events while 649 visitors have viewed our website information. Our WSU Extension publication “Baby-leaf salad green production guide for western Washington” is in press and will be posted on our website <http://vegetables.wsu.edu/LeafyGreens.html>. This seminal publication captures the nuts and bolts of what was learned from field trials carried out through this project. Project results were presented to audiences at the American Society of Horticultural Science Conference, Master Gardener State Conference, Washington Tilt Producers Conference, and the Center for Sustaining Agriculture and Natural Resources BIOAg Symposium.

Our third goal was to create three new markets and increase the sales of Whatcom-grown leafy greens. The benchmark was \$0 earned for leafy greens by producers in Whatcom County, our target was 18,000 lbs. sold of leafy greens with a value of \$58,500 by Sept. 29, 2015. Processing infrastructure for leafy greens crops became operational in June 2014. Leafy greens crops processed and sold via this facility to local wholesale markets were 2068 pounds by Sept 2014, and 3000 lbs. by Sept 2015, totaling 5068 lbs. of leafy greens valued at \$21,539. Four wholesale and institutional markets purchased locally produced leafy greens in 2014, and 15 additional wholesale markets for locally produced leafy greens were identified and purchased product.

### **BENEFICIARIES**

Largely diversified vegetable producers in Western Washington benefitted from this project.

Over the course of the project 392 specialty crop producers participated in outreach events and an estimated 649 visitors visited the newly created leafy greens website. Results from field day post-surveys indicated 93% increase in knowledge and 78% of respondents would “likely” incorporate ideas into the farming operations. In 2014 and 2015, 5068 lbs. of leafy greens were sold into local markets valued at \$21,539. Sixty-seven trial beds of leafy greens were planted in farm field trials where key production components were identified and evaluated for optimal methods for field preparation, fertilization, irrigation, weed management, seeding density, and harvest and post-harvest practices through these trails.

### **LESSONS LEARNED**

We had set the goal of getting several specialty crop producers GAPs certified during the course of the project. The reality, we discovered, is that until markets require producers to be GAP certified, producers will not go through the process. This has played out in other specialty crop production systems. In the processing industries, producers quickly obtained GAPs certification as the centralized processing facilities required it.

Through this project we learned that lettuce was particularly slow to reach maturity in spring and fall plantings, yet lettuce was the crop with the highest demand for baby-leaf salad. As a result, we collaborated with USDA scientists to evaluate germination under cold temperature (40 °F) in a growth chamber of 103 single-parent lineage, homozygous lettuce accessions (53 cos and 50 leaf-type) from the USDA National Plant Germplasm System (NPGS) and six commercial standard lettuce cultivars (three cos and three leaf-type). Overall, an average of 68% of seeds germinated after 7 d and 94% germinated after 10 d. The accessions with the highest percent germination after 7 d have the potential to be used for the development of new lettuce cultivars suitable for an extended, early season production in temperate climates when soil temperature is lower than optimal for lettuce germination. Further studies are underway to assess the ability of these accessions to germinate rapidly under cold field soil conditions.

Identifying and maintaining relationships with specialty crop producers willing to participate in on-farm production trials was an unexpected challenge. While our target number of grower participants was 10, only eight growers participated in the project. Grower interest was low, partially due to crop failures in the first season of on-farm trials in 2013 and growers prioritizing farm operations that already generate income for their farm. Low grower interest in participating in on-farm production trials was addressed by conducting very productive mechanized production trials at CMFC and inviting growers to tour the plantings. Grower interest in GAPs training remains low due to lack of pressure from markets to become GAPs certified. Low grower interest in GAPs training was assessed by directly interviewing five representative growers as to why they did not seek certification. The most common response was “markets do not demand certification”.

### **ADDITIONAL INFORMATION**

There was a total of \$25,000 in matching funds committed for this grant from the Whatcom Community Foundation's Sustainable Whatcom Fund to be used to purchase equipment for the high density seeder and the salad green harvester necessary for the implementation of this project.

WSU Non-recovered F&A is being used as Cost Share for this grant: Year 1 - \$3248; Year 2 - \$3418; Year 3 - \$3911. Total amount \$10,577.

Industry support was provided by the Community Food Coop's Farm Fund. Johnny's Selected Seeds, Osborne Seed Company and Wild Garden Seeds provided seed for variety trials.

Supporting growers who participated in on farm production trials include; Cedarville Farm, Terra Verde Farm, Moondance Farm, Red Mountain Organics, Rabbit Fields Farm, Sage and Sky Farm, Chubby Bunny Farm, Carrot and Stick Farm

Grahn, C., C. Benedict, T. Thornton and C. Miles. 2015. Production of baby-leaf salad greens in the Spring and Fall seasons of northwest Washington. *HortScience in press*.

Grahn, C., B. Hellier, C. Benedict, and C. Miles. 2015. Screening USDA Lettuce (*Lactuca sativa*) germplasm for ability to germinate under cold conditions. *HortScience* 50(8):1155-1159.

Grahn, C., C. Benedict, T. Thornton and C. Miles. 2015c. Baby-leaf salad green production guide for western Washington. Washington State University Extension publication EM095E. 23 p.

Grahn, C., C. Miles and C. Benedict. 2015. Comparing yield of baby-leaf lettuce with Salanova™ 'baby-leaf' head lettuce production in northwest Washington. *HortScience* 50(9):S161.

Grahn, C. M., C. Benedict, C.A. Miles, B. Hellier. 2014. Screening the USDA Lettuce Germplasm Collection for Rapid Germination Rate Under Cold Conditions. *HortScience* 49(9):S242.

Grahn, C.M., C.A. Miles, C. Benedict, T. Thornton. 2014. Evaluating Baby-leaf Salad Greens for Spring and Fall Production in Northwest Washington. *HortScience* 49(9):S320.

### **CONTACT PERSON**

Tom Thornton  
Cloud Mountain Farm Center  
360-966-5859  
[Cloudmt@telebyte.com](mailto:Cloudmt@telebyte.com)

APPENDIX

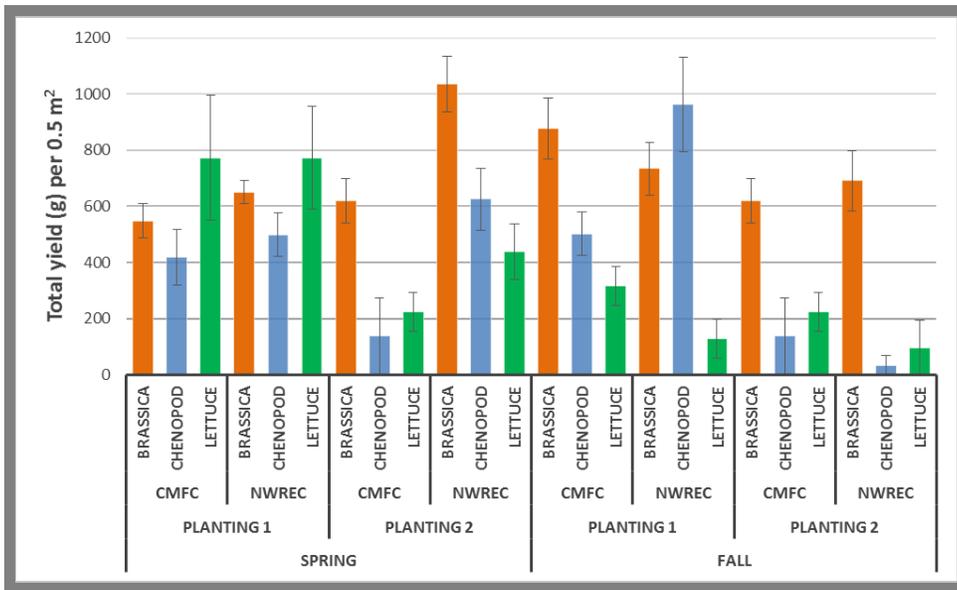


Fig. 1. Mean total yield (g) per 0.5 m<sup>2</sup> by season, planting date, location, and crop type for fall 2012 through spring 2014. Error bars indicate standard error at each location and planting time.

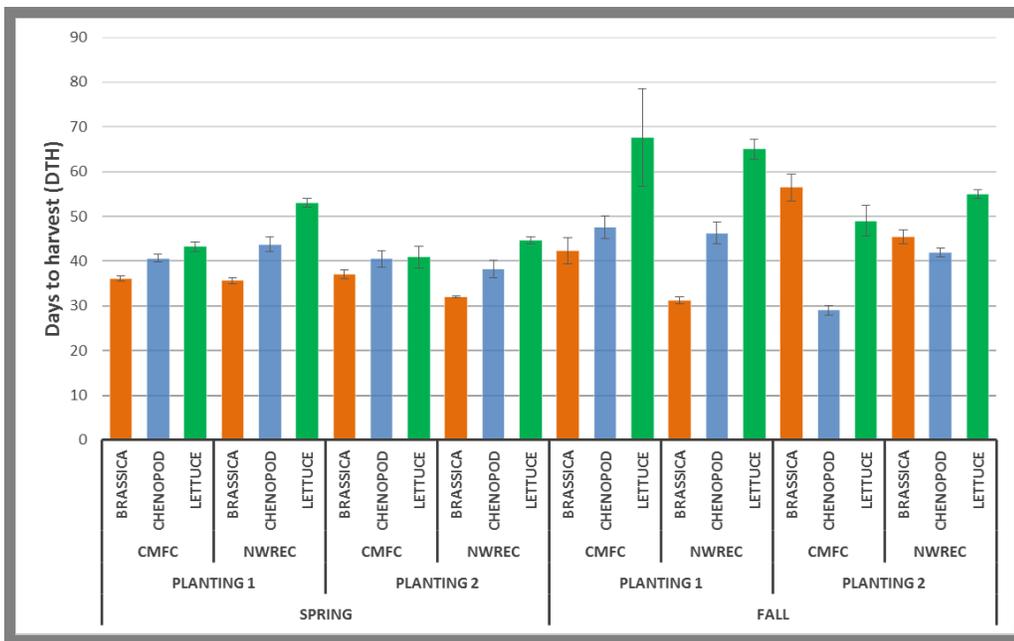


Fig. 2. Mean days to harvest by season, planting date, location, and crop type for fall 2012 through spring 2014. Error bars indicate standard error at each location and planting time.

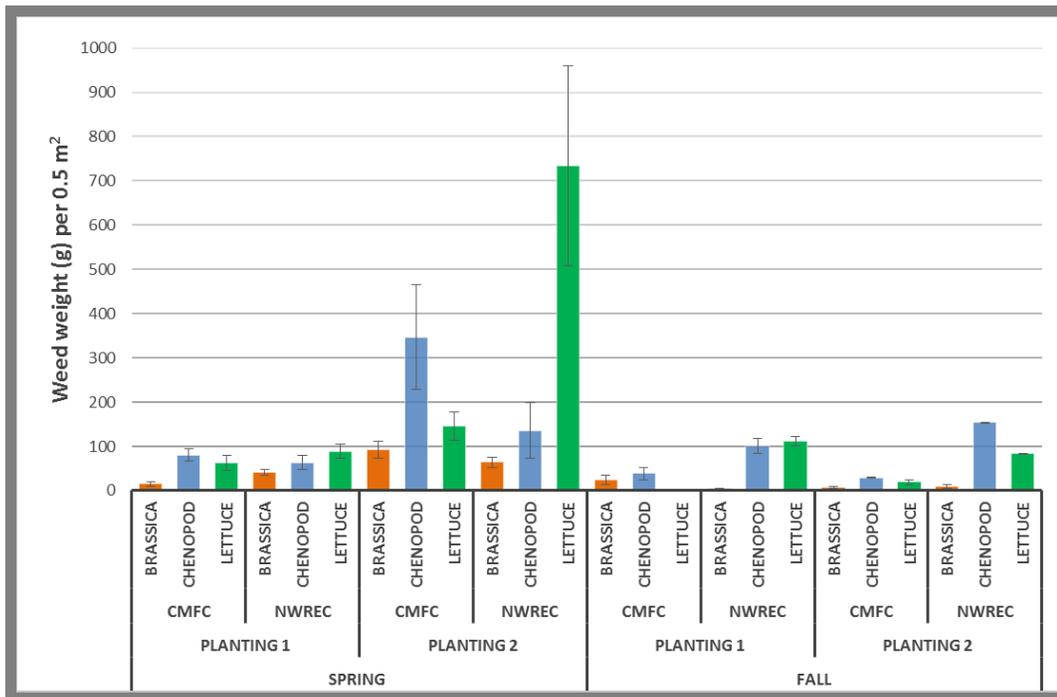


Fig. 3. Mean weed weight (g) per 0.5 m<sup>2</sup> by season, planting date, location, and crop type for fall 2012 through spring 2014. Error bars indicate standard error at each location and planting time.

**Project Title:** Reducing Market Barriers for Sales of Washington and Oregon Floricultural

**Partner Organization:** Seattle Wholesale Growers Market Cooperative (SWGMC)

### **PROJECT SUMMARY**

In 2012, when this project began, approximately 80% of cut flowers sold in the US were imported, mainly from countries with cheap labor costs and government subsidies for cut flower production. Washington and Oregon cut flower farmers had found it increasingly difficult to retain local market share. With country of origin labeling nearly nonexistent, consumers were often unable to ascertain where their flower purchases originated or how they were grown. Aside from direct marketing to the end user, local specialty cut flower farmers had few tools available to differentiate themselves in the market place. In 2011, a group of 12 Washington and Oregon cut flower farmers had formed the Seattle Wholesale Growers Market Cooperative (SWGMC) in order to pool resources to market their products more effectively. The co-op requested funding for this project primarily to help Washington and Oregon cut flower producers overcome barriers restricting their ability to compete in the mass merchandising sector.

This project was designed to help SWGMC survive and grow in its very early years - particularly by opening sales channels to large scale grocery customers. Three years ago, in a region where consumers had made great strides in recognizing and valuing local food, local flowers were largely unrecognized as part of the farm to table movement. Timing was critical to support Washington and Oregon's specialty cut flower farmers in efforts to renovate and rebuild their industry.

For two successive years in 2011 and 2012, SWGMC farmers partnered with Washington State University faculty in a SCBGP project to create curriculum and produce a two-day intensive Cut Flower Growers School. This project built on that initial effort by offering another Cut Flower Growers School in 2013. All three workshops were well attended and received positive reviews from attendees - educating over 140 industry stakeholders in the basics of specialty cut flower production and marketing.

### **PROJECT APPROACH**

At the beginning of the project, SWGMC hired a Mass Merchandising Program (MMP) Manager to develop a program geared toward sales of floral products to grocery chains in the Puget Sound area. SWGMC worked with its staff to conduct a feasibility study and develop a detailed program plan, which was then revised for each year of the project's duration. SWGMC staff worked closely with select floral buyers to develop a number of product lines, including mixed bouquets and growers' bunches promoting popular seasonal crops. The co-op hired contractors to develop branding and packaging that would differentiate its floral products as local and certified sustainably grown. Each year SWGMC conducted outreach to farmers to coordinate production and delivery for the grocery sales program, collected and compiled MMP sales data and polled growers to track project progress. Sales through the MMP were impressive in the first year, meeting 40% of project sales targets. However SWGMC had to take a step backward in developing its MMP program as it lost its primary customer from that first year. The co-op regrouped, replaced its MMP Manager with a person who had a higher level of experience and excellent track record developing local floral sales in grocery, and invested staff time in developing long-term relationships. As a result MMP sales nearly doubled from year two to year three. SWGMC has commitments for continued strong growth next year and beyond.

In coordination with the launch of its Mass Merchandising Program in the spring of 2013, SWGMC oversaw contracts for photography and website development for the co-op - aimed at providing information about local flower farmers and seasonal availability of Washington and Oregon floral products. SWGMC maintained and updated the website - as well as packaging and support materials for its Mass Merchandising Program - periodically, throughout the duration of the project. The website has provided an important communication tool for the growth and development of the co-op generally, as well as supporting the MMP.

SWGMC developed curricula for and held six educational workshops for flower farmers including one two-day Cut Flower Growers School in Washington aimed at educating new and beginning growers; sustainability workshops in both Washington and Oregon; and season extension workshops in both Washington and Oregon. The sustainability workshops were held in partnership with Salmon-Safe and Stewardship Partners and helped flower farmers learn about steps involved in attaining Salmon-Safe certification. SWGMC then oversaw contracts in both Washington and Oregon for Salmon-Safe assessments of 19 Washington and Oregon flower farms - of which 18 subsequently attained Salmon-Safe certification.

With support from Salmon-Safe and Stewardship Partners, SWGMC held Salmon-Safe publicity events at a Portland area grocery store in 2014 and two Seattle area stores in 2015. At these events, SWGMC polled floral consumers about their buying preferences for local and certified sustainably grown floral products. All three events yielded similar consumer feedback. Most were unfamiliar with the Salmon-Safe label, however once educated, many were interested and supportive. The “buy local” message seems to be catching on but there is less customer demand for sustainably grown flowers. For customers to recognize and value Salmon-Safe certified flowers, more work needs to be done to elevate their profile with customers in the grocery setting. Following the 2015 events, SWGMC produced an article which was published in The Produce News, entitled, “Seattle Wholesale Growers Market forges partnerships with Northwest grocery chains.”

The Association of Specialty Cut Flower Growers (ASCFG) provided financial and staff support for a 2012 season extension workshop held in Washington.

Salmon-Safe’s Managing Director, Dan Kent, worked closely with SWGMC to develop and deliver two sustainability workshops - one in Washington and one in Oregon. Stewardship Partners provided additional support for the Washington sustainability workshop. Efforts and support in the form of staff time and printed materials provided by both organizations contributed to a positive response by growers to the Salmon-Safe certification program.

Salmon-Safe provided design for printed in-store signage promoting sustainably grown flowers. Both Salmon-Safe and Stewardship partners provided printed support materials and staff time to plan and execute in-store promotional events.

This project did not benefit other commodities other than specialty crops.

### **GOALS AND OUTCOMES ACHIEVED**

Goal: Increase the amount of floriculture products collectively sold to mass merchandisers:

During the first year of the project, SWGMC invested resources in partnerships with two Puget Sound area grocery chains and made 40% progress toward MMP sales targets. Sales were steady and solid with Town & Country Markets. However, the co-op learned some hard lessons that first year. It had selected PCC as its primary business partner. The store chain had a strong advertising message of supporting local farmers to its customers, but chose not to invest in staff and resources to properly handle and display floral products. After making a concerted effort to educate and foster a sustainable relationship with PCC, SWGMC elected to cut its losses and seek other sales avenues.

In year two, SWGMC regrouped and reworked its marketing and branding strategy. MMP sales numbers took a step backwards to just 17.5% of sales targets as the co-op worked on developing sustainable long term strategies for marketing its products to the grocery sector - with a focus on delivering top quality products and specializing in straight bunches of products that have high consumer appeal and are not easily shipped long distances. Additionally SWGMC invested staff time in developing long-term relationships with companies that have trained staff and adequate facilities for handling floral products, and a strong track record of supporting local farmers.

In year three, SWGMC built on strategies established in year two with steady, but sustainable regrowth.

Goal: Several new jobs will be created as a direct result of this project.

In keeping with the three year trajectory of sales through the MMP, jobs added were strong, achieving nearly half of overall project targets in year one. In year two jobs added numbers fell sharply backwards, then rebounded with solid growth in year 3 for seasonal jobs.

Goal: Increase the sales of flower growers through Salmon-Safe certification and increase the availability of certified sustainably grow local flowers to Puget Sound area consumers.

SWGMC partnered with Salmon-Safe and Stewardship Partners to develop and deliver sustainability workshops in Washington and Oregon - specifically to educate flower farmers about the Salmon-Safe program. SWGMC then contracted with both organizations to provide assessments to Washington and Oregon flower farms. As a direct result of these activities, farmers universally embraced the Salmon-Safe program.

This project had an overall goal of building a self-sustaining Mass Merchandising Program by project completion. SWGMC's overall business growth has been robust over the past three years, with MMP sales accounting for a projected 17% of overall sales in 2015. The program is now on sound footing and set-up to grow on a self-supported basis in future years, providing an important revenue stream for the co-op and its farmer members.

Although shifts in consumer awareness come slowly, SWGMC believes the Salmon-Safe label provides a strategic differentiation in the marketplace - a value which will accrue over time as brand awareness grows.

SWGMC and its partners met and in many cases exceeded all work plan activities geared toward accomplishing project goals. Although not all project goals were attained during the duration of the project, SWGMC projects that revenues and jobs added targets will be attained within the next few years as the self-sustaining Mass Merchandising Program that this grant helped build continues to grow and benefit Washington and Oregon cut flower farmers.

Baseline: Estimated Mass Merchandising annual sales of \$90,000 in 2012. (Actual sales were \$97,800.)

Achievement: \$158,013 (\$130,873 Washington and \$23,118 Oregon).

Target: \$520,000 (\$400,000 Washington and \$120,000 Oregon).

Baseline: No jobs existed for SWGMC's Mass Merchandising Program.

Achievement: .675 year-round full time equivalent jobs (Washington) and 4.2 seasonal full time equivalent jobs (3.95 Washington, .25 Oregon) were added in year 3 of this project.

Target: A total of 3 year-round full time equivalent jobs (Washington) and 8 seasonal full time equivalent jobs (5 Washington, 3 Oregon) to be added as a direct result of this project.

Baseline: One SWGMC flower farmer was certified Salmon-Safe before this project began.

Achievement: 18 flower growers (13 Washington, 5 Oregon) became Salmon-Safe certified by project completion.

Target: 8 flower growers (6 Washington, 2 Oregon) to become Salmon-Safe certified during the project.

Baseline: 19% of products sold to grocery through SWGMC's Mass Merchandising Program were certified Salmon-Safe.

Achievement: 100% of products were certified by project completion.

Target: 50%.

## **BENEFICIARIES**

This project was proposed and administered by farmers in an attempt to help SWGMC, a grass-roots, start up producer's cooperative establish a self-sustaining foothold in the Puget Sound floral marketplace. While they faced many challenges, the farmers felt that accessing large scale buyers was key to the survival and growth of the business and also the most difficult sector to break into without assistance. The challenges turned out to be greater than SWGMC had anticipated and the co-op would likely not have survived its early years without the assistance that this project provided. This project has directly benefited SWGMC's member farmers, their employees and SWGMC staff by providing jobs and helping to create self-sustaining channels for sales of floral products both through the Mass Merchandising Program and the market overall. As the co-op grows, SWGMC expects that USDA's investment in this project will increasingly benefit Washington and Oregon's specialty crop economies for many years to come.

Additionally, many established and beginning farmers of Washington, Oregon and other states benefitted from educational and networking opportunities provided by the workshops that this project funded. Washington and Oregon farms, both within and outside the co-op, benefitted by receiving Salmon-Safe assessments, giving them tools for differentiating their products in the marketplace.

An expanding chain of floral consumers of the Puget Sound area - from florists and event designers to grocery customers - have benefitted by gaining access to increased quantity and diversity of high quality, seasonal Washington and Oregon floral products. Although progress is slow, consumers are changing their buying habits to include more local flowers, as evidenced by the more than 40% year over year revenue growth that SWGMC has experienced in 2015.

This project played a key and timely role in supporting SWGMC through its early startup years and in helping the young producer's cooperative to transition from being owner operated to employing professionally trained management and staff. SWGMC employed 1 year round FTE employee with \$296,800 in sales revenues for 2011. At project completion, SWGMC employs 3.25 year round FTE positions with \$920,000 in sales revenues (\$668,000 from Washington and

\$118,000 from Oregon flower farms) projected for 2015. The company's customer base has grown from 269 to 514 - allowing floral designers and industry professionals at all levels improved access to local floral products. SWGMC projects steady and strong growth to continue in future years as the cooperative establishes itself as the leading wholesaler of local floral products to the Puget Sound area.

200 farmers, florists and industry stakeholders attended and benefitted from 6 workshops supported by this project. Workshops and farm tours were hosted on 5 different Washington and Oregon flower farms, with 20 flower farmers (6 from Washington and 8 from Oregon) compensated for teaching and providing farm tours. 71% of attendees returned post attendance surveys. 94% of respondents indicated that the workshop provided them with information helpful to improving their farm businesses, with 48 respondents specifically remarking on the benefits of learning from other farmers in an "on farm" setting.

19 flower farms in Washington and Oregon received Salmon-Safe assessments, with 18 achieving certification. Although financial benefit measured in increased sales is difficult to quantify, regional and national chains such as New Seasons Market and Whole Foods now recognize the Salmon-Safe label and offer preferential vendor status to certified producers.

### **LESSONS LEARNED**

SWGMC learned some tough business lessons through this project - mainly that it had underestimated the lack of consumer awareness about where their flowers come from and how they were grown, and the heavily price driven nature of grocery floral. Floral is the lowest profit margin and consequently the lowest priority department for most grocery chains. Cheap imported product is abundantly available in the Puget Sound area - both from South America and through the UFG Canadian Flower Auction just across the border. Without educated consumers, even higher end grocery chains claiming to value local farmers take short-cuts in floral. While consumer awareness is changing slowly, SWGMC underestimated the scope of these barriers and the timeline needed to effectively overcome them.

Developing quality business relationships takes both time and discernment. SWGMC's relationship with PCC Natural Markets appeared initially promising, but ultimately was not sustainable because the company did not have trained floral buyers or adequate facilities for handling floral products and chose not to invest resources in building a program. In contrast, SWGMC's relationship with Town & Country Markets has grown slowly and steadily over the past three years - because that company has adequate facilities, values supporting local agriculture and has invested the resources both to educate their customers and to build a long term, sustainable relationship with the co-op. As consumer awareness grows, so does the demand for local floral products. SWGMC is seeing increasing opportunities to develop mass merchandising sales channels. It now chooses new partners slowly and carefully - upholding the farmers' needs to sell their products at profitable price points.

SWGMC has both contributed to and benefitted from a growing "farm to vase" movement in the northwest and throughout the US. Attendees of the workshops that this project funded have established farms and floral businesses, several of which now regularly purchase and sell through the co-op as an increasing network of farmers and florists builds in the Pacific Northwest region.

As it grows, SWGMC continues to provide leadership by example for specialty cut flower farmers around the country. In 2014 SWGMC Board Chair Diane Sukovaty presented on a panel at the ASCFG National Convention in Delaware titled "Cooperative Wholesaling Among Farmers" and has subsequently offered one-on-one mentorship to 5 grower groups around the country interested in the unique collective marketing model that SWGMC offers.

In prior trials and during the first year of the project, SWGMC's Mass Merchandising Program relied mainly on bouquet sales to generate impressive gross revenue. At the end of the first year of this project, SWGMC hired a new program manager with extensive business and marketing experience. Analysis at that point revealed that labor inputs for SWGMC staff to construct bouquets were not profitable. At the new manager's recommendation, the co-op elected to focus on selling straight bunches of grower products for the second two years of the project - significantly reducing gross revenues and short-term jobs added, but building a program which is currently profitable, self-sustaining and growing steadily.

In this process, the farmers of SWGMC learned that grocery floral is an extremely rugged business. Having highly experienced and motivated management, being willing to recognize mistakes and adapt, and taking a slower, steadier approach to building a program have been critical strategies for company survival and growth.

### **ADDITIONAL INFORMATION**

\$4,337 of cash match was provided by the Association of Specialty Cut Flower Growers. Funds were spent on transportation and additional meals costs for workshop attendees of the 2012 Washington Season Extension Workshop.

SWGMC provided a total of \$113,942 in cash match including \$63,625 for building and facilities lease costs (\$15,840 in year 1 and \$47,785 in year 2); \$48,419 for salaries (\$11,024 in year 1 and \$37,395 in year 2) and \$1,898 in bookkeeping expenses.

SWGMC provided \$3,507 of in kind matching funds in the form of co-op member volunteer hours and facilities donations for workshops.

Salmon-Safe contributed a total of \$22,776 (\$19,176 in-kind and \$3,600 cash) matching funds toward this project in the form of grower outreach, assessment coordination and reporting, marketing planning, design services for grower workshops and technical review of grower pesticide use and reduction strategies.

<http://seattlewholesalegrowersmarket.com/>

<http://www.seattletimes.com/business/agriculture/flower-farmers-co-op-is-a-growing-success/>

<http://fieldtovase.com/notes-ascfg-cooperative-wholesaling-panel-jello-mold-farm/>



Denise Johnson, floral staff member at Seattle's Town & Country Markets, discusses the chain's sourcing of locally grown flowers at one of the Meet the Flower Farmer events held in June.

## Seattle Wholesale Growers Market forges partnerships with Northwest grocery chains

By DEBRA PRINZING

With "buy local" sentiments on the rise across all consumer categories, the Pacific Northwest is a region where farmers, ranchers and makers are contributing positively to the economy by telling their story at the cash register.

At the Seattle Wholesale Growers Market, that means delivering local and sustainably grown specialty cut flowers through multiple channels. Established in 2011, the mission of the Seattle Wholesale Growers Market is "to foster a vibrant community marketplace that sustains local flower farms and provides top-quality products and service to the floral industry of the Pacific Northwest."

As a producer-owned cooperative, the market has a cur-

rent membership of 16 flower farms in Washington, Oregon and Alaska. A diverse group of customers, including studio designers, retail florists and mass-market grocers, has embraced the farmer-to-florist wholesale model, said board chair Diane Szukovaty of Jello Mold Farm, based in Mount Vernon, WA. "The market is a dynamic hub for the local floral community. Connecting our customers with the origins of their flowers is a measurable asset that has increased month-over-month, year-over-year," said Szukovaty.

In 2012, the fledgling market received a U.S. Department of Agriculture Multi-State Specialty Crop Block Grant. The \$138,000, three-year grant project, funded through the Washington State Department

of Agriculture and Oregon Department of Agriculture, helped establish SWGM as a reliable source of sustainably grown flowers to regional supermarkets. Grant funds supported additional staffing, marketing, branding and packaging. The grant also paid for each farm to be assessed by Salmon-Safe, a Northwest sustainable agriculture certification program.

SWGM staff worked closely with select floral buyers at independent grocery chains in the region to develop a number of product lines, including mixed bouquets and growers' bunches promoting popular seasonal crops.

One objective of the grant was to track consumer purchasing choices for local and certified sustainable floral products. In 2014, SWGM partnered with Portland, OR-based New Seasons Market for a flower-give-away event. Peterkort Roses, a SWGM member, provided Salmon-Safe certified roses as part of the promotion.

"Our goals were to find out if customers know about Salmon-Safe and if they look for that label when shopping for flowers," said Molly Sadovsky, SWGM manager. "Most customers were unfamiliar with Salmon-Safe; however once we explained what it is, many were interested and supportive."

Last month, Seattle-based Town & Country Markets, a six-store independent grocery chain, hosted two similar Meet the Flower Farmer events. Beautiful blooms spilled from the displays with point-of-purchase signage reading: "Bringing Excited Farmers and Happy Customers Together."

Floral category manager Melanie Cherry, a regular customer of SWGM, said the event "was a great opportunity for our customers and a fun experience for the farmers to see that their hard work is appreciated — and their flowers are loved."

Putting a face on each farmer who grows fresh, safe, unique and local flowers is an added value for Town & Country Markets, Cherry said. "We believe in supporting local farmers. In the past, each of our stores was responsible for finding its own sources for local products. But now that we have a relationship with the Seattle Wholesale Growers Market, each store is assured a reliable source of local flowers with the same choices across our chain. We have a wide mix of customers. We see that they're very interested in where flowers come from and they appreciate and acknowledge local farmers."

Debra Prinzing is the creator of Slowflowers.com and a board member of the Seattle Wholesale Growers Market. She can be contacted at [dprinzing@aol.com](mailto:dprinzing@aol.com).



AUTUMN IS IN THE AIR...  
*fall in love with our*  
**NEW ARRIVALS**

Owl Assortment, Stonewashed Gold, Sea Grass Baskets and Autumn Spice Assortment. View entire collections online.



syndicatesales.com



UPDATES [producersnews.com](http://producersnews.com)

### CONTACT PERSON

Diane Sukovaty  
 Seattle Wholesale Growers Market Cooperative  
 206-290-3154  
[Diane@jellomoldfarm.com](mailto:Diane@jellomoldfarm.com)

**Project Title:** Increasing Regional Organic Farming Capacity

**Partner Organization:** Greenbank Farm Management Group – Agriculture Training Center (GFATC)

### **PROJECT SUMMARY**

This project addressed the need for organic and sustainable farmers to increasingly access, assess, and have the opportunity to develop, appropriate seed choices, which includes high-performing, regionally-adapted varieties of organically grown seed. Within our current seed system, many organic farmers, especially in unique climates, struggle to find organic varieties that meet their production needs and standards and often end up planting widely adapted, conventionally grown varieties instead. While a major part of this issue is the reduced availability of organic varieties, another aspect of this issue is the lack of published variety trials focused on organic varieties, leaving organic farmers without the information they need to make appropriate choices. In addition, the existing seed industry has focused its breeding efforts on proprietary hybrids, leaving the selection of high-performing open-pollinated varieties that farmers can save seed of (and thus further adapt to their unique farm conditions, should they choose to do so) extremely sparse. Finally, many specialty crop farmers do not possess the skills and tools to engage in seed production and variety improvement should they desire to do so.

While the organic food and farm industry has grown exponentially over the past 25 years, the organic seed industry has not experienced the same level of growth and development and, as a result, certified organic farmers often struggle to meet the National Organic Program (NOP) directive to use only organic seed. As organic inspectors increasingly demand organic seed use, as seed costs continue to rise and as seed choices continue to be limited, the need and desire of organic farmers to access, grow, and develop appropriate varieties for their farms and regional organic systems is strong. In addition, the seed industry has experienced tremendous consolidation in the past few decades and many farmers value, and would like to participate in, a decentralized, regional seed system that develops robust OP varieties that can continue to be adapted to individual needs. Finally, as the organic seed industry grows, many farmers may be enticed by market opportunities to incorporate seed production enterprises on their farms.

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

### **PROJECT APPROACH**

This project addressed the issues described above by 1) training and funding farmers in conducting on-farm variety trials to assess new varieties, 2) training farmers in seed-production, 3) training farmers in variety improvement and plant breeding, 4) making specialty seed-cleaning equipment available to regional farmers and 5) creating a community forum for farmers to assist each other in their seed endeavors. In addition, the Greenbank Farm also 6) conducted numerous variety trials with published results and 7) engaged in seed saving and variety improvement projects to help develop regionally adapted varieties.

Specific activities performed and tasks achieved by the Greenbank Farm and project partners during the project period include:

- 11 workshops were conducted around NW Washington with 350 attendees. Topics included seed production, conducting on-farm variety trials, conducting on-farm plant breeding and advanced seed cleaning.
- A mobile seed-cleaning trailer was developed and made available, via an online reservation calendar, for farmers to rent at minimal cost. 10 farmers have rented the trailer so far.
- 13 regional farmers were supported in conducting on-farm variety trials assessing 53 varieties.
- 9 variety trials assessing 89 varieties were conducted at Greenbank Farm and field days were held for regional farmers to view the trials.
- 28 varieties were grown, selected and saved, with seed shared by Greenbank Farm.
- A list serve for WA seed producers was begun to develop an online community of information sharing and support. Currently 52 seed producers have joined the group.
- An online networking tool is being developed that will absorb the list serve group and provide more resources and opportunities. The online tool will include an interactive chat forum, a map of seed producers, seed producer profiles, and a database for seed buyers to connect directly with seed growers. The networking tool is currently undergoing final refinements and will launch in Jan 2016.

A survey of this project's workshop participants was conducted to assess changes in their seed activities over the past three years of the project. 29 responses were received (18%) with these responders reporting the following:

- 26 (90%) reported beginning or increasing seed production activities.
- Of the 7 who stated they currently sell seed commercially, 5 had increased their sales in the past three years.
- 16 (55%) reported they began or increased their on-farm variety trialing activities.
- 14 (48%) reported they began or increased their on-farm variety improvement or breeding activities.

In addition to the survey responses, it is known that several additional producers who did not complete the survey began or increased their seed production, trialing and development activities.

The project's initial goal of also facilitating increased seed marketing opportunities was premature as many farmers who engaged in the project's activities desired more time and experience before engaging in commercial sales. To address this future need of seed producers, the online networking tool is being designed to include facilitating connections between seed buyers and seed producers.

In conclusion, the project has had a significant impact on the number of farmers in NW Washington trained and active in seed production, on-farm variety trials and variety improvement activities. The ongoing resources of the mobile seed-cleaning trailer and online networking tool will continue to facilitate the development of a farmer-based regional seed system that addresses the specific needs of the regions organic specialty crop growers.

The primary project partner was Organic Seed Alliance who 1) taught the majority of the workshops, 2) provided technical assistance to regional farmers with their on-farm variety trials, 3) advised Greenbank Farm in its seed production and variety trial activities, 4) assisted Greenbank Farm in promotion of the project and 5) developed the online networking tool.

Project staff ensured, through conversations with all project participants, that all supported on-farm trials and seed equipment use was only to be used for specialty crops.

### **GOALS AND OUTCOMES ACHIEVED**

The activities completed include, 1) training and funding farmers in conducting on-farm variety trials to assess new varieties, 2) training farmers in seed-production, 3) training farmers in variety improvement and plant breeding, 4) making specialty seed-cleaning equipment available to regional farmers and 5) creating a community forum for seed farmers to assist each other in their seed production endeavors. In addition, the Greenbank Farm also 6) conducted numerous variety trials with published results and 7) engaged in seed saving and variety improvement projects to help develop regionally adapted varieties.

*Outcome #1: Increase the number of Western WA farmers skilled and active in seed research, development, production and marketing, of regionally adapted, organic, specialty crop seed.*

Based on a survey of project participants, 26 reported beginning or increasing their seed saving activities, 16 reported they began or increased their on-farm variety trialing activities and 14 reported they began or increased their on-farm variety improvement or breeding activities. It is known that several other producers who did not respond to the survey also began or increased these activities. With only 18% of project participants responding to the activity survey, it can be assumed that many more of them increased their seed production activities as well.

*Outcome #2: Western WA organic farmers will have access to, and be able to contribute to, variety trial information focused on specialty crop varieties adapted to organic conditions in western WA.*

The project supported 22 trials (9 at Greenbank Farm and 13 at regional farms) of 142 varieties and the results are (or will be) available to the public (2015 data will be published 12/15/15). With more farmers trained in variety trialing and a networking tool developed, the sharing of variety trial information should continue to increase.

*Outcome #3: Western WA organic farmers will have greater access to regionally grown and adapted organic specialty crop seed.*

76% of survey respondents reported recognizing an increase in the availability of regionally grown and/or adapted seed and 93% reported increasing their use of this seed. With 90% of respondents growing seed and 48% engaged in crop improvement activities, the availability and access to regionally grown and adapted seed should continue to increase. In addition, Greenbank Farm grew 28 varieties of specialty crops to seed and has made them available to the public.

*Outcome #4: More Western WA farmers will be growing and selling organic specialty crop seeds commercially and will be doing so efficiently and profitably through the shared use of the seed production tools.*

While 5 survey respondents reported increasing their commercial sales of seed, this outcome was deemed premature for this project. Most participants need several years of experience with seed production to engage in successful commercial sales. While this outcome was not achieved during this grant period, project staff continue to believe it will be a long-term outcome of this project. To facilitate a future increase in Western WA farmers selling seed, the online networking tool is designed to include facilitating the connection between buyers and sellers of seed.

All activities established for the project were completed with the exception of the development of a collaborative producer group to market seeds and its associated winter planning meeting. This was deemed a premature goal and funds were used instead to develop an online networking tool to, in part, facilitate future seed sales and collaborations.

<b>Outcome</b>	<b>Baseline data</b>	<b>Target</b>	<b>Achievement</b>
Farmers saving seed	Unknown	Increase of 30	30+
Farmers selling seed	23 (WSDA organic)	Increase of 20	5+
Farmers doing variety trials	Unknown	Increase of 15	16+
Farmers breeding	Unknown	Increase of 10	14+
Variety trials published	Unknown	+ 45 crops / 225 varieties	+ 22 trials / 142 varieties
Regionally grown/adapted seed	Unknown	+ 30 varieties	+ 28

While the project encountered challenges recruiting farmers to conduct variety trials (most claiming time limitations) and the goal of increasing commercial sales was deemed premature, the project reached its targets for farmers engaged in seed production, trialing and breeding work.

### **BENEFICIARIES**

The beneficiaries of this project are the 157+ organic specialty crop growers of Western WA who participated in the project and received seed production training, variety trial training and support, crop improvement training, accessed seed cleaning equipment, accessed networking opportunities and accessed variety trial reports. With the mobile seed trailer and online networking tool continuing as long-term regional resources, other farmers will inevitably continue to become beneficiaries in the future as well.

- 350 attendees to regional workshops (157 unique individuals)
- 10 farmers rented the mobile seed cleaning trailer
- 13 farmers were supported/funded in conducting on-farm variety trials
- 52 people have joined the online discussion group
- No economic impacts were assessed

### **LESSONS LEARNED**

Lessons learned by project staff include the recognition of both the desire of regional farmers to engage in on-farm research (i.e. variety trials) and the challenges they face in making the time and effort to accomplish these activities, even with financial incentives. Many farmers initially expressed interest in conducting on-farm variety trials but later decided not to take it on. With an original target of 30 farmers conducting trials, only 10 of the 13 farmers who did take it on were able to complete the activity. One idea is that in future projects, on-site technical assistance may result in greater farmer success and follow through than technical assistance made available solely over phone and email.

Another challenge of the project was understanding and meeting the insurance requirements of the mobile seed-cleaning trailer. Standard insurers did not want to insure the trailer, traditional rental equipment insurers were reluctant to start a policy with an organization that has only one piece of rental equipment and requiring renters to possess appropriate insurance coverage limits the number of farmers who can rent it.

Positively, most participants were very enthusiastic about the workshops and demonstrated eagerness to put their new knowledge into practice.

While the primary focus of the grant was to reach NW WA regional farmers, the students of the Organic Farm School at Greenbank Farm, with their privilege of proximity to many of the grant activities, were some of the most impacted beneficiaries. Many of them stated that, despite not considering it before the program, they would include seed production as an important component of their future farms, and several of them have put this into action. In addition, through the

growing of variety trials on the OFS Student Farm, OFS students develop strong skills in conducting randomized, replicated trials for on-farm research, many of which identified this as a key skill learned in their exit interviews.

The primary unachieved outcome was increasing the number of new seed producers selling seed commercially. The vast majority of project participants were beginning seed producers who did not possess or develop the experience or confidence to engage in commercial sales in the short time frame. As a result, the anticipated creation of a collaborative seed production and marketing group did not materialize as well. In future projects, expectations for growers to adopt new enterprises should be long-term with an understanding that farmers must experiment, practice and evaluate for several years before being willing to scale up to commercial levels of production. While this outcome was not substantially achieved during this grant period, project staff continue to feel as though it will be a long-term outcome of the project.

### **ADDITIONAL INFORMATION**

16. Provide the total level of cash or in-kind matching donations utilized for your project. Describe the amounts, sources and ways in which the donations were utilized.

Cash Match:

Office supplies	\$648.87
Bookkeeping	\$2,520.00
Farm assistant	\$6,110.75
Publication costs	\$666.00

In-Kind Match:

Facility rentals	\$1,250.00
<b>Total</b>	<b>\$11,195.62</b>

All matches come from the Greenbank Farm. Matching funds were less than anticipated because 1) email was used exclusively (not traditional mail as planned) for all communications and 2) less events were held at the Greenbank Farm than expected. While the grant was written with the expectation that all events would happen at Greenbank Farm, it was later determined that more farmers would be better served by hosting events in multiple locations around the region.

Greenbank Farm project website: <http://greenbankfarm.biz/seed-project/>

(Contains all project information including variety trial links, mobile seed trailer reservation site and links to list serv.)

### **CONTACT PERSON**

Sebastian Aguilar

Greenbank Farm Management Group

360-222-3171

[Trainingcenter@greenbankfarm.com](mailto:Trainingcenter@greenbankfarm.com)

**Project Title:** Farmer-Buyer Trade Meetings

**Partner Organization:** Cascade Harvest Coalition (CHC)

**PROJECT SUMMARY**

Washington state specialty crop producers who want to connect with local food buyers often do not have the time or skills necessary to develop successful business relationships. Farmer-Buyer Trade Meetings are a series of fifteen networking and educational opportunities designed to directly connect local producers with local food buyers, create new market relationships, and expand sales opportunities for farmers. Farmer-buyer trade meetings are timely because there is rapidly growing consumer demand for local specialty crops in retail, institutional, and foodservice markets and facilitated networking meetings are a cost- and time-effective method of connecting specialty crop producers and local buyers.

Of particular importance, as regional sourcing expands, so does the information, resources and skills needed by farmers if they are to take advantage of growing market opportunities. There is a significant gap between the purchasing requirements of retail grocers and institutional buyers and the ability of small- and mid-sized producers to meet those requirements. Education is needed on a broad range of subjects, such as packaging, labeling, third-party certifications, GAPs and other food safety certifications, SKUs and bar codes, etc. Trade meetings offer the opportunity for producers and buyers to be in the room together – a lot of problem solving is done face-to-face in addition to building new business relationships and sales.

Farm-to-Table workshops are structured to provide a range of education, networking and marketing opportunities for the diversity of producers and food buyers in Washington. This includes small farmers just starting out to larger producers looking for more diversified markets, and from small restaurant chefs looking to source locally for their customers to large food service operations serving many retail and other institutional buyers like school districts and hospitals. Perhaps the most valuable aspect of all the trade meetings is the ability of producers to introduce themselves, get visibility and exposure for their products, and credibility as producers to a wide diversity of buyers interested in sourcing locally. The trade meetings have also provided important opportunities for producers to showcase new specialty crops. As years of participant feedback demonstrates, these events are critical in creating the opportunities for these connections to be made.

Washington Specialty Crop Farmer-Buyer Trade Meetings are a series of 15 networking and educational meetings to connect local specialty crop producers with local retail and institutional buyers and educate both on a variety of communication, marketing and food safety issues. The goal is to increase specialty crop sales in Washington by facilitating strong, long-lasting, successful business relationships. The meetings build on a successful 9-year history and will include a number of new and emerging opportunities for broadened farmer-buyer participation and sales. Five Farm-to-Table workshops will be held each year serving at least 1,050 specialty crop producers over the three year project. New sales made at the trade meetings are expected to generate approximately \$840,000 dollars in additional specialty crop farmer income. The collaborative planning team has extensive experience planning and facilitating successful trade meetings and building farmer-buyer sales relationships.

The project builds on many years of successful collaboration between Cascade Harvest Coalition and Sustainable Connections, along with a myriad of other groups and individuals around the state, to host farmer-buyer trade meetings through a FY09 SCBGP grant. The collective farm-to-table efforts have allowed us to create a “clearinghouse” for farmer-buyer trade meetings in the state, which has helped make planning, outreach, execution, and follow-up more efficient and effective. Data collected during fall 2009 to winter 2012 indicate total attendance at the farmer-buyer trade meetings of 1,210. Estimated sales from specialty crop producers totaled \$40,960 for the same period with expected sales of an additional \$266,720. Project goals of sales and new business connections have been met each year. CHC has also exceeded estimated matching contributions from both collaborative partners and community supporters.

**PROJECT APPROACH**

*Event Details & Planning Process:*

The planning process for each Farm-to-Table workshop follows proven formats that allow for flexibility (reflecting seasonality, venue availability, resource availability, producer and buyer participation, etc.) and collaborative partner suggestions on relevant and emerging production, marketing and distribution issues. Extensive targeted outreach was conducted for each event and web-site support was developed for all events to serve as a clearinghouse of information on dates, locations, etc. Target audiences for these events included: specialty crop farmers/producers (immigrant and

nonimmigrant farmers, food artisans, bakers, vintners, and food processors among others); buyers (grocers, restaurateurs, chefs, schools, hospital, nursing home and prison food service managers); and agriculture support organizations. A multi-media outreach plan was deployed, blending traditional methods with social networking and web based campaigns.

The format for Trade Meetings was as follows:

- 1:00-1:15 Sign-in
- 1:15-1:25 Opening remarks, review of the day
- 1:25-1:40 Participant introductions
- 1:40-2:40 Panel discussion
- 2:40-3:10 Question and answers, open discussion of focus topics
- 3:10-3:55 Open networking
- 3:55-4:00 Wrap-up and evaluations

This agenda format was designed to balance participant introductions, expert panel presentations and open networking time. Each workshop was held on a Friday or Monday afternoon, as this time and day of the week was determined to be the most conducive for producers and buyers to attend.

The purpose of the “Introductions” was to break the ice, showcase the diversity of interests represented by the attendees, and to give each attendee a moment to share goals for the day and establish preliminary framework for later discussion (e.g. if multiple people mentioned distribution as an issue, then distribution would become a focus topic for the panel and for discussion.)

The “Panel Discussion” was a chance for local experts from both the producer side and the buyer side to present personal experience accounts of challenges and success selling and buying locally. The accounts provided working models of success, which spurred group enthusiasm, and helped ground the general concept of a more localized food system with concrete examples.

The “Open Networking” period was an opportunity for participants to actively form new sales and communication relationships with each other. Some tools to help facilitate conversation were provided (see attachments): examples of “Fresh Sheets” from farms that have successful direct sales techniques; examples of “Intent to Buy” sheets from local grocery stores that have successful relationships with local farmers; examples of menus that highlight local ingredients from restaurants that work directly with local farmers; “Tips for Connecting Local Farmers and Local Buyers”, a document created by Chefs’ Collaborative.

Overall, this agenda format was successful and helped buyers and producers communicate more effectively and learn how to work with one another.

*Schedule of Events*

Date:	Event:	City:	Partnering Organizations:
1/17/2013	South Sound Food Summit	Tacoma, WA Counties: Pierce, Thurston, Mason	University of Puget Sound, Tacoma Farmer's Market Association, Tacoma Regional Tourism Board, Healthy Communities of Pierce County, Tacoma Community Gardens, (NABC)
2/22/13	NW WA Farm-to-Table Trade Meeting	Bellingham, WA Counties: Whatcom, Island, Skagit, San Juan	Sustainable Connections, NABC
3/21/13	Farm to Buyer Meet and Greet	Wenatchee, WA County: Chelan	Community Farm Connections

4/16/13	Olympic Peninsula Farm-to-Table Trade Meeting	Sequim, WA Counties: Jefferson, Clallam	WSU Clallam and Jefferson County Extension Offices
12/9/13	South Sound Farm-to-Fork	Lacey, WA Counties: Thurston, Mason, Grays Harbor	WSU Thurston County Extension Office, Enterprise for Equity, Olympia Farmers Market, South Sound Fresh, Thurston County Fairgrounds
2/17/14	NW WA Farm-to-Table Trade Meeting	Bellingham, WA Counties: Whatcom, Island, Skagit, San Juan	Sustainable Connections, NABC
5/7/14	Farm to Buyer Meet and Greet	Colville, WA County: Stevens, Spokane	LINC, WSDA Farm to School Team, WSU Extension
1/30/15	North Central Washington Farm-to-Table Trade Meeting	Okanogan, Chelan, Douglas	Okanogan Producers Market Association, Tilth Producers of Washington, Puget Sound Food Hub, Applecart Fruits, 21 Acres, WSDA GAPs, RMA, WSU Extension
2/9/15	Northwest Washington Farm-to-Table Trade Meeting	Whatcom, Skagit, San Juan	San Juan County - Peggy Bill, WSU Extension - Candice, WSDA Farm to School, Sustainable Connections, NABC
2/27/15	South Sound Farm-to-Table Trade Meeting as part of the 2015 Pierce County Farm Forum	Pierce, Thurston, Mason	Pierce County, WSDA, WSU Extension, NABC, PCD, FarmLink
3/20/15	West Sound Farm-to-Table Trade Meeting	Jefferson, Kitsap, Grays Harbor	KCAA, KCD, WSU Extension - Jefferson, WSU - Kitsap
3/27/15	Eastern Washington Farm-to-Table Trade Meeting	Spokane, Stevens	Tilth Producers of Washington, LINC, WSDA Farm to School & GAPs, WSU Extension
4/24/15	South Eastern Washington	Walla Walla, Franklin, Benton	Tilth Producers of Washington, WSDA Farm to School & GAPs, WSU Extension
	Farm-to-Table Trade Meeting		
9/25/15	South Sound Trade Meeting - Thurston County Request	Thurston, Mason	Thurston County, Evergreen College, Thurston Food Council
9/28/15	Southwest Washington Farm-to-Table Trade Meeting	Clark, Lewis, Cowlitz, Skamania	WSU Extension, Clark County, Lewis County Land services, Organically Grown Company

*Attendees for 2013:*

<b>Event Attendees</b>	<b>2013</b>
Total Attendees	436

Specialty Crop Producers	58
Buyers	60

*Attendees for 2014:*

<b>Event Attendees</b>	<b>2014</b>
Total Attendees	135
Specialty Crop Producers	65
Buyers	32

*Attendees for 2015:*

<b>Event Attendees</b>	<b>2015</b>
Total Attendees	364
Specialty Crop Producers	118
Buyers	86

Total attendance at all 15 Farm-to-Table events was 935, of which 241 were unique specialty crop producers and 178 were unique buyers (some producers and buyers brought more than one person to each event). The remaining attendees included other producers, ag service providers, educators, lenders, nonprofits and community members.

Our partners provided significant contributions to all of the Farm-to-Table trade meetings hosted. Contributions include, but are not limited to: staff time, community networking, direct relationships with buyers and farmers, volunteer support, administrative support, program content and marketing.

Most importantly partner organizations lend local credibility and have direct relationships with the communities we are seeking to serve. They understand local issues at an in depth level. Collaboration allows for these partnerships to achieve together what would be difficult or impossible to achieve alone given financial constraints and/or lack of staff time and knowledge of each community's unique challenges.

Sustainable Connections in particular was a great partner leading on-the-ground organization for the annual Farm-to-Table workshop located in the Northwest Puget Sound region. CHC has built a strong network of dozens of industry stakeholders and other individuals and organizations around the state. These include a wide diversity of specialty crop producers, retail and institutional food buyers, ag service providers, community non-profit organizations and educators who help with outreach, serve as speakers on panels, and provide input and insight on emerging issues of relevance to both specialty crop producers and food buyers.

To ensure that WSDA funding is only reaching specialty crop producers we use program fees and sponsorships to cover costs for any non-specialty crop producers.

**GOALS AND OUTCOMES ACHIEVED**

The goals of this project are to increase income for Washington specialty crop producers and increase the number of business relationships between local specialty crop producers, local buyers, and supporting agricultural organizations. Measurable Targets include: (1) Income for Washington specialty crop producers will be increased by an average of \$800 in new sales per trade meeting participant per year, and (2) the number of business relationships between local specialty crop producers, local buyers, and supporting agricultural organizations will be increased by an average of two new business relationships per trade meeting participant per year.

After each trade meeting, participants filled out an exit survey to estimate the number and dollar value of connections they made at the meeting. At three and eight months after each trade meeting, participants will be asked to fill out an online survey to determine how many lasting connections they made and the value and nature of sales resulting from those connections.

*Target 1: Increased income for local producers.*

This project increased income for local producers by directly connecting them with interested buyers and facilitating development of sales relationships through exercises, open networking, and follow-up discussions. Follow-up surveys conducted in August 2015 show almost \$7,000 in sales of local farm products resulting from connections made at the meeting. Responses to follow-up questions also show that a majority of attendees anticipate future sales resulting from connections made at the workshop, with many expecting sales to occur in the next fiscal year.

*Target 2: Increased business relationships*

This project increased the number of business relationships for local producers by directly connecting them with interested buyers and facilitating development of sales relationships through exercises, open networking, and follow-up discussions. Follow-up surveys conducted in August 2015 show between 2-5 connections made at the meeting, resulting in an increase of sales.

*Increased market share for locally produced food.*

The workshops helped increase the market share for locally produced food by bringing together a broad spectrum of food buyers and local food producers to discuss the benefits and advantages of sourcing local food over traditional food sourcing through corporate services and brokers. Buyers that attended the workshops represented school districts, healthcare and hospital food service, grocery stores, restaurants, distribution companies, home delivery companies, buying clubs, and everyday consumers. At the workshops, Cascade Harvest Coalition distributed nine unique pieces of educational materials that explained the benefits of buying local food and why local food should have a greater market share. The sales made from connections established at the workshops also helped increase the market share of locally produced food. Anticipated future sales will increase market share further.

*Increased understanding of how to successfully market the products of a farm business to buyers.*

Developing a successful marketing strategy can be one of the most difficult tasks for a farmer. The workshops helped increase farmers' understanding of how to successfully market their products to local buyers by giving them customizable, proven tools and best practices, presenting speakers who had successfully marketed their farm products, and directly discussing with buyers which methods are most effective.

*Increased understanding of how buyers can successfully work with growers.*

The workshop format was designed to encourage buyers to talk directly with local growers about ways that buyers can help create successful sales connections. For the first two workshops, the meetings followed an agenda format designed with activities that encouraged interaction and conversation between producers and buyers on various topics, including marketing strategies, product quality, distribution, value added processing, cooperative business arrangements, etc.

The goals for this project were to facilitate 15 Farm-to-Table Trade Meetings across Washington State, providing real opportunities for regional farmers and food buyers to develop long term, economically beneficial relationships. Secondly, we aimed to provide training and information for farmers to be prepared to sell directly to wholesale buyers, including information on Good Agricultural Practices and marketing tools to sell specialty crop products at various scales. Actual accomplishments included 14 Farm-to-Table trade meetings and one informal meet and greet.

Training provided at these events included: entry into wholesale and institutional markets, on farm best practices for certification of WSDA GAPS, introduction to value added processing, marketing, food distribution and aggregation models such as food hubs, on farm agri-tourism, starting a successful CSA business and innovative funding models.

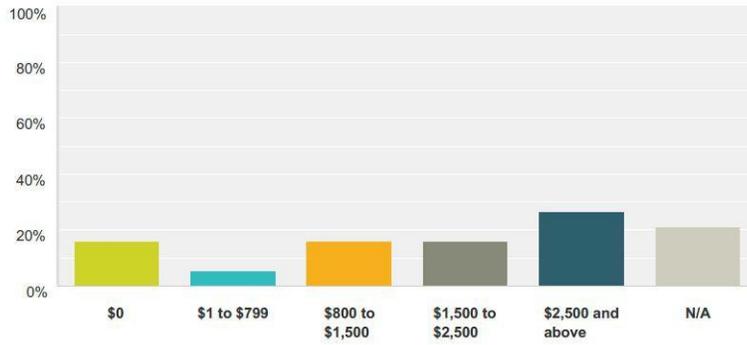
The timeline for the trade meetings shifted due to staff transitions, but we were able to accomplish all targeted activities and goals within the project timeframe.

Concrete sales are hard to capture at the event unless a handshake agreement or forward contracting deal is made. Thus, much of the sales data are captured during follow up survey work. The data show that farms with well-developed marketing and distribution infrastructure find the most success at these meetings - averaging between \$1,500 and \$2,500 in sales. Smaller, less developed farms averaged closer to \$450 in sales. However, smaller farms reported the most new connections made, averaging around six to eight new relationships. Although the sales numbers for smaller farms are low, survey results showed that they value the meetings and are making more connections to buyers with follow up sales potential.

On average producers made between two and five connections during trade meetings, well exceeding our goal of two new business relationships per trade meeting.

**Q6 Estimated valued of SPECIALTY CROPS sold during this growing season. Estimated value is greatly appreciated.**

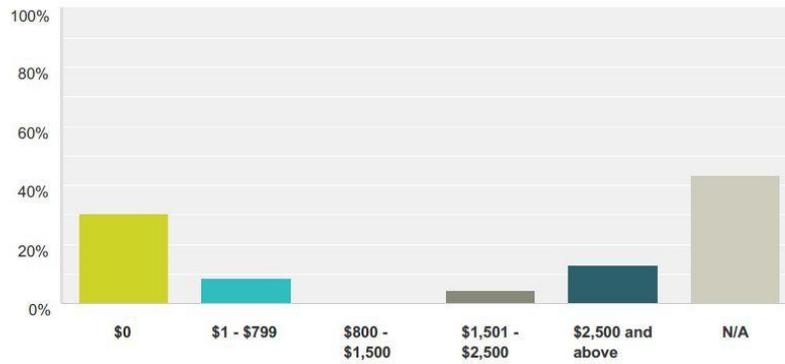
Answered: 19 Skipped: 11



Answer Choices	Responses
\$0	15.79% 3
\$1 to \$799	5.26% 1
\$800 to \$1,500	15.79% 3
\$1,500 to \$2,500	15.79% 3
\$2,500 and above	26.32% 5
N/A	21.05% 4
<b>Total</b>	<b>19</b>

**Q8 ESTIMATED value of specialty crops bought through connections made at Farm-to-Table Trade Meetings. Specialty crops include fruits and vegetables, tree nuts, dried fruits, herbs, honey, horticulture, floriculture and nursery products.**

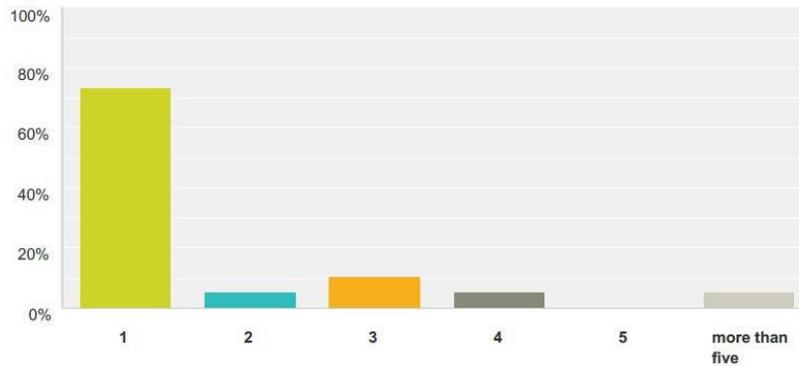
Answered: 23 Skipped: 7



Answer Choices	Responses	
\$0	30.43%	7
\$1 - \$799	8.70%	2
\$800 - \$1,500	0.00%	0
\$1,501 - \$2,500	4.35%	1
\$2,500 and above	13.04%	3
N/A	43.48%	10
<b>Total</b>		<b>23</b>

**Q5 Approximately how many vendors did you sell to based on connections made at the trade meeting you attended?**

Answered: 19 Skipped: 11



Answer Choices	Responses	Count
1	73.68%	14
2	5.26%	1
3	10.53%	2
4	5.26%	1
5	0.00%	0
more than five	5.26%	1
<b>Total</b>		<b>19</b>

**BENEFICIARIES**

Approximately 1,050 specialty crop producers from around the state were targeted for participation in trade meetings across the duration of this project and learned how to overcome key barriers to new markets and develop new sales connections. Buyers find one-on-one opportunities to make connections at Farm-to-Table Trade Meetings a very valuable tool to find, source and sell local food products.

The number and distribution of workshops was intended to help build local capacity and resources for these types of trade meetings in areas where both established and emerging market opportunities exist. Throughout the period of this project, community demand has increased and can be seen by requests from specific areas including South Puget Sound communities as well as Eastern Washington

*Quotes from participants:*

"Yes...we want to serve local food as much as possible. The session allowed us to meet about 10 producers in 1 hour. Great use of time. We want to support people doing interesting crops, products...we found fiddle head ferns, mushrooms, Andean root crops. Not sure how we would have found these folks on our own." Buyer, Olympic Peninsula Farm-to-Table

"I have been trying to recruit Nash's to deliver to my co-op for over a year. This face to face connection allowed us to finally start looking at the logistics of making that possible." . Buyer, Olympic Peninsula Farm-to-Table

"Fabulous...I wasn't sure how the speed dating would go, it was the best part for us. Nice to have a place to do this on a more regular basis...bring buyer and producer together." Specialty Crop Producer, NW WA Farm-to-Table

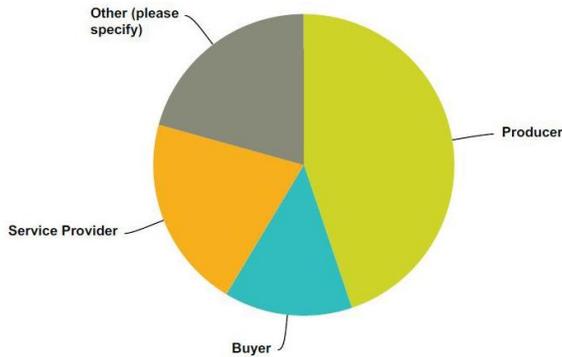
Due to changes in staffing in the middle of this project, we only have obtained follow up data from the last year of participants. However we can extrapolate the economic impact of the project based on this data as well as the number of specialty crop producers that participated in the project.

In the last year of the project, 118 Specialty Crop Producers participated. 37 of them completed the survey averaging \$1500 in new sales and 3-5 new connections. Using this data we can predict that the same percentage of SCP may report for the whole project and demonstrate a similar average.

Over the course of the project there were 241 unique producers. Using the formula above, we can estimate that the total number of sales could have averaged \$112,065 in increased sales ( $[\frac{37}{118}] * 241 * 1500$ ) and the number of connections made would be 298.

**Q3 Which best describes you:**

Answered: 29 Skipped: 1

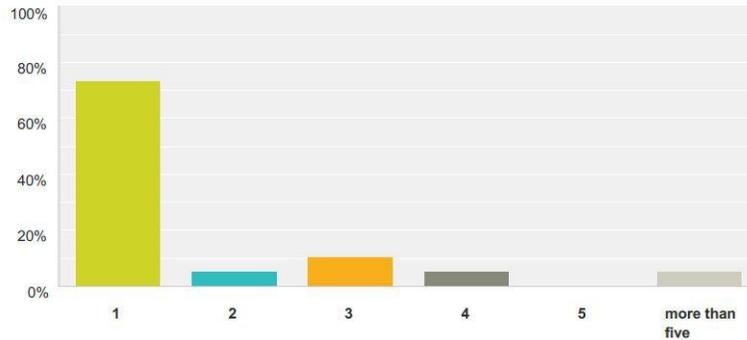


Answer Choices	Responses	
Producer	44.83%	13
Buyer	13.79%	4
Service Provider	20.69%	6
Other (please specify)	20.69%	6
<b>Total</b>		<b>29</b>

#	Other (please specify)	Date
1	Co-op of farmers/producers/consumers	9/19/2015 7:13 AM
2	President, KPC Farm Council/KP Farm Tour	9/18/2015 3:24 PM
3	Producer/CD employee	9/18/2015 1:35 PM
4	Pierce County Staff - Agriculture Program	9/18/2015 12:43 PM
5	Board member	9/18/2015 12:22 PM
6	federal government employee	9/18/2015 12:14 PM

**Q5 Approximately how many vendors did you sell to based on connections made at the trade meeting you attended?**

Answered: 19 Skipped: 11



Answer Choices	Responses	
1	73.68%	14
2	5.26%	1
3	10.53%	2
4	5.26%	1
5	0.00%	0
more than five	5.26%	1
<b>Total</b>		<b>19</b>

**LESSONS LEARNED**

Clear and definable obstacles begin to emerge from survey results and one-on-one conversations with buyers and farmers. At the forefront for producers is overcoming the barrier of access and distribution to wholesale markets. And for buyers we see similar impediments - difficulty engaging smaller, local farms due to time constraints and distribution difficulties.

Continuing to steward and develop relationships with producers and buyers after trade meetings allows us to provide introductions and entry points for producers long after the event has concluded. The impact of these ongoing relationships is invaluable. It is unclear how to capture the financial impact of these ad hoc connections, but they are real and significant to the scope of this grant.

Data collection is difficult. We are currently working to find better ways to engage participants and get more data from a broader range of participants.

## Q10 What is the main barrier to carrying local food in your business?

Answered: 8 Skipped: 22

#	Responses
1	Cost and over saturation of the same crops
2	NA
3	We provide an online marketplace for consumers to purchase from local farmers & producers and coordinate all farmer deliveries to distribute to individual purchasers. It takes considerable management to operate a system such as ours yet we function solely on volunteer management. Sadly this is ultimately unsustainable. Farmers set their own prices, we charge them 10% of sales up to a max of \$15 per week & consumer members pay an annual membership fee. While this pays our overhead costs, we continue to depend on intensive management voluntarily donated by a hard working board of directors. Our inability to adequately compensate a manager will likely be our demise. Our system works beautifully...farmers vastly prefer it to farmers markets, consumers like it, but we need operational funding to compensate our skilled management or we won't survive even after five years in operation. If we fail it will negatively impact our small farming community.
4	you question is squed to veggie farmers, I'm a dairy farmer. I made a lot of contacts with others at the meeting and really enjoyed the presentations. It was a very good meeting. And I did wind up being able to sell some cheese too... ;-)
5	Finding local sources who have their USDA organic certification. We will always buy local when we can if it is available.
6	Lack of year round availability.
7	Schools are not in session during peak harvest...I would buy all year if I could
8	na

## Q7 What is the main barrier you face selling wholesale?

Answered: 10 Skipped: 20

#	Responses
1	NA for question #5.
2	Low wholesale prices. It's tough to compete with large scale producers.
3	Price and market
4	facetime with the decision maker.
5	N/a
6	key contacts keep changing, need to build new relationships
7	The price being high enough to cover my cost let alone make a profit.
8	On Key Pen farms are small, and barely produce enough to sustain Fresh Food Revolution. A better coordinated program would need to be developed to expand.
9	labor for harvest and delivery
10	I had to answer questions 5 and 6 but I am not a producer

Due to staffing changes during this reporting period, as well as a lag in hiring and onboarding, many of our follow up trade meetings will be held in the final year of the grant. However these trade meetings did deliver on the goals and objectives of the grant.

Since the foundations for future trade meetings had been made primarily only in the Puget Sound Region, much of summer 2014 was spent working on developing partnerships and investigating issues in the regions we had not gone into for some time such as Spokane, Walla Walla, Yakima, and Clark Counties.

An imperative part of this work has been to identify partner organizations that can assist in executing an event that meets the needs of their unique region. In the case of the meet and greet in Colville, we were able to leverage partnerships with WSDA Farm to School program to invite other institutional and wholesale buyers alongside schools in learning about direct sourcing from Specialty Crop Producers. This initial meeting was a very successful event for laying the foundation for relationships in this community and will be built upon with a trade meeting held in the following year.

We had originally planned to head back to Central Washington for our final two trade meetings of this grant period. However, due to other WSDA events in those areas, as well as the detrimental fire season, we decided to let the region recuperate while we revisited requests for trade meetings from our other regions. After having multiple conversations with partners in Central and Eastern WA, including WSFFN, WSU-E and LINC, it was determined that this season is not ideal for another trade meeting.

In June 2015, Thurston County reached out to inquire about hosting a trade meeting in the Olympia area this fall. We connected with our local partners and determined that there was enough need in the region for a second event this year, as the Tacoma event in February primarily drew in Pierce County farmers and businesses.

We hosted a second event in the South Sound, this time focusing on Thurston and Mason counties in late September. We had both local county jurisdictions, as well as WSDA GAPs, WSU-E, and Evergreen Community College on Board for this event.

Clark County also reached out in summer of 2015 and asked us if we could come to SW Washington for a trade meeting. We were very excited about this opportunity as we had not visited the SW region during this grant period. We collaborated again with WSDA GAPs, WSU-E economic development, as well as Clark County for a September event that was well attended.

Activities, goals, and outcomes of the project were achieved, though the measurements had some flaws in accuracy. In order to help others expedite problem solving, I would recommend a few items to maintain:

- Create accurate tracking sheets by farm/participant to send in at their leisure to increase accuracy, but may not increase reporting, therefore;
- Follow up within a 2 week time period. After two weeks participation in follow up surveys dropped significantly. This is particularly challenging when trying to capture impact of the meeting on the growing season which may be months away, therefore;
- Switch to a sample set of producers to track rather than all participants

#### **ADDITIONAL INFORMATION**

The majority of in-kind matching funds came from partner organization staff time. Further in-kind donations from all partners came from social media and web-based outreach, outreach materials and day-of event support.

Total Level of cash/in-kind match for all events was \$66,248, far exceeding the cash/in-kind budget of \$11,500.

#### **CONTACT PERSON**

Katie Lynd

**Project Title:** Building Demand for Specialty Crops at Washington State Farmers Markets

**Partner Organization:** Washington State Farmers Market Association (WSFMA)

### **PROJECT SUMMARY**

Farmers markets in Washington are celebrated for bringing together small farmers to sell local produce in a family-friendly setting that builds community, encourages healthy eating, and generates economic activity -- not just for the market but for the neighboring businesses as well. Specialty crops dominate the markets. The initial purpose of this project was to use the Washington State Farmers Market Association's (WSFMA) statewide network of farmers markets to build the demand for specialty crops and improve specialty crop vendors' marketing capacity by addressing a number of key issues that market managers and farmers currently face, and to enable the WSFMA to professionalize its services to member markets and create new services for specialty crop farmers.

The specific issues, problems and needs that this project sought to address are:

- **Basic marketing skills:** Many farm vendors (and managers) lack core marketing skills, including signage, effective product displays, strong customer service, dynamic online representations, and quality product to increase sales. This is especially important in an age when shopper expectations continue to rise exponentially.
- **Increasing competition from other retail venues** such as grocery stores with massive marketing budgets that create a "farmers market" atmosphere in their produce section to evoke local farm connections and confuse consumers.
- **Increasing use of technology:** Farmers markets rely heavily on cash sales even though shoppers increasingly use credit/debit or EBT cards to purchase items. Starting to use new technology can be expensive and difficult to figure out without access to useful information that addresses the unique needs of market managers and direct marketing farmers.
- **Farmers markets rely on the WSFMA as its statewide representative,** however as a small non-profit with part-time staff and small operating budget, it cannot do the marketing, education and research that, in other sectors, are supported by commodity commissions.
- **WIC and Senior Farmers Market Nutrition Program (FMNP):** This is an important federal program for low-income shoppers to purchase specialty crops at farmers markets. Within Washington State, the program is vulnerable to changes in the state budget. Many markets depend on this additional source of revenue for farmers to keep farmers at their market. Without a stable program, a number of farmers have reported they would stop selling at some markets around the state.
- **Since the loss of the WSDA Small Farm and Direct Marketing program,** WSFMA and its member markets are increasingly being tapped as a resource by growers. The volume of emails and phone calls to the WSFMA office requesting assistance from growers has expanded significantly.

This project was timely and important because the marketplace in which farmers markets operate has been changing quickly, in ways that require new skills and strategies from specialty crop farmers and market organizers to successfully meet these new challenges. Given that farmers market organizers operate on tight budgets, many with part-time or volunteer staff, it is difficult to navigate the complex world of technology, marketing and sales psychology, applicable permits, and regulations needed to operate a successful business. This project addressed a number of the key issues impeding market organizers and specialty crop farmers' ability to adapt to the changing landscape of food retail sales.

This project builds on the work completed in a Specialty Crop grant that WSFMA received in 2010 to improve and build on the WSFMA conference that features training and education for specialty crop farmers and market managers to increase sales of specialty crops at farmers markets around Washington State. Survey results from conferences and specialty crop workshops geared towards market managers and farmers, indicated that WSFMA had succeeded in developing a strong mix of workshops focused on marketing and selling strategies as well as farming methods related to season extension and food safety issues, that farmers and managers felt would boost their ability to market crops and increase sales. This current grant's activities built on that success and used the conference as a building block toward developing an ongoing relationship with specialty crop farmers by developing a farm membership program, and increased coaching and support to farmers and managers.

## **PROJECT APPROACH**

The project started in October 2012 with developing the workshop track for specialty crop farmers for the January 2013 WSFMA conference. The conference planning committee reviewed results from workshop evaluations and surveys taken at previous conferences and the questions commonly asked of staff to develop the workshops. The eight workshops were geared to specialty crop farmers and be of interest to others. Workshops included FMNP updates; marketing farm businesses throughout the market season, financial planning for direct marketing farm businesses, value added processing; smart phone SNAP app; strategies to attract and retain farmers market employees; using the farm booth to build connections and expand sales; risk assessment; and what happens in a product recall. The goal was to have 40 specialty crop farmers attend. This number was in line with the previous conference and it was difficult to meet. 26 farmers attended the conference. Of those, 12 returned conference surveys. All felt the conference had been helpful and that they had learned something new that would help them increase sales in 2013. The most useful topics were strategies to use social media effectively, the psychology behind integrating relationship building with customers with your booth display, and how to evaluate the financial impact of farmers market sales. Farmers were asked what they would like training on – the most common responses were more information about the produce marketing rules and more marketing/social media.

In addition, there were 10 workshops for market managers that focused on federal nutrition programs, marketing and outreach to attract diverse shoppers, and strategies to create effective special events that increase sales for specialty crop farmers.

The general sense from attendees and in the survey evaluations was that “this was the best conference ever.” There was more professionalism, better selection of practical and useful workshops and more opportunities for connecting and networking. Per one respondent: “Very informative presenters and sessions, overall well gauged to current issues.” In 2014, the volunteer conference coordinator unexpectedly resigned and WSFMA hired a professional coordinator to fill in. The planning committee also discovered that the 2013 conference surveys and workshop evaluations which were to be used to document benchmarks for this grant were not available. Using the general materials and available feedback the committee and professional coordinator planned the 2014 conference. With a generous donation, WSFMA was able to offer scholarships to all specialty crop farmers who wanted to attend the conference. As a result, 36 specialty crop farmers attended (goal was 40).

There were seven workshops targeting specialty crop farmers and/or for managers promoting specialty crops (goal was six). Topics included strategies to leveraging the farmer’s story to increase sales using social media; updates on leafy greens rules and food safety for specialty crop farmers; how to accept WIC and Senior FMNP, pricing specialty crop farm products at the market-how to get the price a farmer needs; season extension and increasing number of year round farmers markets; strategies for media and marketing with a panel of experts; and using EBT incentive programs to increase sales of specialty crops.

Farmer responses to the workshops ranged from “*Great presentation, I learned a lot of helpful stuff*” to “*It was great to learn your story is bigger than who and what you do but everything you are, from a bird who flies over your farm to spring floods*” or “*Onsite promotional ideas I will implement at the market now!*” Again, there was a general sense that “this was the best conference ever.” Many managers reported how pleased they were to see more farmers at the conference and that added a lot of value for them to be there.

Concurrently with planning the conferences, staff continued to respond to telephone and email queries from market organizers and specialty crop farmers. Many farmers had questions about how to find new markets at which to sell; produce handling rules, and health department rules. Market managers tended to ask questions about how to fill product gaps at their markets, verifying vendor authenticity, food assistance benefits, market policies and rules.

Federal Nutrition Assistance benefits, specifically the WIC and Senior Farmers Market Nutrition Programs (FMNP) impact specialty crop sales for farmers by providing targeted funds for low income seniors and young families to purchase fruits and vegetables at farmers markets. To operate most effectively, these programs need monitoring and education to policy makers to understand why they are important. Over the two years of this project, WSFMA participated in 26 meetings with the Good Food Coalition and Anti-Hunger & Nutrition Coalition regarding educational opportunities and trainings to ensure the continuation of the FMNP programs and partnerships among agencies, nonprofits and farmers markets.

Staff started developing the farm membership program in the fall of 2012 by gathering information from farmers about their perceptions of WSFMA and types of training needs they have related to selling at farmers markets. They did this utilizing one-on-one discussions at farmers markets, attending conference and farmer focused events to increase the visibility of the WSFMA and educating farmers about the services WSFMA offers while developing the membership program. WSFMA attended the 2012 Tilth Conference and interviewed farmers. Using their feedback and evaluating the types of questions WSFMA was receiving via telephone and email, staff drafted a membership program to gather feedback at the 2013 WSFMA conference. Using that input, they developed a full program to roll out in fall 2013. Drafts of a new brochure and dues structure were vetted with key specialty crop farmers at every step. One pleasant surprise of this work was to realize that farmers were very receptive to the idea of “joining” WSFMA and felt it made sense. Staff were also pleased to discover that farmers thought that one benefit of membership in WSFMA was that it would be considered a “sign of approval” or authenticity as a “true” farmer. One unexpected finding was that farmers appreciated WSFMA’s “Roots Guidelines” (WSFMA’s membership expectations that prioritize farmer producers) as a standard of quality for farmers market membership as well as farm membership.

The goal was to have 65 new specialty crop farmers by the end of the project. Although the goal was not met by the end of the project, WSFMA did have 61 members by the end of January 2015 (one month late). The initial outreach strategy was to provide market managers with electronic materials so they could forward WSFMA membership information to their specialty crop farmers. This proved to be more difficult than anticipated as managers were busy and there was no direct “benefit” to their market. WSFMA posted information on the website and conducted outreach to farmers who had attended previous conferences. This also did not prove very successful. What staff found was that one-on-one conversations were the most effective way to get oral commitments from farmers to join and that still did not result in many completed membership applications.

What became the most effective strategy was to connect membership in WSFMA with discounted registration and/or scholarships for the annual conference. As a result of that strategy, 50 additional farmers joined.

Another strategy to develop ongoing relationships with farmers was to provide follow up marketing assistance to 40 specialty crop farmers with on-site consultations, coaching, and materials review, as appropriate. Over the course of two market seasons, staff and board members met with 40 farmers in a variety of settings – at 53 farmers markets, 3 annual vendor meetings held by individual markets, and one market sponsored training session.

To complement the work with specialty crop farmers, WSFMA staff and board provided follow-up workshops and presentations with individual market organizations that requested assistance. In 2013 and 2014, staff or board members attended four meetings of market managers and vendors to talk about social media, promotions, and effective sales strategies. All presentations were focused on the needs of specialty crop farmers.

New in 2014, staff worked with a group of interested member market managers to develop the Farmers Market Week promotion plan that features specialty crops. WSFMA asked market managers to send in their favorite recipes featuring specialty crops and selected three to feature. Recipe cards and signage were printed and mailed to all member markets and farm members. In addition, the recipes were featured on the website.

During September WSFMA sent a survey to member managers asking for feedback about effectiveness of the WSFMA support during farmers market week and the perceived impact these activities had on specialty crop sales. 24 Market managers responded to the survey, representing 38 markets (1/3 WSFMA membership). 89% of the managers used the recipes and signage provided by WSFMA, primarily at the market info booth and at specialty crop farm vendor booths. Over 25% also shared on social media and in the market newsletter. Managers were mixed on whether they saw much increase in specialty crop sales, in part because they didn’t track on it. Several managers featured the recipes in cooking demos during Farmers Market Week. **Over 81% of managers said this type of promotional campaign was a service they would like WSFMA to provide in future years.**

In October, staff prepared a survey to all 51 farmers (36 specialty crop) who attended the 2014 conference to find out whether they implemented anything learned at the conference and impact on sales. 16 farmers responded (31% response rate). 15 were specialty crop farmers. 14 farmers reported that they applied ideas that they learned at the 2014 conference to their sales operations in the 2014 conference season (one farmer retired and did not apply any ideas and one did not respond to this question). **Comments from farmers:** *I stepped up my usage of social media and converted to a*

*purchased website. I was more confident in setting MY price and sticking to it throughout each particular fruit "season." "Networking with other vendors was also beneficial as well as learning about products through the trade show. For example, I bought a canopy awning from Canopies by Fred that worked great to shade our product...." "The roundtable discussion with managers was very helpful." "I have a better display."*

The WSFMA upgraded its communications (print and online) about member services, specialty crop promotion materials, with information about the new farm membership program <http://www.wafarmersmarkets.com/farmmembership.html>, vendor booth guide <http://smallfarms.wsu.edu/wsu-pdfs/FM%20Vendor%20Marketing%20Guide%20June%202014%20v1.pdf>, special promotions for Farmers Market Week, and partnered with WSU to create an FAQ for farmers about selling at farmers markets (see attached). Staff were tracking email and telephone requests from market managers and farmers without segregating specialty crop requests. Once that was adapted, staff were able to identify 172 requests from specialty crop farmers over 16 months, or 10.75 requests per month. Assuming this rate applied for the whole project, it would be 258 requests.

2013: Project Partners were Tilth Producers, WSU Extension, WSU Small Farms Program, WSU School of Safety and Nutrition, WithinReach, Nutrition First, Catholic Charities of Spokane, and the Washington Sustainable Food and Farming Network as well as Washington Department of Health. WSU provided food safety training workshops at the conference, supported market managers by providing travel funds, and provided significant guidance and support to develop the farm membership program and used their networks to help promote the conference to farmers and other interested groups. All partners have participated in the annual conference providing training, guidance on activities and decisions, and reviewed new materials.

2104: Project Partners were Tilth Producers, WSU Extension, WSU Small Farms Program, WSU School of Safety and Nutrition, WithinReach, Nutrition First, Catholic Charities of Spokane, and the Washington Sustainable Food and Farming Network as well as Washington Department of Health. WSU Small Farms Program presented a workshop on their farmers market vendor research at the conference, analyzed WSFMA membership data about specialty crop vendors for its annual report, provided significant guidance and support to develop the farm membership program, and used their networks to help promote the conference to farmers and other interested groups. Catholic Charities, WSFFN, Nutrition First and WithinReach provided significant time and resources to ensure the WIC/Senior Farmers Market Nutrition Programs operated at farmers markets in 2014. In addition, these groups supported EBT incentive programs that offered vouchers for low income shoppers to purchase additional fruits and vegetables, at more markets in 2014. All partners have participated in the annual conference providing training, guidance on activities and decisions, and reviewed new materials. WSU Small Farms Program also developed a Vendor Booth Guide targeting specialty crop farmers (under their SCBG project). As part of WSFMA farmer and manager training and support, staff used the booth guide as a tool to provide visual examples of product display, signage and other best practices.

The grant proposal anticipated this situation and outlined that WSFMA would tailor its programming only to specialty crop farmers and processors and that registration would require farmers to identify their products.

To ensure that WSFMA was only using grant funds to benefit specialty crop farmers on conference related work, it prioritized their participation for the annual conference and focused all farmer workshop track on topics most relevant to specialty crop farmers.

All specialty crop farmers wanting to participate in the conference received free registration from a scholarship, if requested. All other farmers and market managers paid full registration or went through the formal scholarship application process.

Examples of the workshops for farmers:

- Hiring and retaining good sales employees, taught by a specialty crop farmer,
- Marketing and selling theories using specialty crop farms as examples and was taught by a manager of a specialty crop farm incubator program,
- Training and updates for the WIC and Senior Farmers Market Nutrition Program,
- Product recall information taught by state Dept of Agriculture staff focusing on produce recalls.

In addition most of the staff time spent on planning for the conference was considered a match and was paid by non-grant revenue sources. All volunteer time was considered a match for the grant to ensure that staff time paid by the grant is used to benefit specialty crop farmers. All work spent on this grant, using grant funds was tracked on time

sheets and documented in the bookkeeping system to ensure that all SCBG funds were spent on activities and expenses directly related to this grant.

## **GOALS AND OUTCOMES ACHIEVED**

### **Goal #1: Create the capacity for WSFMA to directly support specialty crop farmers throughout the year.**

This project documented the support that WSFMA provides to specialty crop farmers by improving its internal tracking system to monitor telephone calls and emails and collect farm name, whether or not it sells specialty crops, question and measure of success of WSFMA service. In the first year, WSFMA received 224 requests. In the second year, it received 220 requests. Although WSFMA anticipated increased requests as farmers became more familiar with WSFMA's services that did not happen. Requests were stable although the type of questions changed. More requests were about value added and processing questions: what products would be popular at markets, where to find out about rules and regulations, where to source ingredients, etc.

**The benchmark, based on six months of data, was 30 requests per month from all farmers.** Because no one knew much about the farmers and many prefer to remain anonymous, WSFMA estimated it would respond to at least 250 emails or phone calls from specialty crop farmers seeking help from WSFMA to solve problems, dealing with issues related to FMNP and EBT technologies, and getting into markets.

### ***Goal #2: Increased farmer confidence and skills in direct marketing specialty crops at farmers markets.***

WSFMA measured farmer knowledge and satisfaction with sales with a survey taken during workshops at the annual conference and measured changes in confidence and skills with a follow up evaluation toward the end of the market season. The target was to have 80 specialty crop farmers indicate increased confidence and skills at marketing specialty crops. **The benchmark was based on strong farmer satisfaction with the WSFMA conference and farmer workshops to help increase skills in direct marketing.**

20 specialty crop farmers attended the first conference and 34 attended the second conference. For each conference WSFMA reached out to farmers to attend via partner list serves with electronic communication, at conferences and farmers markets with flyers, with press releases to key media such as the Capital Press and WSDA and when talking on the phone. Partner list serves included WSU Small Farms Team, Cascade Harvest, Tilth Producers, all WSFMA member markets, the general WSFMA list serv.

### ***Goal #3: Increased sales of specialty crops among farmers receiving training.***

WSFMA continued to measure the change in specialty crop sales by farmers attending the WSFMA conference. Farmers were asked to measure their specialty crop sales by scaled self-evaluation (low increase, no increase, slight increase, significant increase) and dollar value when available. The target over two years, was that there would be a 15% increase in sales of fresh produce and value added products for the 80 farmers who participate in marketing workshops at the conference and receive support from managers and WSFMA.

***WSFMA started tracking changes in farmer sales with the 2011 conference and the benchmark was based on reported sales increases that averaged 12% each year.*** These numbers reflect product sales from all channels.

At the 2013 conference, specialty crop farmers who completed the survey reported an average 12% increase in sales during the 2012 market season, over 2011. Specialty crop farmers who completed the 2014 conference survey self-reported increases and decreases in sales from the previous year that averaged out to be 15% increase in sales in 2013 over 2012. Nine farmers reported sales increases and four reported sales decreases. Weather was cited most frequently as a reason for sales changes as was good market managers, more effort to keep market tables full of product, expanded CSA sales (which reduced market sales).

Farmers who completed the follow up survey in September were split on whether their farmers market sales increased or decreased in 2014 market season with slightly more saying their sales increased 10-20% than those saying they decreased by a similar amount. 25% of the farmers said their sales had stayed "about the same." Reasons cited for sales increases were "*changed sales days, added a market day, better production this year, more years selling which means larger customer base.*" Reasons cited for sales decreases were "*lost staff, fewer customers at the market, expanded CSA because it pulls in about \$15 per hour of labor rather than \$5 per hour at the farmers market, too many markets in Vancouver/Portland area.*"

### ***Goal #4: Increased capacity and promotional materials and knowledge among 65 market managers.***

**Target:** 65 market managers learn new skills on how to market specialty crops and follow up training with vendors during the market season.

**Benchmark:** There is currently no benchmark for quantifying market manager knowledge. The plan was to use the 2013 conference survey to establish a benchmark. As mentioned before, the surveys and results were not delivered to staff so there was no opportunity to establish a benchmark. Based on summary information prepared by the conference organizer, there were 43 market managers who attended the 2013 conference. 71 market managers attended workshops at the 2014 conference. 99-100% of managers reported on workshop evaluations that their knowledge was increased as a result of the workshops targeting how to market specialty crops. 90-100% of the managers indicated they learned things they can implement in their own practice, or thought they could implement. **Performance Measure:** Measured by pre-training and follow up evaluation. This was measured during the 2014 market season by a follow up survey after Farmers Market Week. Managers were asked whether they had implemented new materials and noticed any sales impacts. Most managers did not hear feedback from vendors and didn't ask. Staff will ask managers to ask vendors whether they notice any increase in sales as a result of the promotional recipes in future years. 81% of the respondents stated they would like to see similar promotions in the future. Comments from the managers:

*"One woman tried the beet recipe, then rushed back to the market to purchase more beets!"*

*"comparing sales with the previous and following weeks, many vendors who had the recipes at their stalls had higher sales during FM week!"*

*"The vendors and market goers at our market loved it! Even vendors who didn't sell the recipe ingredients wanted to get involved. For example our cheese vendor had recipes out with suggested additions. Also for me, it was great to hear that the vendors had been seeing the materials at their other Markets..."*

**Goal #5: Increased sustainable support by WSFMA for farmer vendors.**

**Target:** Over two years, 65 new specialty crop farmer members.

**Benchmark:** There is currently no option for farmers to join WSFMA.

**Performance Measure:** Measured by paid memberships. One month after the project ended, WSFMA had 61 specialty crop farmer members. Although this target was not met, WSFMA tried several strategies to increase before finding the most effective strategy which was to link the renewal to registering for the statewide conference.

**Goal #6: Increased capacity of the WSFMA to promote markets and specialty crop farmers.**

**Target:** WSFMA will develop new content directed to specialty crop farmers on Website; better articulate its services through new print and online communication materials targeted at marketing specialty crops.

**Benchmark:** Currently WSFMA has only a printed farmers market directory to distribute. Although we receive monthly web analytics, they have not been tracked regularly.

**Measurement:** Over the course of the project, website site hits increased just over 6%. Over 1/3 of visits are to the WSFMA farmers market directory. Website views of membership and conference pages had similar increases.

Notable increase page views were for EBT Incentive programs that feature specialty crops which were introduced in 2013.

There were no long term Expected Measurable Outcomes for this project.

Activities and Goals	Actual Accomplishment
Respond to specialty crop farmer and manager requests for information about FMNP, EBT, new technologies, training opportunities, farmers markets in WA, specific farmers market issues	WSFMA was able to track farmer and market manager requests to document the types of questions being asked and changes in volume of activity. Responded to 444 requests from farmers (286 from specialty crop farmers) and 1,312 from market managers.
Represent farmers markets and vendors in state and stakeholder meetings for WIC EBT and FMNP, and SNAP development. (three per year)	WSFMA actively participated in 26 meetings of the Good Food Coalition, Anti-Hunger and Nutrition Coalition, and periodic meetings with DOH, DSHS and policymakers about the status of WIC EBT and FMNP and SNAP development. Key Issues addressed were regarding continuation of WIC and Senior FMNP, WIC EBT transition, farmer acceptance of EBT, and EBT Incentive programs promoting specialty crops.

<p>Develop marketing training educational track for specialty crop vendors and market managers at the annual WSFMA conference, including prioritizing topics, identifying presenters, outreach, conference logistics, and registration, six workshops per conference</p>	<p>The WSFMA and the conference planning committee met regularly to plan all aspects of the conference, evaluate workshop and conference surveys, select presenters, outreach and special conference activities. Each year there were seven or eight farmer- focused workshop that addressed issues specific to direct selling specialty crops at farmers markets. Each year there were an additional five – seven workshops targeting market managers that addressed common issues related to specialty crop promotions, vendor relations, federal nutrition assistance and incentive programs to increase shoppers and sales of specialty crops.</p>
<p>Attend Tilth Producers Conference to raise awareness about WSFMA services among specialty crop producers and invite Tilth to attend the WSFMA conference to cross-pollinate training potential.</p>	<p>The WSFMA executive director, Karen Kinney attended the 2012 and 2013 Tilth Conferences to raise visibility about WSFMA, its services, and selling at farmers markets. At the 2013 conference WSFMA presented a workshop on using shopper psychology to improve farmers market booth displays that increase sales, and about using technology to accept credit/debit and EBT cards. In 2013, WSFMA participated on a panel at the Inland Empire Small Farms Conference about direct selling at farmers markets, restaurants and grocery stores.</p>
<p>Annual WSFMA conference with marketing trainings for specialty crop vendors, and managers.</p>	<p>Both the 2013 and 2014 conferences were held at the Heathman Lodge in Vancouver WA. The number of specialty crop farmers attending increased each year to 36 in 2014, a record high. The number of market organizers attending increased each year to 126 in 2014.</p>
<p>Develop WSFMA farmer member category with benefits, dues structure and communications program including web, email and mail, newsletters, networking around ongoing training opportunities.</p>	<p>At the 2012 Tilth Conference WSFMA informally surveyed farmers to learn what they know about WSFMA and its services, what type of services they think would help them improve their farmers market business, and whether they would be interested in joining WSFMA if it had a farmer membership program. Using this information and the results of conference surveys and the types of questions asked</p>
	<p>of WSFMA by farmers throughout the year, staff developed a program that was then vetted with 20 key specialty crop farmers market vendors. Using feedback, WSFMA adjusted the program and developed a brochure for the program.</p>
<p>Roll out new WSFMA farmer memberships</p>	<p>WSFMA had a soft roll out the new farm membership program at the Inland Empire Small Farms Conference in the fall 2013 and at the 2013 Tilth Conference. In November and December 2013, WSFMA advertised the new membership program on its list serves, to all member markets and partner organizations. It offered one-year memberships to farmers who responded to surveys and in 2014, it included a one-year membership for farmers who received scholarships to attend the conference. It adapted the conference registration so that farmers could join WSFMA when registering for the conference.</p>

<p>Provide follow up marketing assistance to 40 specialty crop farmers with on-site consultations, coaching, materials review, as appropriate for each farmer</p>	<p>During 2013, Kinney provided 10 individual farm consultations at farmers markets by watching the farm booth to evaluate shopper flow, product display, farmer-shopper interactions, and farmer materials and then provided feedback and suggestions. With the assistance of a WSFMA board member, WSFMA also offered follow up training sessions for farmers who had attended the 2013 conference and wanted to train staff or receive more in-depth feedback about their displays, materials and using social media. In 2014, Kinney provided 30 individual farm consultations. Using the Vendor Booth Guide developed by WSU, she created a packet of helpful materials to leave with interested vendors. The packet also became a good tool for market managers to use when working with their specialty crop farmers.</p>
<p>Provide follow up support to market managers with their market-wide specialty crops promotions and work with individual specialty crop vendors. And do follow up evaluations from conference.</p>	<p>In 2013, WSFMA staff developed the first ever Farmers Market Week Toolkit for market managers to promote their markets during this national week-long event. It included templates for: press release announcing Farmers Market Week; sample letter to the editor about the benefits and impacts of farmers markets; proclamation for local jurisdictions to declare Farmers Market Week; promoting a featured recipe; and sample ideas of activities to promote fresh produce at the market. Working with a leading chef in Seattle that sources local, Jason Brzozwy of Maria Hines Restaurants, WSFMA created a Farmers Market Week recipe and video featuring the specialty crop farmers who supplied the ingredients and the chef making the recipe. In 2014, WSFMA asked member markets to submit recipes that featured specialty crops that were in-season around the state, affordable and easy to prepare. Staff selected three recipes, designed recipe cards and flyers for markets and vendors to use to promote the recipes. A number of markets featured the recipes in chef demos during the week, on websites and in e-newsletters. Staff surveyed member markets about the new strategy and found that 87% of the markets wanted WSFMA to continue this service in future years. In September 2014, WSFMA partnered with the WSDA Farm-to-School program to promote the Taste Washington Day school lunch recipes that included specialty crops available at farmers markets</p>

	<p>still open for the season. This was a new opportunity that built on the type of support WSFMA offered for Farmers Market Week.</p>
<p>Upgrade WSFMA communications (print and online) about member services and add farm vendor member services and specialty crop promotion materials for managers in downloadable formats to website.</p>	<p>In 2013 WSFMA created a farm membership brochure that highlighted WSFMA as an organization and the benefits of membership. It developed recipe cards and related display flyers that were very popular with market managers and farmers selling the ingredients. WSFMA reviewed the new Vendor Booth Guide developed by WSU and used its networks through farmers and member markets to distribute it as a training tool. WSFMA updated its website with new content about the farm membership program, resources to promote specialty crops and policy work that helps increase sales to specialty crop farmers. WSFMA selected a web designer for a more extensive upgrade its website that will include new content and resources for farmers.</p>

<b>Expected Measureable</b>	<b>Baseline Data</b>	<b>Achievement of set targets</b>
<p>Create the capacity for WSFMA to directly support specialty crop farmers throughout the year.</p>	<p>WSFMA started tracking more information about emails and phone calls to the office. Between October – September 2012-2013, staff responded to 224 farmers and 617 market manager questions. The majority of phone calls from farmers were about farmers markets – where they were, how to apply, permits needed, and secondly about food safety rules/regulations and how it works at farmers markets. In mid-2013, WSFMA started differentiating between specialty crop and non-specialty crop farmers to track. During the last six months of the year, 60 of the 224 farmer requests were identified as specialty crop. In 2014, 121 of 312 farmer calls were identified as specialty crop farmers. Staff also received 815 requests from market managers. One reason for the increase from managers was better tracking of calls with questions about membership.</p>	<p>The goal was to respond to at least 250 requests from specialty crop farmers. Based on the time used to develop a system to track specialty crop requests, staff calculate there were 258 requests.</p>
<p>Increased farmer confidence and skills in direct marketing specialty crops at farmers markets.</p>	<p>The goal was for 80 specialty crop farmers to increase their confidence and skills in selling at farmers markets. Workshop evaluations from the farmer workshops document a high level of satisfaction with the content and new information. In 2013, 28 farmers attended the conference (data was not available to document how many were specialty crop). In 2014, 46 farmers, of which 27 were specialty crop farmers, attended the conference.</p>	<p>The goal of 80 specialty crop farmers attending the two conferences was not met. However, the workshop evaluations show a high level of satisfaction with the workshops and strong interest in returning to the conference. Staff do not have access to surveys and workshop evaluations from the</p>

	<p>Workshop evaluations from the 2013 conference were not available for staff to review for grant reporting. For the 2014 conference all six farmer workshops 95% of session attendees felt the content was good or excellent, 91% indicated the workshop greatly or somewhat increased their knowledge and 88% stated they learned things they thought they could implement in their own practice/operations. WSFMA responded to two opportunities to reach additional specialty crop farmers via workshops at the Tilth 2013 Conference and the 2013 Inland Empire Small Farms Conference. The Tilth presentation was to over 50 farmers, approximately half were specialty crop. The workshop evaluations indicate farmers felt they learned new information about booth display and strategies to increase sales by shoppers.. In addition, WSFMA had a display. Over 600 market directories were distributed. The Inland Empire Conference workshop had about 70 participants, primarily farmers.</p>	<p>2013 conference. The WSFMA received increased funding for farmer scholarships for the 2014 which gave more farmers the opportunity to attend the conference. Many 2014 conference attendees noted on their evaluation forms that they were pleased to see more farmers and felt it added a lot to the conference.</p>
<p>Increased sales of specialty crops among farmers receiving training.</p>	<p>WSFMA has started tracking changes in sales for farmers who attend the annual conference. Specialty crop farmers who completed the survey reported an average 12% increase in sales overall. This does not reflect only farmers market sales.</p>	<p>Based on self-reporting by direct marketing specialty crop farmers who attended the 2013 and 2014 conferences, their sales increased each year between 12-15%.</p>
<p>Increased capacity and promotional materials and knowledge among 65 market managers.</p>	<p>There was no existing benchmark to document whether market managers learned new skills on how to market specialty crops and train vendors during the market season. The 2013 conference evaluation was to establish the benchmark. As noted previously, the WSFMA staff did not receive the 2013 conference surveys or workshop evaluations to use to establish a benchmark. 65 conference attendees registered as market managers. The overall conference report from the 2013 conference coordinator indicated a high level of satisfaction and new skills learned.</p>	<p>There were 85 self-identified market managers attending the conference representing 81 different farmers markets. The 2014 workshop evaluation forms for the market managers indicated high levels of satisfaction with new knowledge and information that they would implement to help increase sales of specialty crops.</p>
<p>Increased sustainable support by WSFMA for farmer vendors.</p>	<p>Prior to the project starting, WSFMA was collecting data on the types of phone calls and emails coming into the office. As a result, staff could document the types of questions and needs that direct marketing farmers had. To recognize the time and staff investment in this service and to help make it sustainable, WSFMA wanted to develop a farmer membership category. The goal was revised to acquire 65 paid farm members over the two years.</p>	<p>WSFMA almost met its goal and it took one additional month. During the first quarter of the second year, 15 farms joined WSFMA. As of the end of January 2015 (one month after the end of the project), WSFMA had achieved 61 farm memberships.</p>
<p>Increased capacity of the</p>	<p>Currently WSFMA has only a printed farmers</p>	<p>WSFMA increased distribution</p>

WSFMA to promote markets and specialty crop farmers.	Market directory to distribute.	of its statewide farmers market directory from approximately 25,000 in 2013 to 30,000 in 2014. Web hits decreased slightly. Farmers Market managers expressed strong support of WSFMA toolkit and recipe cards featuring specialty crops and would like this service to continue. Anecdotally, market managers reported strong satisfaction with the WSU Vendor Booth Guide as a tool to help specialty crop farmers perform better at the market.
--	---------------------------------	--

**BENEFICIARIES**

**Specialty Crop Farmers:** The project benefited 330 specialty crop farmers who sell at farmers markets throughout Washington State. Approximately 80 farmers will benefit through the specialty crop marketing training with follow up assistance, and 250 will benefit from direct assistance from the WSFMA. In general, these farmers sell a wide range of specialty crops (as indicated on the cover page) of this proposal and typically farm in one part of the state and sell in another. Most have small acreage, with intense, diversified production; tend towards more sustainable production; are passionate about the unique features of their products; value farming as part of their identity; have some form of help from family or student interns; have a wide range of professional experience; are less likely to be born into conventional agricultural; tend to be younger than average farmer age; may be Hmong, Latino, Somali, Russian, or White; male or female; learn through networking, hands on experience, alternative educational opportunities, and on farm creativity; are undercapitalized, under insured and also work off farm.

Specifically, this project directly benefited specialty crop farmers by:

- Increasing their marketing skills and confidence;
- Providing ongoing, in-market assistance and support;
- Giving them access to one-on-one consultations and support from the WSFMA;
- Learning about other training opportunities;
- Creating a direct means of being part of the WSFMA;
- Increased sales through individual marketing efforts, market-wide specialty crop promotions, and FMNP/EBT sales.

**Farmers Markets.** The project benefited at least 65 farmers market managers by increasing their skill level so they can more effectively advise specialty crop farmers about ways to improve their sales at farmers markets and create market-wide promotions. Managers who attend the annual WSFMA conference and participate in workshops specific to market leaders, will learn basic marketing psychology, vocabulary to discuss key concepts, booth design and layout. The managers will learn communication skills to better support their vendors and respond to questions positively. Managers will also learn ways to create seasonal special events around specialty crops that will generate increased sales for vendors and build stronger customer loyalty to the market.

**WSFMA.** WSFMA benefited from this project in many ways. The conference workshops better targeted the needs of specialty crop farmers and market managers who provide vital sales venues for those producers. Conference surveys and follow up surveys showed that farm sales improved, and both farmers and market managers had increased confidence in their marketing and outreach skills. By developing a farmer member category, WSFMA was able to target the specific type of training and education that farmers need when selling at farmers markets. The new services help fill a gap of direct market resources and marketing expertise that farmers and market managers need. The impact is that WSFMA is on stronger footing and farmers, managers, partners and stakeholders have a much better understanding

of what WSFMA is and its role in Washington's agriculture and food system. The project has also helped identify a realistic staff capacity needed to carry out its programs.

57 specialty crop farmers attended the two conferences and reported on average 12-15% increases in sales each year, and continued to use WSFMA as a resource for asking questions about selling at markets, regulations and permits, technology, and to discuss business planning ideas and how to get networked with markets. Each year, on average 750 specialty crop farmers benefited from the work WSFMA did to stabilize the FMNP program and increase funding to reach more farmers and farmers markets. This resulted in approximately \$300,000 in additional sales to approximately 750 specialty crop farmers across Washington. Based on the Farmers Market Week follow up survey with market managers, 88% of managers distributed close to 3,000 specialty crop based recipe cards which benefited hundreds of farmers as shoppers bought the featured crops.

Market managers – Over the two years, 146 market managers attended the conferences' workshops and learned new skills to increase shopper purchases of specialty crops, and start using the technology so that shoppers could use their credit/debit and EBT cards to buy specialty crops. All 125 farmers markets that are authorized to accept WIC and Senior FMNP checks benefited from the work WSFMA did to increase funding and stabilize the program. Market managers also benefited by having access to materials that directly helped them promote specialty crops, such as the Farmers Market Week recipes and a tool to help the help farmers do a better job selling their products (Vendor Booth Guide).

The WSFMA benefited by having more participants at the conference and increased interest in sponsoring scholarships so that more specialty crop farmers could attend. By having the funding to hire a professional conference coordinator, WSFMA was able to make significant changes to the conference content which increased the value to participants and helped to professionalize the event and broaden its appeal to more farmers. This increased revenue to the organization and gave more farmers direct access to the organization. WSFMA was able to start the process to upgrade its website which will have future benefits and give it more capacity to share resources and information on the website.

### **LESSONS LEARNED**

During the course of this project, WSFMA and partners identified a straightforward way to collaborate more effectively which was to leverage each organization's skills to benefit the group. For example, under its specialty crop grant, developed the Farmers Market Vendor Booth Guide for a small group of farmers and WSFMA then distributed it at a much wider level as a training and education resource to market managers and their specialty crop farmers. This has become a strategic way to approach new projects.

Another lesson was the value of "plug and play" type materials to a large number of farmers market managers. This was demonstrated during Farmers Market Week when market managers enthusiastically used the recipe cards and signage that WSFMA developed and leveraged them to create cooking demos, specials at the market, and to feature the specialty crops in e-newsletters. This was a good model that WSFMA can replicate in the future.

Another lesson was the importance of keeping the focus of a project narrow enough to do it well. This project had many different activities which made it difficult to give each activity adequate attention.

It was important to differentiate when to work through market managers and when to work directly with farmers on different activities. It became clear that it was more appropriate to work directly with farmers when the topic was primarily between WSFMA and the farmer, such as on the farm membership program. When the activity directly benefited both the market and the farmers, then it was appropriate to work directly through the managers, such as with the Farmers Market Week recipe cards and signage because they benefited everyone.

The conference survey results from farmers showed that there were many farmers both new to farming or new to direct marketing and the conference filled an important educational niche for them by focusing on skills and knowledge that will increase sales of their product.

Another important lesson learned is that the conference planning process depends on extensive board volunteer time which is not sustainable over the long term. WSFMA staff and board are evaluating how to organize the planning so that the board is less involved.

There were no unexpected outcomes or results for this project.

The updates to the website were not as extensive as originally planned. The website designer was hired, initial designs were completed and the framework put together. The WSFMA is committed to the outcome and has identified a plan to get it completed, outside of this project. The lesson learned is that a website upgrade takes much more time than was anticipated during this project, and is very difficult to do when an organization is trying to simultaneously undertake many other priorities and program activities.

**ADDITIONAL INFORMATION**

The below chart explains the uses of both matching funds and program income. The indirect funds expended by WSFMA reflects staff time spent on the conference that was dedicated to non-specialty crop work. All program income from registration and membership will be used to further the work the education, training and outreach work to specialty crop farmers and market managers.

<b>Matching Funds:</b>	<b>Budget</b>	<b>Actual</b>
Scholarships	\$ 9,000	\$ 13,650
Indirect from WSFMA	\$ 23,720	\$ 10,065
Board Volunteer	\$ 1,500	\$ 18,085
<b>Total</b>	<b>\$ 34,220</b>	<b>\$ 41,800</b>
<b>Program Income:</b>	<b>Budget</b>	<b>Actual</b>
Conference registrations	\$ 21,875	\$ 52,199
farm memberships	\$ 2,600	\$ 520
<b>Total</b>	<b>\$ 24,475</b>	<b>\$ 52,719</b>

**CONTACT PERSON**

Karen Kinney  
 WA State Farmers Market Association  
 206-265-3788  
[Execdirector@wafarmersmarkets.com](mailto:Execdirector@wafarmersmarkets.com)

**Project Title:** Educating Washington Organic and Sustainable Specialty Crop Producers

**Partner Organization:** Tilth Producers of Washington

### **PROJECT SUMMARY**

Small diversified family farms have been the mainstay of the Northwest's organic and sustainable production for decades. These diversified farms focus production on a wide array of specialty crops. Large corporations have entered the organic sector, development pressure on agricultural lands is intensifying, farming costs are rising and ecological imperatives are mounting. Washington's small to mid-scale specialty crop producers are finding it increasingly difficult to maintain profitability and stay abreast as new technological or biological solutions to farm and pest management emerge. In addition, Washington farmers are aging, putting a vast amount of hard-earned expertise in organic specialty crop production at risk. There is currently no centralized, comprehensive statewide intern placement service or technical assistance center to assist agricultural students, interns and beginning organic farmers in finding resources and identifying training opportunities on farms in Washington State. Nor is there a repository to capture and disseminate the wealth of experience embodied in Washington's successful organic specialty crop farmers. Specialty crop growers have limited options for learning organic and sustainable farm practices, particularly those who do not have a family heritage or formal education in diversified cropping systems. Washington State University (WSU) programs that typically partner with Tilth Producers to teach sustainable and organic practices and undertake and disseminate research have faced severe budget cuts, placing strong and unmet demand on Tilth Producers' educational capacity. Between 2009 and 2011, attendance at the Tilth Producers annual conference increased by 50%, and grew further in subsequent years, indicating a continued interest by small scale organic specialty crop producers for opportunities to gain knowledge and technical skills. The need for expanded, quality educational experiences was addressed through WSDA Specialty Crop Block Grant Program (SCBGP) funding of the Tilth Producers project "Educating Washington Organic and Sustainable Specialty Crop Producers."

SCBGP funding supported Tilth Producers in training farmers to grow and market organic specialty crops competitively, with the objectives of increasing the number of successful specialty crop growers in Washington, reducing barriers to beginning specialty crop growers, facilitating an intergenerational transfer of at-risk organic specialty crop farming knowledge, improving profitability of established specialty crop growers, disseminating research and successful practices on organic controls for pests and diseases of specialty crops and improving environmental stewardship of Washington agricultural lands and waters.

Tilth Producers dedicated funding received through this grant exclusively to education on specialty crops by careful, appropriate selection of workshop content, speakers and teaching farms.

As of 2011, the U.S. organic food industry had been growing at a rate of 20-30% per year for ten years. In Washington State, organic acreage had increased eight-fold since 1993 and the organic food industry was valued at over \$200 million per year. Growing consumer demand and industry interest in organic specialty crops, combined with an unprecedented, unmet demand for Tilth Producers educational services, presented an exceptional opportunity to increase statewide capacity to educate and support Washington's specialty crop producers. The activities implemented under this SCBGP project directly addressed this timely need.

This project did not build on a previously funded project.

### **PROJECT APPROACH**

In October 2012 Tilth Producers of Washington hired a qualified Education Coordinator to research grower needs and to design and implement educational programs that benefit specialty crop growers. Focus for administering this grant was geared toward providing growers specialty crop knowledge both at the field level and for successful sales. Farm practices and marketing know-how were disseminated primarily through farmer-to-farmer transfer of knowledge, though researcher-to-farmer education was also an integral component. Of high concern is the need to ensure transfer of knowledge from experienced growers to beginning growers, especially from those who are nearing the end of their productive farming years. The original coordinator left the position in early 2014 resulting in hiring a new coordinator, who began in May 2014. This re-staffing caused a lag in the timeline of grant activities, but ultimately did not affect the ability for project activities to be completed.

In order to design a detailed, coordinated support strategy for specialty crop growers, Tilth Producers undertook to analyze and identify gaps and priority educational and support needs of specialty crop growers. Discussions were initially held with Tilth Producers Board and educational program committee members, as well as with other organizations and stakeholders around the state. Conversations with experienced growers and beginning farmers were considered carefully, as needs vary based on the number of years growers have been working. A total of 137 evaluations from the 2012 Tilth Producers annual conference were closely analyzed, as well as historical evaluation data from past farm walks that included 218 unique responses. Input was solicited from the 30 members of the WSU Small Farms Team at their annual retreat. Audiences at all Tilth Producers educational events were informally surveyed and asked to do evaluations in order to assess needs. A more comprehensive specialty crop grower survey was finalized in early fall 2013 and was shared widely via the internet and in hard copy. This survey was created in coordination with WSU Small Farms team staff and the project's Peer Review Team (PRT), which was comprised of eleven agriculture professionals and farmers from across the state. On an ongoing, anecdotal basis, educational offerings for specialty crop growers offered around the region were tracked to help determine which needs are being addressed and which may require more attention. While the timeline for this particular grant activity was only a few months, it became clear to Tilth Producers staff that regular assessments were needed in order to best serve the needs of specialty crop growers throughout the grant period and beyond. A final specialty crop survey was administered via the internet February - March 2015, garnering 66 total responses from specialty crop growers. This survey showed how well project activities served the educational needs of specialty crop producers.

Over the course of the grant period, a suite of online resources for specialty crop growers was developed and implemented. On the Tilth Producers webpage this included the following: internship postings, business classifieds, farm walk summaries and booklets, conference workshop audio, *Tilth Producers Quarterly* journal articles. Separate from the Tilth Producers website, a wiki page was developed titled Wiki for Farmers. This wiki page was launched in April 2015. Content was generated by Tilth Producers staff and the Washington State Small Farms Program.

On November 8, 2013, during the 2013 Tilth Producers Annual Conference, a special one-day farm tour event was held that visited three Yakima Valley farms utilizing high tunnels for the production of specialty crops for season extension. Publicity was included as part of all conference-related marketing on the website and in registration materials. The three farms chosen for the tour were all certified organic and represented different production and marketing approaches. All three farms utilized the high tunnels in different ways. The farms represented a diversity of grower knowledge and experience: one farm was more than 20 years old and had 7 tunnels in current use and is owned by a Hispanic male. The other two farms were both owned by women who were relatively new to organic farming, though one had previously been a conventional grower. One used her high tunnel for CSA production into the colder months; the other utilized hers to grow crops that struggle in the area's hot climate. All three had worked with NRCS for their high tunnel procurement and a regional NRCS staff person plus other agricultural professionals joined the tour to answer questions. Interpretation was provided for the Hispanic farmer to ensure his presentation was clear for the audience. Registration was higher than expected, with a total of 60 participants expressing interest. As a result, two tours were run and each participating farmer presented twice during the day.

A total of 6 hands-on, one-day farm workshops were planned, publicized and implemented over the course of the grant period. For the first year's requirement to host two hands-on workshops in specialty crop practices, Tilth Producers chose to plan, publicize and implement "crop mobs". These hands-on learning events offered the host farm an opportunity to receive valuable labor while participants gained specialty crop knowledge from experienced growers in attendance. Host farmers also benefited from the guest growers' knowledge. Working in partnership with the Washington Young Farmers Coalition (WAYFC), Tilth Producers organized two spring crop mobs in western Washington attended by 34 participants. Projected numbers for each hands-on event as per the grant's projected Program Income was for 60 attendees paying \$40 each. The spirit of a crop mob is an experimental learning opportunity for new growers and is typically offered for free. Consequently, in coordination with its partner WAYFC, Tilth Producers chose not to charge for these hands-on crop mobs and expected a large numbers of attendees. Unfortunately the excitement about using the crop mob model for hands-on learning did not match the reality, and the number of participants was much lower than anticipated, though all gained useful knowledge. It was decided to not pursue this model again in years two and three. In the second year, due to a staffing change, no hands-on farm workshops were planned or implemented for 2014. However, this was remedied by the implementation of 4 hands-on farm workshops in 2015. Topics covered included grape pruning (Feb. 2015), specialty crop production using draft horse power (April 2015), on-farm seed production (July 2015), and profitable mid-scale vegetable production for wholesale markets (Sept. 2015). A total of 70 farmers participated in these hands-on workshops.

Due to the hands-on nature of the draft horse workshop, registration was limited to 15 participants. Generally speaking, the smaller hands-on workshop sizes proved ideal for those in attendance to be able to have a true hands-on experience. As a result, it is recommended that future hands-on workshops have a registrant limit based on the activities to occur so that attendees receive a rich, educational experience.

A total of 12 beginning and 12 advanced farmer workshops were part of the overall workshop slates at the Tilth Producers annual conferences in 2012, 2013, and 2014. These sessions were publicized to growers in advance of each event. Workshop presenters were a mix of experienced specialty crop growers and agricultural experts such as university researchers and government representatives.

At the conference in November 2012 in Port Townsend, WA topics covered included:

- Beginning Farmer Workshops:
  - o "Farming Land You Don't Own"
  - o "Soil Fertility and Soil Amendment"
  - o "Essential Record Keeping"—"CSA Start Up"
- Advanced Farmer Workshops:
  - "GAP and GHP Certification"
  - "Growing Organic Berries"
  - "Opportunities in Mushroom Growing"
  - "Managing Black Dot, Silver Scurf and Late Blight on Organic Potatoes"

At the conference in November 2013 in Yakima, WA, topics covered included:

- Beginning Farmer Workshops:
  - o "Weed Management in Organic Vegetable Production"
  - o "Crop Planning Using Spreadsheets"
  - o "What's Bugging Your Farm?"—"Leasing Land for Farming"
- Advanced Farmer Workshops:
  - o "Growing Seeds for the Market Place: Strategies, Challenges, Regulations"
  - o "Organic Pest Management in Orchards and Berries"
  - o "Using High Tunnels for Crop Production"—
  - o "Need Money to Buy or Improve your Farm?"

At the conference in November 2014 in Vancouver, WA, topics covered included:

- Beginning Farmer Workshops:
  - o "Drip and Micro-Irrigation for Small-Scale Growers: Simple, Scalable Systems"
  - o "Fundamentals of Seed Production"
  - o "New Apple Orchard Development: From the Soil Up"
  - o "Designing for Plant Disease Management on your Organic Vegetable Farm"
- Advanced Farmer Workshops:
  - o "Farming with Beneficial Insects: Ecological Strategies for Pest Management and Pollination"
  - o "Tools for Creating a Nutrient Management Plan in Organic Systems"
  - o "Imagine Organic Solutions: Spotted Wing Drosophila and Brown Marmorated Stink Bug"
  - o "Farm-to-School: Reasons, Rules, and Realities"
- An additional two specialty crop roundtable sessions were offered at the 2014 conference:
  - o "Farm Stands and Farm Stores: Opportunities and Challenges"—
  - o "State of Organic Seed"

In partnership with WSU Small Farms Team, Tilth Producers planned, publicized and implemented a total of 38 farm walks across the state. An additional farm walk was planned and publicized with a cider apple producer for September 2015, but was unfortunately cancelled due to the farmer having a family emergency. A farm walk was unable to be

rescheduled in its place. Of the 38 farm walks, 14 directly addressed specialty crop focused topics, 5 of which were unique within the farm walk slate, and 4 of which included a hands-on component. Specialty crop topics covered included: organic blueberry production, mushrooms, season extension in vegetable production, cider apple production, value-added processing, unique tree fruit and nut crops, on-farm composting, assessing pollinator habitats on the farm, and diversified marketing strategies. Throughout all farm walks, experienced and new farmers exchanged methods, challenges, solutions and camaraderie. Every farm walk was attended by a resource specialist including WSU researchers and extension agents, WSDA Organic Food Program inspectors, NRCS staff and researchers, USDA-ARS researchers, USDA-FSA staff, and various local conservation district staff across the state. Each attendee received a booklet containing material to reference and take home. These documents were also made available on the Tilth Producers website along with a full summary written by the Education Coordinator. At all farm walks an optional brown-bag lunchtime was offered as an opportunity for attendees to network with one another. Though this increased staff time at the host farm, the idea proved worthwhile as the additional, unstructured time together for attendees was spent discussing farming, further creating transfer of knowledge. Evaluations were collected from each attendee by WSU and later analyzed; the information gathered will inform future specialty crop workshops and farm walks. Overall, the specialty crop farm walks served a total of 374 participants, including resource specialists and farmers. Anecdotal, visual data indicates that the breakdown of participants by gender was roughly 43% men to 57% women; that attendees under 30 was roughly 33% and those older 67%; and that attendees who were Latino or other ethnicity was 17%. Evaluation data, however, showed that 41% of attendees were beginning farmers and 59% were experienced. This data point reinforces other information in that indicates individuals of all ages are learning to farm.

Three one-day universities on specialty crop production and marketing practices were completed. Due to scheduling issues there was no one-day university in year one. In year two, Tilth Producers staff and the PRT finalized one specific and one general topic for two 2014 one-day university workshops: one regarding pest and disease management and one regarding holistic financial planning. Due to a change in staff, these one-day universities were not implemented within grant year two. In year three, all one-day universities were planned, publicized, and implemented. In November 2014, a holistic financial planning one-day university was planned, publicized, and implemented in conjunction with the 2014 annual conference in Vancouver, WA. The second one-day university was held in January 2015 with a focus on crop planning and record keeping for a diversified vegetable farm in Mount Vernon, WA. A final one-day university was held in August 2015 in Pullman, WA, focused on organic farming, soil fertility, and composting. This one-day university was held in partnership with faculty of the WSU Department of Crop and Soil Science. Overall, a total of 136 farmers, community members, and resource specialists attended one-day universities. These educational events were offered in unique locations across the state, allowing the participation of unique farmer audiences.

To document and disseminate best growing and marketing practices of successful, experienced organic specialty crop producers, Tilth Producers generated a permanent record suited for each type of educational program offered. For all farm walks, educational booklets were created in conjunction with the host farmer and appropriate resource contacts. The booklets were distributed to attendees and then made available on the Tilth Producers website. Conference workshops were best captured with audio recordings, and the 24 audio files were also made available on the Tilth Producers website. Farm walk, crop mob, and workshop summaries and photos were created and shared on the Tilth Producers website and Facebook page, as well as published in the *Tilth Producers Quarterly* journal.

Consultation with agricultural researchers and experienced growers occurred throughout the grant period to aid in the development of a final research agenda for biological control for pests and diseases of specialty crops. Anecdotal information suggests that farmers would like to see research and education that offers an integrated approach to disease management. This was particularly apparent at the one-day university focused on soil fertility and compost, where discussions focused on increasing the biological activity of soils to prevent disease. Unfortunately, a formal meeting over such topics of Tilth Producers with the WSU Small Farms Team and WSU CSANR faculty did not materialize. However, Tilth Producers did participate in an organic stakeholder forum organized by the WSU Agricultural Research Center in April 2015, which had the stated principal goal to receive input on how WSU can invest in research to strengthen and expand organic agriculture in the region. Tilth Producers is not a research institution in itself, but will continue to address pest management issues in future programming and seek out partnerships with research institutions.

The Peer Review Team (PRT) convened for a total of five meetings during years two and to help identify educational needs, develop criteria for assessing methodology, provide information on current research, and identify presenters and

farm locations for programs. Significant specialty crop needs identified included season extension, business skills, value-added options, soils knowledge, post-harvest handling, holistic farm management, pest and disease management, record keeping, and marketing. Effort was made to discern appropriate learning formats for each topic, with the PRT identifying those best suited for hands-on learning or on-farm experience versus classroom-based training. The PRT was composed of experienced growers and agricultural professionals including academic researchers and extension faculty, government employees, and non-profit representatives. It was of the utmost importance for the Peer Review Team to include a variety of stakeholders to provide the best guidance to Tilth Producers programming and resources.

Researchers and Small Farms Team members from the WSU Center for Sustaining Agriculture and Natural Resources (CSANR) helped identify topics and host farmers for farm walks and workshops. WSU also participated in collaborative planning; delivered education events and concepts; assisted with event logistics, outreach, materials, and facilitation; provided administrative support for farm walks, including collaborative planning, implementation, outreach, speaking and evaluation; and also participated on the Peer Review Team.

Approximately 140 established Washington specialty crop producers, researchers, and agriculture experts served as presenters, speakers, and farm walk hosts at educational events. This group included:

- Certified organic specialty crop farmers who presented workshops at the annual conference, hosted farm walks and provided support and expertise at farm walks. More experienced growers shared practical and/or hands-on knowledge and skills that supported new farmers. These farmers also provided valuable specialty crop farm knowledge to participants through written material for booklets and *Tilth Producers Quarterly* journal articles.
- Agricultural professionals attended educational events to provide additional education for growers. Organizations represented included NRCS, local conservation districts, agricultural researchers, private agricultural consultants. Also providing technical assistance were:
  - Extension agents from both Washington State University and Oregon State University,
  - Washington State Department of Agriculture speakers and outreach support from the WSDA Organic Food Program, WSDA Food and Consumer Safety.

Washington Young Farmers Coalition participated in identifying needs; assisted with selecting workshops, farm walk topics, and host farms; coordinated events; prepared educational materials; provided outreach; and also participation on the Peer Review Team.

Washington State Farmers Market Association and Cascade Harvest Coalition assisted with outreach for all events, and the latter organization also participated on the Peer Review Team.

Approximately 300 consumer and farmer volunteers assisted with program delivery, especially at the annual conference, which included volunteers from Washington Young Farmers Coalition and students from WSU Organic Agriculture Program, Wenatchee Valley College, and The Evergreen State College.

Organic industry retailers, wholesalers and farmers donated food and beverage for events.

Educational programs offered under this grant were integrated into Tilth Producers general programming, so care was taken to track information specific to the SCBGP project. Survey data indicates that Tilth Producers audience is interested in specialty crop production though not all attendees may currently be specialty crop producers. For instance, oftentimes attendees are interested in expanding their farm operation to include specialty crop production. As much as possible, specialty crop educational events hosted by Tilth Producers are identified as such in outreach and publicity materials. The WSDA Specialty Crop Block Grant Program logo is used on publicity materials for applicable workshops and events. Evaluations are done at each event and data from only specialty crop farm walks and workshops are tabulated for grant reporting.

## **GOALS AND OUTCOMES ACHIEVED**

**OUTCOME 1 TARGET:** Both the number of certified organic farms and the overall organic specialty crop acreage will show an increase of at least 3% over the grant period.

**ACTIVITIES COMPLETED:** According to statistics provided by Washington State University, Center for Sustaining Agriculture and Natural Resources (WSU-CSANR, “Current Status of Certified Organic Agriculture in Washington State: 2014), and determined using data from the WSDA, total certified organic acreage decreased 4% between 2012 and 2013. However, certified organic specialty crop acreage has actually increased: vegetable acreage increased by 5%, tree fruit by 2%, small fruit, grapes and nuts by 1%. The exception is the number of acreage in herbs, which decreased by 11%. Also, the number of certified organic farms fell from 731 farms in 2012 to 712 farms in 2013. Between 2013 and 2014, total certified organic acres in Washington increased 3.1%. The increase held true for specialty crops - vegetable acreage increased by 22.9%, tree fruit by 0.5%, small fruit, grapes and nuts by 0.7%. In 2014, 700 total farms were certified and 7 were in transition. The fluctuations in certified organic acreage and sales are due to factors beyond Tilth Producers educational programming’s impact, especially given that the state’s organic growers include farms of all sizes and crop types, not just small-scale specialty crop producers. Additionally, Washington state’s organic industry includes export market and wholesale producers in comparison to Tilth Producers audience which is comprised primarily of direct market specialty crop producers.

While the initial target of a 3% increase in certified organic acreage was met, it is still unknown how to best attribute that increase to the educational opportunities provided during the grant period. All programming and resources provided by Tilth Producers are centered on organic production practices, which likely have an effect on the ability for growers who have taken part in these services to successfully become certified organic. Evaluation data for farm walks and conference workshops illustrates that a majority of farmers are likely to implement changes on their farms based on the knowledge they obtained about organic production practices.

**OUTCOME 2 TARGET:** The number of new Tilth Producers organic specialty crop farm memberships increases by at least 10%.

**ACTIVITIES COMPLETED:** In October 2012, Tilth Producers membership was 514 and in September 2015 membership was 493. Despite this apparent decrease – and because Tilth Producers membership is on a rolling not an annual basis – membership fluctuates as farmers renew their memberships to take advantage of programming registration discounts, most notably the annual conference held each November. For this reason, there is always a surge of renewals in October of every year, placing membership numbers closer to 520. Of that roughly 520, 50% are identified as farm/family members with an additional 30% as individual members. Despite efforts to determine the exact number of members who are specialty crop growers, our best estimate is that 60% of Tilth Producers membership grows at least one specialty crop product.

The overall goal of Tilth Producers programming is to help reduce barriers for beginning organic specialty crop growers and provide them with knowledge and tools to continue farming successfully.

**OUTCOME 3 TARGET:** Convene and record a minimum of 24 educational and networking sessions taught by seasoned organic specialty crop growers.

**ACTIVITIES COMPLETED:** During the period of this SCBGP project, Tilth Producers implemented 46 educational sessions taught by experienced organic specialty crop growers. This number includes farm walks, one-day universities, hands-on farm workshops, and conference workshops. All sessions were made available to non-participating specialty crop producers via either audio recordings, written summaries, session booklets, or presentation information. Additionally, the wiki page hosted 11 articles about organic farm practices written by expert growers and researchers.

**OUTCOME 4 TARGET:** A minimum of 40% of all farmer participants indicate they have realized direct income benefits to their farm as a result of attendance in educational events or online resources offered by Tilth Producers.

**ACTIVITIES COMPLETED:** Data collected through a final specialty crop survey in early 2015 reports that of those respondents that attended a specialty crop farm walk in either 2013-2014 (N=17), 50% indicated that their knowledge gained through attending a farm walk likely increased their farm’s income. As for online resources of those respondents who reported utilizing Tilth Producers online resources (N=21), 48% attributed their knowledge gained as likely increasing their farm’s income. The total sample size of this final survey was 67 (13% of Tilth Producers membership of approximately 500), so we would expect a different result had a more thorough approach been taken to survey both members and non-members of Tilth Producers who grow specialty crop products.

**OUTCOME 5 TARGET:** The number of Tilth Producers non-certified farm memberships in the sustainable and ecologically sound categories increases by at least 5%.

**ACTIVITIES COMPLETED:** Education events included information about sustainable and ecologically sound production practices, with all Tilth Producers farm walk host farms being certified organic or self-identifying in the sustainable and ecologically sound category. All program speakers, both growers and agriculture professionals, espouse organic and sustainable practices and address environmental stewardship when practical. Unfortunately, Tilth Producers did not develop a concise method to track increases of farm members who realized sustainability benefits as a result of Tilth Producers programming.

No expected measurable outcomes were long term.

**GOAL 1 - Increase the number of organic specialty crop growers in Washington.**

**ACTUAL –** Several of the specialty crop conference workshops focused on organic practices and/or were implemented by experienced certified organic farmers. All of the farm walk hosts followed organic practices, with 8 of the 14 farm hosts being certified organic. At every farm walk event, a representative of the WSDA Organic Food Program was in attendance as a resource for attendees to ask questions about certification and organic production practices. Though a direct correlation with an increase in organic specialty crop growers can be made with attendance to educational programming during this period, Tilth Producers is confident that the education made available reduces barriers for growers working towards using organic practices, gaining certification, or maintaining organic certification with updated information on practices and recordkeeping.

**GOAL 2 - Reduce barriers to beginning organic specialty crop farmers.**

**ACTUAL –** A majority of attendees to educational programs were identified as beginning farmers through evaluation data. This confirms that beginning farmers look to Tilth Producers programming to provide them with high quality information regarding specialty crop practices. With a majority of educational program attendees indicating in evaluations that they would make changes to their farm operations based on what they learned, Tilth Producers is confident that its programming is reducing barriers for beginning organic specialty crop farmers.

**GOAL 3 - Facilitate an intergenerational transfer of at-risk organic specialty crop farming knowledge.**

**ACTUAL –** The majority of conference presenters and farm walk host farmers were experienced organic specialty crop producers. Not only was their knowledge of specialty crop farming captured in the peer-to-peer learning format but also in *Tilth Producers Quarterly* journal articles, direct interviews, farm walk booklets and summaries, and workshop summaries. This literature was made available through the Tilth Producers website and if available in print, at educational events. Attendees represented a majority of beginning growers and others interested in learning new skills from fellow experienced growers.

**GOAL 4 - Improve profitability of existing specialty crop farmers through improved production practices.**

**ACTUAL -** Per data from the Tilth Producers 2013 SCBGP survey farmer respondents indicated that educational opportunities provided by Tilth Producers are likely to improve their farm profitability. To give these farmers further resources to improve their profitability in addition to production practice know-how, focus was placed on including conference workshops on financial planning; a one-day university focused on crop planning and record keeping; and a hands-on workshop focused on profitable mid-scale vegetable farming from planting through marketing to wholesale retailers. Per data from the Tilth Producers 2015 SCBGP, farmer respondents did indicate that attending educational opportunities in the previous two years likely increased their farm income.

**GOAL 5 - Improve environmental stewardship of Washington's agricultural land and waters.**

**ACTUAL –** Environmental stewardship was often addressed during farm walks, though not always the focus. For example, in 2014 the following farm walks discussed stewardship practices:

- Alpenfire Cider, the growers discussed their use of bee boxes to house native mason bees and the maintenance of surrounding forest to encourage raptor habitat.
- Stockhouse Farm, attendees were informed of how trees had been planted in the farm's early years and today provide a buffer for persistent wind from the nearby river.

- Bow Hill Blueberries, discussed the recent conversion of their historical, conventional blueberry farm to one operated with certified organic practices.

Through partnerships with stakeholders and under the advisement of the Peer Review Team, Tilth Producers developed baseline data which was built upon anecdotal evidence collected through previous engagement with the specialty crop grower community. This evidence was gathered from previous seasons of farm walks and conference workshops. Tilth Producers was not able to develop a concise method to measure a baseline for all outcomes, nor a concise way to measure related achievement. Program evaluations do point to a continued need for programming that addresses organic practices, farm profitability, and environmental stewardship – especially if taught by experienced growers and agricultural professionals. Growers who attended programs often commented on a need for more farm walks and programs focused on specialty crop production practices and indicated a desire for further opportunity to engage with their peers. From the information gathered Tilth Producers believes this grant project met the needs of specialty crop producers as presented by the Tilth Producers community, though it is hard to measure whether the outcomes as set in the original proposal were concretely met. The grower community is fluid from year to year, making it difficult to properly assign baseline data to describe them as an audience. That being said, the Tilth Producers grower community is uniquely able to present their challenges and offer suggestions for how continued Tilth Producers educational programming helped them realize their own farm business goals – something we have found to be defined on an individual basis.

### **BENEFICIARIES**

Small to mid-sized specialty crop producers across the state benefitted from knowledge gained through attending farm walks, hands-on farm workshops, one-day universities, and annual conference workshops. For those growers who were unable to attend educational opportunities in person, all resource material was made available on the Tilth Producers webpage including farm walk booklets, farm walk summaries, workshop summaries, interviews, and audio recordings. Researchers, agriculture specialists, and resource staff in attendance at project events also benefitted as they gained knowledge of the needs of Washington specialty crop producers.

Geographically, educational events were intentionally located throughout the state. Of the 39 Washington counties, 13 counties played host to specialty crop farm walks and/or hands-on farm workshops. They included Chelan, Clark, Clallam, Thurston, Jefferson, King, Kitsap, Klickitat, Skagit, Lewis, Wahkiakum, Whatcom, and Whitman. The Tilth Producers annual conferences during this grant period was held in three unique regions of the state: Clark, Jefferson, and Yakima counties. Though growers may not be able to attend all educational programs offered, hosting them in various locations and counties allowed for programming with targeted topics that appealed to local growers.

The following table summarizes data collected from specialty crop producers in 2013 and again in 2015 that relates to the economic impact of the project. The survey in 2013 was offered as both a hard copy and an online format, while the 2015 survey was online format only. As samples of the larger Tilth Producers membership, these results indicate that the majority of members grow at least one specialty crop product.

<b>Survey Period</b>	<b>Nov. 2013 – Jan. 2014</b>	<b>Feb. – Mar. 2015</b>
Total # of Respondents	160	67
% of Specialty Crop Producers	90%	100%
% of Respondents Vegetable Growers	84%	80%
% of Respondents Berry Growers	45%	48%
% of Respondents Tree Fruit Growers	40%	34%
% of respondents that indicated that the knowledge they gained through the attending an annual conference was likely to have increased their farm's income	25%	45% <sup>w</sup>
% of respondents that indicated that the knowledge they gained through the attending farm walk was likely to have increased their	57%	55% <sup>wx</sup>

farm's income		
% of respondents that indicated that the knowledge they gained through the attending an on-farm workshop was likely to have increased their farm's income	55%	52% <sup>wxy</sup>
% of respondents that indicated that the knowledge they gained through utilizing resources on the Tilth Producers webpage was likely to have increased their farm's income	23%	40% <sup>wxyz</sup>

<sup>w</sup> 36 responded to the question regarding farm walk attendance, 20 indicating that they attended farm walks during the previous two years

<sup>wx</sup> 38 responded to the question regarding conference attendance, 27 indicating that they attended an annual conference during the previous two years

<sup>wxy</sup> 38 responded to the question regarding workshops attendance, 25 indicating that they attended an on-farm workshop during the previous two years

<sup>wxyz</sup> 37 responded to the question regarding utilizing online resources, 25 indicating that had utilized online resources during the previous two years

## **LESSONS LEARNED**

This SCBGP project allowed for more systematic review and follow-up of Tilth Producers stakeholder community and educational program attendees. A crucial success point was the hiring of an Educational Coordinator to oversee targeted programming for specialty crop producers. While Tilth Producers had always collected farm walk and workshop evaluations, the addition of a dedicated staff person to organize and capture input from the PRT and other stakeholders as well as evaluation feedback was invaluable.

An important lesson learned was the need to set realistic goals as well as appropriate means to measure progress. Not enough time was given to refine survey techniques to appropriately track the efficacy of programming and resources in quantitative terms. However, the grower community of Tilth Producers provides rich anecdotal feedback and every educational opportunity during this grant project doubled as a forum for growers, resource specialists, community members, and Tilth Producers staff to engage in dialogue regarding the needs for organic specialty crop growers, with a focus on providing skills and knowledge to help them be successful. Where the quantitative data may lack on certain points, it is made up for with the community of growers and open exchange of ideas created by Tilth Producers and project partners.

The inclusion of hands-on workshops in this project was in response to previous evaluation data and proved more complicated to implement successfully than expected. It was learned that only small groups can effectively benefit from hands-on learning and that attendee expectations must reflect this. Not only did attendees benefit from a small group, grower presenters were better able to impart experiential, peer-to-peer knowledge in such settings. Related, it was also learned that hands-on opportunities may be limited due to safety and liability concerns, both of the participants and also of the specialty crop itself (e.g., food safety practices that discourage 'volunteer' labor such as that provided in a hands-on workshop).

The wiki page for farmers was a resource that was expected to be widely used by growers, both as contributors and as commenters/viewers. Stakeholders and farmers alike regularly requested ways in which to engage in conversation with peers regarding production and business practices. Further, Tilth Producers identified a need for agricultural researchers to disseminate their research findings to specialty crop growers. Consequently WSU was a contributing partner in the wiki project but was also unable to help generate interest and usage. Despite heavy promotion, the response and use of the wiki page was lackluster. Feedback from specialty crop producers indicated barriers such as lack of time to write entries and ambivalence about having something worthy to share, among others. Though online resources are widely used by the Tilth Producers audience, it was made apparent by the lack of interest in the wiki page that exchange of information between farmers occurs more organically in a one-on-one or in person basis. This unexpected result forced Tilth Producers to consider different ways of implementing the wiki page but no successful options were discovered.

Throughout the period of the project there was a focus on determining specific organic growing practices and information needed to support the success of specialty crop producers. The project activity to develop and later disseminate a research agenda for biological control for pests and diseases of specialty crops was both too specific a need and beyond the overall capabilities of Tilth Producers. Through discussion with the Peer Review Team this workplan activity was deemed outside the skillset of the PRT and the stakeholder audience which was consulted. Research institutions determine their agendas

internally based on faculty research and feedback, though stakeholder input is often requested. While several researchers participated in the PRT and stakeholder discussions, none have authority in the decision making of a university research agenda. As a non-profit that educates specialty crop producers Tilth Producers is best positioned to provide input for a research agenda, not to create such an agenda.

### **ADDITIONAL INFORMATION**

The following were match contributions:

- Salaries & Wages Managing:
  - Director Salary: 15% time for 36 months = \$27,450 (oversight and management);
  - Bookkeeper: 90 hours @ \$40/hr = \$3,600 (data entry and tracking);
  - Program Assistant: 100 hours x \$18/hour = \$1,800 (for event registration, accounting, publicity and outreach)
  - Administrative Assistant: 80 hours x \$18/hour = \$1,440 (same as above)
- Benefits: Director - 15% time = \$1,725
- Supplies: office supplies \$1,630 (est.) - general supplies (Tilth Producers)
- Printing: \$2,040 (est.) - Farm walk fliers, workshop publicity, TPQ articles (Tilth Producers)
- Meeting Space: \$3,400 (est.) - conference and workshop facilities (Tilth Producers)
- Communications: \$1,590 (est.)- Attributable portion of website and telephone fees (Tilth Producers)
- WSU Center for Sustaining Agriculture and Natural Resources (CSANR) = \$20,798
  - WSU staff providing 84 total hours of in-kind: David Granatstein, Marcy Ostrom
  - WSU staff providing 48 total hours of in-kind: Lynne Carpenter-Boggs, Doug Collins

The following were in-kind contributions:

- Peer Review Team: 10 individuals each contributed approximately 32 hours of their time
- Publicity: Approximately 8 collaborators each contributed staff time and resources to publicize educational events under this grant.

### **AgInfoNet Articles/Radio:**

June 18, 2014 "Farm walks": <http://www.aginfo.com/index.cfm/report/id/Search-28319>

July 11, 2014 "Growing new farmers": <http://www.aginfo.com/index.cfm/report/id/Search-28514>

February 6, 2015 "Vineyard management workshop": <http://www.aginfo.com/index.cfm/report/id/Search-30246>

### **Capital Press Articles:**

April 2, 2013 "Farm walks study variety of applied skills": <http://www.capitalpress.com/content/SB-farm-walks-ADV-040513>

October 4, 2013 "Tilth Producers plan annual conference Nov. 8-11":

<http://www.capitalpress.com/article/20131004/ARTICLE/131009953/1009>

**Tilth Producers Farm Walk Page:** <http://tilthproducers.org/programs/farm-walk/>

**Tilth Producers Quarterly Journal Online Library:** <http://tilthproducers.org/programs/journal/>

**Tilth Producers Workshop Page:** <http://tilthproducers.org/programs/workshops/>

**Tilth Producers Conference Audio Library:** <http://tilthproducers.org/library/conference-audio/>

**Tilth Producers Online Farmer Resources:** <http://tilthproducers.org/farmer-resources/>

**Tilth Producers Facebook Page:** <https://www.facebook.com/TilthProducers>

**Wiki for Farmers:** <http://wikiforfarmers.wikispaces.com/>

### **Yakima Herald Article:**

March 21, 2014 "Cultivation innovation: Tilth farmers learn about high tunnels":

[http://www.yakimaherald.com/news/local/cultivation-innovation-tilth-farmers-learn-about-high-tunnels/article\\_f62eb0a3-ffd5-5a74-a108-86d88db78b7a.html](http://www.yakimaherald.com/news/local/cultivation-innovation-tilth-farmers-learn-about-high-tunnels/article_f62eb0a3-ffd5-5a74-a108-86d88db78b7a.html)

### **CONTACT PERSON**

Nancy Allen

Tilth Producers of Washington

206-632-7506

nancy@tilthproducers.org

**Project Title:** Evaluation of Input Residue and Biological Material Impacts Organically Grown Hops

**Partner Organization:** Washington Hop Commission (WHC)

### **PROJECT SUMMARY**

United States breweries are increasing their practice of "dry hopping," a brewing regime in which hops are introduced later in the brewing process, during fermentation and post-fermentation in addition to the more traditional kettle boil stage. Also, an increasing number of breweries are producing small quantities of fresh-hopped ales at harvest time, using green, fresh (high-moisture) hop cones that are introduced directly into the brewing process without drying or other post-harvest processing (wet hopping). Previous studies to quantify pesticide residues in beer have been conducted using dried hops treated with conventional pesticides, with hopping additions taking place during the kettle boil stage. This study produced beers using late additions of both fresh/green and dried whole and pelletized hops, representing both conventional and organic hop production as well as hops completely untreated by pesticides, and compared these hopping regimes to beers using additions of dried hops during the traditional kettle boil stage. The WHC intended to demonstrate whether pesticide residue levels in the resulting beers were consistent across these various hopping regimes. Additional work was completed beyond the scope of the original proposal to include how the plant nutrient programs under which these hops were grown impacted the quantity of anions, cations, and minor elements in the resulting brews.

The market share of all-malt beer sales is increasing domestically and internationally. Brewers small and large are revolutionizing beer by increasing their use of hops and being innovative as to how they incorporate hops into brewing regimes to enhance the flavor profiles of the beers they produce. Brewers, driven by increasingly sophisticated consumer demands for healthy and sustainably produced products, pride themselves in taking a holistic approach and producing products that are not perceived as being unhealthy for the consumer.

The WHC set forth in this project that hopping at all stages in the brewing process as well as substantially increasing hopping rates compared to traditional American Pilsners was not contributing to the pesticide risk cup<sup>1</sup> for consumers of beer.

This project was not previously built on another Specialty Crop Block Grant Program project.

### **PROJECT APPROACH**

In 2013 Dr. Doug Walsh established plots in a 3-year old research hop yard *cv.* 'Cascade' at Washington State University's Irrigated Agriculture Research and Extension Center IAREC) near Prosser, WA onto which the WHC established conventional nitrogen fertilization regimes in replicated plots (n=4) that consisted of applying 120 lbs of N dry in spring and then chemigating in a total of an additional 120 lbs of N on a routine basis (approximately weekly) with a final application date of July 19, 2013. Onto this block the WHC applied a series of pesticide treatments that, while likely greater than those in a standard conventional commercially produced block, were within the realm of a pesticide program that potentially would have been applied by a conventional hop farmer. Details will be provided on pesticide application later in this research report but application records were maintained by Good Laboratory Practices

(GLP)-certified pesticide applicators and rigorous standards nearly compliant with GLP practices were maintained. The only deviation from GLP compliance was that the WHC chose to forego the additional expense of paying for a quality assurance inspector. Throughout the rest of this final report, hops originating from this block within the research hop yards will be referred to as "conventional" and subsequently all the beers brewed from hops originating from this block will be referred to as "conventional" as well.

Concurrently Dr. Walsh rehabilitated an 8-year old *cv.* 'Cascade' block in 2012 on the WSU Prosser IAREC headquarters unit. This block of hops had been used in a cover crop study that had been discontinued due to funding cuts and had not been strung for several years. Consistent irrigation was applied to this block and organically acceptable methods were

---

<sup>1</sup> EPA introduced the "risk cup" concept to help explain the impact of the Food Quality Protection Act on the allowable level of exposure to a given pesticide through all routes of exposure, taking into account whether any other pesticides pose risks through a common mechanism of action. The "risk cup" is a graphical representation of the acceptable amount of exposure to a given pesticide for a person of known weight. The size of the risk cup is typically reported in milligrams of pesticide per day, and is based on the pesticide's inherent toxicity and the average weight of a child exposed to the pesticide.

used to try to build up the soil nutrients in this block in 2012 and 2013. No pesticides have been purposefully applied to this block of hops in over 5 years and hops harvested from this block and beers that were subsequently brewed with these hops will be referred to as “nontreated” throughout the rest of this research report.

Commercial organically produced hops cv. ‘Chinook’ were obtained from an organically-certified hop grower that is located near Moxee, WA. Pesticide and nutrient spray records were obtained from the grower and will be detailed later in the body of this report. These hops and the beers that were brewed from these hops will consequently be referred to as “organic” throughout the rest of this report.

The WHC harvested hops from the conventional and nontreated blocks that were grown at WSU Prosser IAREC and calculated yields. Some “wet” hops were then frozen at  $-18^{\circ}\text{C}$  for use in wet hopping beers as detailed later in this report. The rest of the hops were dried down to 8 to 10% moisture in the forced-air, propane-heated research hop kiln. These dried hops were then pressed into 1-lb bricks and stored in the walk-in cooler at  $-18^{\circ}\text{C}$ . The WHC then shipped samples from these 1-lb hop blocks as well as aliquots of hops from the organically produced hops to Yakima Chief for alpha and beta acid quantification tests and to Quality Analytical Lab, Ft. Lauderdale, FL, for tissue nutrient analysis. Green hops, as well as hops kiln-dried to 10% moisture, were sent to the analytical lab. Yields were significantly ( $p<0.01$ ) lower in the nontreated block than the conventional block. Yield per acre could not be calculated in the commercially produced organic block; hence no statistical analysis was possible. Nutrient levels of plant macro- and micronutrients in dried hops among the 3 candidate treatments are detailed in. No significant ( $p>0.05$ ) differences in the quantities of K, Fe, Mn, B, Cu, and Na were measured among the three treatment regimes. Among the macronutrients there were statistical differences in the percent dry matter among the candidate hop treatments for N, P and Ca. The percent dry matter of N was significantly ( $p<0.05$ ) lower in the nontreated hops than in the conventional and organic hops. P was significantly ( $p<0.01$ ) greater in the nontreated and organic hops than the conventional hops and the quantity of Ca was significantly ( $p<0.05$ ) greater in the nontreated hops and significantly ( $p<0.01$ ) lower in the organic hops. Among the micronutrients for which there were statistically significant differences among the candidate hop treatments: the quantity of Mg and Mo were both significantly ( $p<0.05$ ) lower in the organic Chinook than the conventional and nontreated Cascade hops; the quantity of Zn was significantly ( $p<0.01$ ) greater in the organic Chinook than the conventional and nontreated Cascade hops; the quantity of S was significantly ( $p<0.01$ ) lower in the nontreated Cascade than in the conventional Cascade and organic Chinook hops; and the quantity of Al was significantly ( $p<0.05$ ) greater in the nontreated Cascade than in the conventional Cascade and organic Chinook hops.

Concurrently aliquots of hops were shipped to the Western Region IR-4/Trace Analytical Laboratory located in the Department of Environmental Toxicology laboratory for analysis of pesticide residues on the hop treatments detailed above. The conventional hops had been treated throughout the growing season and the pesticides applied to these hops, the target pests for the pesticide, the number of individual applications for the pesticide, the rate per acre, the application dates, and the days prior to harvest are detailed in. Pesticides applied included the active ingredients norflurazon, trifluralin, carfentrazone-ethyl, dimethomorph, boscalid, pyraclostrobin, mefenoxam, copper hydroxide, imidacloprid, myclobutanil, quinoxifen, etoxazole, triflumizole, and bifentazate. The pesticides that were applied to the organic Chinook hops are detailed in. The pesticide active ingredients applied to the organic hops included saponin, *Isaria fumosorosea*, *Chromobacterium subsugae*, extract of *Reynoutria sachalinensis*, sugar, and potassium salt soap. No pesticides were purposefully applied to the non-treated hops, although some inadvertent drift of pesticides was detected from a nearby wine grape vineyard cv. ‘Chardonnay’. The WHC obtained the spray records from the viticulturist who manages this vineyard and anecdotally the residues detected at trace levels matched products applied for powdery mildew and spider mite control in this vineyard.

#### **Methodology for the determination of pesticide residues in hops and beer**

Wet and dried hop samples were received frozen at the IR-4/Trace Analytical Laboratory in October 2013. The hop samples were chopped in the presence of dry ice to generate a homogeneous sample suitable for analysis. In April 2014, aliquots of the samples (0.5 g dried hop and 2.0 g wet hop) were placed into 50 mL polypropylene centrifuge tubes and 15 mL of acetonitrile was added. The tubes were capped and vigorously shaken for 1 minute at 1500 rpm using a Geno/Grinder 2010 shaker. The sample extract was transferred to a polymeric solid phase extraction (SPE) cartridge for cleanup. The resulting extract was concentrated, re-dissolved in a mixture of 10 mM ammonium acetate/methanol, and analyzed by liquid chromatography tandem mass spectrometry (LC-MS/MS). Pesticide residues detected in hops are detailed in.

Beer samples were received frozen at the IR-4/Trace Analytical Laboratory between June and August 2014. Prior to analysis the beer samples were thawed and mixed thoroughly. Aliquots of beer (20 mL) were transferred into 50 mL polypropylene centrifuge tubes and 4 g of magnesium sulfate, 1 g of sodium chloride, and 5 mL of 1% acetic acid in acetonitrile were added. The tubes were capped and vigorously shaken for 1 minute at 1500 rpm using a Geno/Grinder 2010 shaker. Beer samples were placed into a centrifuge for 5 minutes at 4000 rpm. The resulting upper layer of acetonitrile was sampled and diluted with a mixture of 10 mM ammonium acetate/methanol prior to analysis by LC-MS/MS.

In November 2013 hops were removed from the freezer and allowed to thaw to room temperature. These hops were then pelletized in the research pelletizer and vacuum packed in plastic wrap using a Seal-a-Meal® food packing device. These pelletized hops were subsequently returned to the walk-in freezer at -18°C for use in the brewing process. Given the increase in use by craft brewers, the WHC was investigating how pelletizing hops might impact the contribution of hops to the nutrient and pesticide load in beer.

### **Methodology for residue trial brewing**

Four batches of beer were brewed per brew day, with two brewed simultaneously in the morning and two simultaneously in the afternoon. Prior to boiling, 27 gallons of sweet wort was prepared, divided evenly between two 18-gallon Blichmann Boilermaker brew kettles. Nine to ten gallons of hot tap water, at approximately 140°F, was added to each pot. Two eight-gallon pouches of William's American Light liquid malt extract (LME) were then stirred into each pot, with extract residue rinsed out of each pouch with additional 140°F water and added to the pot. Additional hot water was then added to each pot to bring the volume up to 13.5 gallons. The contents of the two pots were then mixed by pouring sweet wort back and forth with a 5L plastic beaker, with three gallons at a time being transferred from one kettle to the other, before mixing thoroughly, then transferring six gallons of this mixture back to the first kettle. This process was repeated several times to allow for thorough mixing.

One kettle was then used to fill two eight-gallon Boilermaker brew kettles, with 6.5 gallons being added to each pot. Each batch of wort was boiled for a total of 75 minutes, with heat being monitored to keep both pots boiling at the same pace. The post-boil wort volume was approximately 5 gallons per batch. A Blichmann HopBlocker was used in each eight-gallon brew kettle to prevent hop material (when hops were added) from blocking taps and tubing.

After the boil, the wort was stirred continuously for 10 minutes to simulate a whirlpool step then allowed to settle for 5 minutes. Wort was drained from the kettle and sent through a Blichmann Therminator counter-flow chiller to cool it below 80°F. A sample was taken immediately after chilling to measure the original gravity. After chilling, pure oxygen was bubbled into the wort at approximately 5 psi for one minute. Two packs of Fermentis Safale US-05 yeast were added to the wort before the fermenter was sealed and swirled briefly to mix in the yeast.

Beers were ale-fermented at temperatures typically ranging from 70 to 78°F in Cornelius-style soda kegs. Primary fermentation lasted 7 days, at which time the wort was transferred to a sanitized, CO<sub>2</sub>-purged keg using CO<sub>2</sub> pressure. After an additional 7 days, the secondary fermenter keg was placed in a 40°F refrigerator for several hours to clarify the beer before transfer into a sanitized, CO<sub>2</sub>-purged serving keg. Primary fermenters were modified by cutting off the last 1.5 inches of the dip tube, to account for the settling of yeast sediment at the bottom of the keg. Secondary fermenters were similarly modified, with the last ¾ inch of dip tube removed.

Test beers were divided into four treatments with different hopping regimens. In treatment 1, hops were added to the wort 15 minutes after the start of boil and boiled for 60 minutes. In treatment two, hops were added 70 minutes after the start of boil and boiled for 5 minutes. In treatment 3, hops were added at flameout, immediately after the end of the boil. For treatment 4, hops were not added to the brew kettle, but were added to the secondary fermenting container immediately before racking (transfer of beer from one fermenting container to another).

Each of these four treatments were performed using fresh (wet) conventionally treated hops, dried whole hop conventionally treated hop cones, dried whole organically treated hop cones, dried whole untreated hop cones, and hops pellets formed from conventionally treated hops. The beers brewed and additional details including which extract (A or B), hop source, hop type, when hops were added, amount of hops added, original and final gravity, percent alcohol by

volume, and key dates in the brewing process are detailed in. When dried, whole hops or pellets were used, hops were added at the following rates: 70.0g in treatment 1; 36.6g (1/2 lb/barrel rate) in treatment 2; 73.2g (1 lb/barrel rate) in treatment 3; 73.2g (1 lb/barrel rate) in treatment 4. Due to the moisture content, fresh hops are generally approximately five times heavier than their dried counterparts. Accordingly, the hopping rates for fresh-hopped beers were: 350.0g in treatment 1; 182.9g (1/2 lb/barrel rate) in treatment 2; 365.8g (1 lb/barrel rate) in treatment 3; 365.8g (1 lb/barrel rate) in treatment 4. Each treatment, using each type of hop, was replicated four times. In addition to the hopped treatments, four batches of control beer, with no hops added, were brewed.

Between each use, all equipment was rinsed thoroughly then cleansed with SB Brewery Cleaner at a concentration of approximately 2 to 4 oz per gallon of water, as recommended by the label, then rinsed again. Smaller equipment, such as beakers, stirring spoons, and HopBlockers, were washed in an industrial dishwasher. Brew kettles, kegs, stainless still stirring spoons, HopBlockers, and oxygenation stones were also rinsed with pure acetone after cleaning. All equipment used to handle beer and wort post-boil was sanitized using Star San, a phosphoric acid-based sanitizer, at the concentration recommended by the label (approximately 1 oz per 5 gallons of water).

Aliquots of beer from each of these brews were then shipped to the Western Region IR-4/Trace Analytical Laboratory for analysis. The WHC had originally intended to brew all of the beers using a consistent source of extract, but unfortunately through the brewing process the WHC had to order and brew with a second batch of extract designated Extract B. In magnitude of pesticide residue tests performed on beers brewed with the no-hops-added treatment it was determined that the extract was contributing 2.46 parts per billion of boscalid in beers brewed with Extract A. No residues of boscalid were detected in beers brewed specifically with no hops added with Extract B. Subsequently the magnitude of boscalid residues detected in beers brewed with Extract A were corrected by reducing the residues detected by 2.46 ppb to correct for the extract's addition to the boscalid residue levels. These corrected values were subsequently used for the statistical analysis of the contribution of hops to the magnitude of boscalid residues detected in beers.

In the final analysis for pesticide residues present in beer, only two pesticides that were detected above the level of detection could be analyzed statistically. These were bifentazate and boscalid. The results of this analysis are detailed in the attachment. In beers brewed with both conventional dry hops and wet hops there were several trace detections of imidacloprid and pyraclastrobin. Wet hopping with the conventional hops consistently made the greatest contribution of boscalid and bifentazate to the beers compared to conventional dry or conventional pellet. However, in all cases these were far below levels with any health or legal ramifications. Wet hopping is not a traditional method for hopping, and is used in a very small minority of beers.

Low levels of boscalid were detected in the organic hops and this was likely the product of inadvertent spray drift from nearby conventionally produced crops. The contribution of residues of boscalid and bifentazate by dry hopping with conventional hops were consistent between using dried whole cone and dried pelletized hops. Trends within hopping regimes in beers brewed with dry whole cone or dry pelletized hops indicate that boiling time reduces boscalid and bifentazate residue levels, but this was only statistically significant ( $p < 0.05$ ) in the conventional whole-cone beers. A similar trend was observed with wet hopping with timing at 7 days after boil during fermentation contributing the most boscalid and bifentazate residues detected in beers.

Aliquots of all the beers were also shipped to Quality Analytical Laboratory in Florida for their standard analysis of well water. In this analysis the pH and EC are calculated, the cations  $\text{NH}_4$ , K, Mg, Na, and Ca are quantified at mg per liter, the anions,  $\text{NO}_3$ ,  $\text{PO}_4$ ,  $\text{SO}_4$ , Cl,  $\text{HCO}_3$ ,  $\text{CO}_3$ ,  $\text{CaCO}_3$ , are measured in mg per liter, and the minor elements Fe, Mn, Cu, Zn, Mo, and Al are also quantified in mg per liter. Among the anions, the addition of hops regardless of brewing regime had no measurable effect on the quantities of K, Mg, Na, and Ca present in beer. This data is not shown. Among the cations, the addition of hops regardless of brewing regime had no measurable effect on the quantities of Cl,  $\text{HCO}_3$ , and  $\text{CO}_3$  present in beer. This data is not shown. Neither the addition of hops nor any specific hopping regime made a significant ( $p > 0.05$ ) contribution of any of the minor elements to brewed beers compared to the beers brewed without hops. This data is not shown. Means of the substances quantified in beers that had significant differences ( $p < 0.05$ ) are detailed in the attachment. This included the cations  $\text{NH}_4$  and Ca and the anions  $\text{NO}_3$ ,  $\text{PO}_4$ , and  $\text{SO}_4$ .

The significant partners in this project were representatives from the brewing industry, hop grower representatives, and University Scientists based at UC Davis, Oregon State University and Washington State University. The craft brewers,

hop grower representatives provided input to the University-based scientists. This project has increased communication levels substantially and from this project the WHC will build new partnerships and collaborations.

Not applicable to this project, this project does not have the potential to benefit non specialty crops.

### **GOALS AND OUTCOMES ACHIEVED**

The primary goal of this project was to confirm that hop pesticide residue levels are consistent in beer, regardless of the form of hop and the hopping regimen that is used in the brewing process. The WHC achieved these results as detailed above in the section entitled *Project Approach*. In this section it has clearly been documented that this goal has been completed. Furthermore, WHC expanded the studies to include the contribution of the hopping regime to the quantity of anions and cations in beers. Among all the pesticides applied to the hops in the hop yards WHC could only quantify two pesticides in the beers brewed from the treated hops. Wet hopping in general and reducing boiling time in dry hopping typically increased the quantity of these two pesticides, but fortunately the quantities of these pesticides were inconsequential by orders of magnitude when compared to EPA and FDA standards. Results were very similar for the contribution of hops to the quantity of anions and cations in beer for each brewing regime as well as hopping regime.

Now that the science-based research is completed, the outreach phase will be initiated. The WHC anticipates two journal publications will be derived from this project. Additionally, a panel discussion and seminar is scheduled in which the project partners will present these research results and conclusions at the 59<sup>th</sup> Annual American Hop Convention and Hop Research Council Winter Meeting, January 20-23, 2015, in San Diego, California. This conference is an ideal venue for discussion of the results from this project. Results will also be presented at the Craft Brewers Conference and BrewExpo America in Portland, Oregon, April 14-17, 2015.

### **Documented that hops make a negligible contribution to the pesticide residue load contained within beer.**

The WHC has accomplished all of the project goals plus more than originally proposed in the plan of work. In addition to documenting that hops provide negligible contribution to the pesticide residue levels in beer regardless of the form of hop or the hopping regime, the WHC has documented the contributions that hops make to the quantity of measurable cations and anions present in beer.

The WHC has evaluated hops from conventional pesticide treated, organic, and completely pesticide untreated production systems, and quantified the pesticide residues that were detected in beer brewed under four different hopping regimens. This project provides sound data to brewers and assures the brewers that pesticide residue levels are negligible, regardless of the form of hops used or the hopping regime. The WHC anticipates publishing two scientific articles based on this project and presenting a detailed report to the Hop Research Council, Washington Hop Commission, Craft Brewers Association, and other appropriate industry organizations for distribution, discussion, and educational outreach.

### **BENEFICIARIES**

Hop Growers, brewers, hop merchants, and beer consumers are all beneficiaries of this project.

Not relevant to this project. This project evaluated the fate of pesticide residues and nitrates in hops through the brewing process, and compared the residues in the resulting beer to those in the hops. While the results of the project provide valuable information that will be used to educate brewers regarding these issues, there is no quantifiable economic impact at this time. If a brewer at some point in the future detected pesticide residues or nitrates in their beer, and a public relations issue developed, or additional restrictions were then placed on growers regarding the use of pesticides or fertilizers in hop production, there would certainly be an adverse economic impact on hop growers. However, it is impossible to quantify this impact at the current time.

### **LESSONS LEARNED**

The staff and graduate students at the WSU Environmental and Agricultural Laboratory have certainly improved their beer brewing skills. The WHC has learned how difficult it is to produce hops with no pesticide inputs.

There were no unexpected outcomes or results that were an effect of the implementation of this project.

**All the key objectives for this project were met.**

**CONTACT PERSON**

Ann George

509-453-4749

[ageorge@wahops.org](mailto:ageorge@wahops.org)

**ADDITIONAL INFORMATION See Attachment C 12-25-B-1495 Hop**

**Project Title:** Delimiting survey for tree fruit pests, Cherry Blossom Moth and Grape Tortrix

**Partner Organization:** Washington State Department of Agriculture, Pest Program (WSDA)

### **PROJECT SUMMARY**

In 2011, the WSDA pest program detected the Cherry Blossom Moth, *Argyresthia pruniella* (CBM), and Grape Tortrix, *Argyrotaenia ljugiana* (GT), for the first time in the United States, in Whatcom County. Both species are fruit pests in their native Europe, and the Washington tree fruit industry has expressed concern over their detection here. CBM larvae are active early in spring and feed in developing buds; in outbreak years than can destroy up to 90% of cherry buds. GT has 2-3 generations each year, depending upon the climate. Its preferred hosts are Ericaceae, particularly heathers and *Vaccinium*, but its broad polyphagy makes it a potential pest of several species. Unmanaged GT larvae have destroyed up to 47% of late-season apple harvest in parts of Russia, and late generation larvae feed on grapes causing damage similar to *Lobesia botrana* and *Eupocelia ampiguella*. This project sought to define the extent and density of populations and determine if they are well established in the state, and communicate the results of these surveys to Washington stakeholders in several venues.

Cherry Blossom Moth (*Argyresthia pruniella*) and Grape Tortrix (*Argyrotaenia ljugiana*) are pests of a wide variety of economically important fruiting species. CBM was detected for the first time in the United States in Whatcom Co. in 2011. Seventeen specimens were detected at three sites in Blaine, WA, close to the border with British Columbia. All were captured with pheromone traps hung on cherry trees; two backyard fruit trees and one wild *Prunus virginiana*. Known hosts of CBM in our region include cherry, plum, apricot, apple, pear, and hawthorn. These moths pose a potential management problem for all producers of these crops, primarily through destruction of developing flower buds. Overwintered larvae bore into stems at buds, eliminating the season's blossoms. Control of the pest is likely to be of special concern to organic growers, who are limited in their control tools. It is unknown how export market access would be affected if these pests become established. CBM is not a pest of mature fruit, and larvae would not likely be transported via fruit exports. However, both Chile and Japan regulate CBM specifically, and broad establishment of this pest could be of concern for phytosanitary certification of nursery stock. Additionally, adults are active and on wing in early July through August, and established populations could increase pre-clearance burdens for cherry exporters.

A single specimen of GT was collected in Whatcom County in 1997, although not identified until 2011. The 2011 identification was concurrent with Canadian detection of a congeneric species, although some confusion exists as to the exact species identity. It is possible that the pest and native species exist as a complex, but the dearth of specimens doesn't allow complete understanding of the current pest status of these animals. GT is a serious grape and apricot pest in Europe, and a minor pest of several other commodities. Adults prefer apples as oviposition sites, but hosts include grapes, apricot, lavender, apple, pear, blueberry, and huckleberry. Taken together, the value of these crops exceeded 2 billion dollars in 2010.

Delineating the distribution and densities of these two new potential pests will benefit tree-fruit, vine, and berry producers in the state. Cherry growers in particular may be impacted by establishment of CBM in any cherry-producing areas of the state, if greater expenditures are necessary to control feeding larvae or host-seeking adults. Potential damage is difficult to predict, particularly since introduced species can have dramatically different impacts than in their native range. Even so, early detection and knowledge of a pest's distribution provides growers and regulatory agencies with the decision space within which to develop appropriate responses, whether eradication, mitigation, or management. By determining the extent of these pests' distribution in WA so soon after initial detection, we can maximize the time growers and agencies have to respond to these new pests and develop control methods if necessary.

This project was not built upon a previously funded project.

### **PROJECT APPROACH**

During this project we placed 245 pheromone-baited traps to survey for two exotic pest moths in Washington State. 161 *Argyresthia pruniella* (cherry blossom moth) traps were placed in seven counties, and 84 *Argyrotaenia ljugiana* (grape tortrix) traps were placed in five counties. Traps were placed in April-May, checked semi-weekly through mid September, and then removed. All traps were screened in the laboratory. *Argyrotaenia ljugiana* was not found again in Washington during this trapping survey. *Argyresthia pruniella* found at 25 sites; 2 sites in San Juan County—a new location in

Washington State—and the remainder in Whatcom County. Trapping data indicate it has spread into Bellingham, which is several miles south of the previous data for Whatcom County. It was not found in the cherry production areas in eastern Washington. By placing traps early and retrieving them in the fall, we were able to mostly capture the flight period for this new moth. However, the end of the flight period is unclear, as a few moths were still captured in the last trap period.

This project did not have the potential to benefit non specialty crops.

**GOALS AND OUTCOMES ACHIEVED**

245 pheromone traps were placed in locations around Washington state to detect and delimit these moth populations. Four posters and two talks were presented at professional or stakeholder meetings during this project. A brief report was prepared and posted to a cooperative WSDA/WSU Extension website describing defoliating pests. There were no long term measurable outcomes for this project.

Trapping Goal: 170 total traps in Whatcom and Skagit counties, ~50 total traps in eastern Washington counties  
 Trapping Accomplishment: 225 traps in western Washington counties, 20 traps in eastern Washington. Geographic distribution of the traps was adjusted to concentrate traps near the previously detected specimens, to reflect the greater density of potential host material and less intensive management in western Washington, and because of limited site availability in eastern Washington

Table 1- Traps deployed by county and target pest

County	<i>Argyresthia pruniella</i>	<i>Argyrotaenia ljugiana</i>
Whatcom	69	43
Skagit	33	28
San Juan	21	6
Jefferson	0	1
Clallam	9	6
Snohomish	10	0
Grant	12	0
Okanogan	7	0

Outreach Goal: Present information at three public forums and one web-accessible format

Outreach Accomplishment: Information presented at six public forums and one web-accessible format

Combined with previous data, this project generated a well-delineated range for *A. pruniella* in Washington State. The extensive trapping period enabled by this project also allowed us to identify the approximate beginnings of the flight period, and indicated that the moth may be active even later in the summer than was previously supposed.

**BENEFICIARIES**

We have no data delineating specific beneficiaries of this project. The data were presented at meetings targeting the tree fruit industry and research community. The information was also made available to the public on two WSDA associated websites: <http://agr.wa.gov/PlantsInsects/insectpests/Exotics/Surveys/2014CherryBlossomMothSurveyReport.pdf> and [http://invasives.wsu.edu/defoliators/species\\_faqs.html](http://invasives.wsu.edu/defoliators/species_faqs.html).

Approximately 86 and 60 conference participants were present in the audience for the two talks given about *Argyresthia pruniella*, respectively. Over 2200 total registrants were present at the four meetings where a poster was presented, although there is no way to estimate how many may have actually looked at a poster.

The web-accessible information and fact sheet were posted on June 6, 2014. Since that time the cherry blossom moth directory has been accessed 697 times and the fact sheet downloaded 20 times.

**LESSONS LEARNED**

The data supplement previous survey data and strongly suggest that *A. pruniella* is both increasing its range and population density. It is not clear how damaging this pest may become in the PNW. There were no more *A. ljugiana* detections, and there are some indications that the original GT detection may have been a similar native species.

There were no unexpected outcomes or results that were an effect of the implementation of this project.

All activities, goals, and expected measurable outcomes were achieved during the project period.

**ADDITIONAL INFORMATION**

There were no in-kind or cash donations utilized for this project.

<http://www.invasives.wsu.edu/defoliators/news.html>

[http://www.invasives.wsu.edu/defoliators/species\\_faqs/graphics/Cherry\\_blossom\\_moth/ArgPruSheet.pdf](http://www.invasives.wsu.edu/defoliators/species_faqs/graphics/Cherry_blossom_moth/ArgPruSheet.pdf)

**CONTACT PERSON**

Chris Looney

WSDA, Pest Program

360-902-2042

[clooney@agr.wa.gov](mailto:clooney@agr.wa.gov)

**Project Title:** Succession planning tools for specialty crop farmers and their families

**Partner Organization:** Washington State Conservation Commission (SCC)

### **PROJECT SUMMARY**

Washington State's specialty crop sector is a large feature of our state's agricultural economy. Washington is one of a handful of states that produces a significant portion of the national total for number of crops. The total land area allocated to specialty crops is relatively small compared to other major field crops, however they are generally high value crops and thus have a relatively large economic impact.

One challenge facing specialty crop farmers is estate planning for the future of the farm. The majority of the state's farms are family run entities and transitioning the farm to the next generation of farmer can often be a complex, difficult task. Factoring the average age of our state's farmers increasing, land values rising, and population growth, planning the future of the farm has never been more timely.

One way to address this challenge is through education and outreach to not only growers, but professionals that engage in estate planning. Effective estate planning can ensure the farm will continue as a farm thereby supporting the state's agricultural future.

Farm estate planning can be an emotional and complicated process. Farm estate planning information is often not available and may be difficult to understand. Prioritizing valuable time to better understand farm estate planning and identify goals and values for the farm can be a challenge for farm families. In addition, estate planning professionals can better serve the farm community if they know the challenges and opportunities. This can be addressed through educational resources and outreach opportunities.

The purpose of this project is to increase awareness of the importance of farm estate planning. This was achieved through development of the workbook *Planning the Future of the Farm – A workbook supporting specialty crop farm transfer decisions*, a series of estate planning landowner workshops, and a continuing legal education event targeted at estate planning specialists.

The motivations for this project are multiple. The current population increase the state is experiencing. According to the Washington State Office of Financial Management, the state's population has increased 5% since 2010 to over 7 million residents. The forecast shows continued strong population growth which can impact farms across Washington. Farms experience this impact through pressure to convert farmland to non-agricultural purposes to accommodate increased population growth. Conversion can be for home development, environmental mitigation and protection, or even recreational opportunities.

Another motivation is the cost of farmland. The rising cost of farmland can impact new and beginning farmers as well as those looking to transition out of farming. Over the past 10 years, Washington farmland values have risen significantly. Since 2011, values have increased 31%. In 2015, farmland values were up 8% from 2014. This impacts new farmers looking to access land and can influence existing farmers' decisions as land value is often connected to retirement.

Land transfers are also on the rise. According to recent results of the 2014 Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey released August 31, 2015 by the U.S. Department of Agriculture's National Agricultural Statistics Service (NASS), by 2020, Washington farmland landlords are expected to transfer 884,214 acres to different owners. Of these, 309,962 acres are expected to be sold to non-relatives, 94,029 are expected to be sold to relatives, and 407,254 are expected to be put in trust.

This project was no built on a previously funded SCBGP project.

### **PROJECT APPROACH**

To address estate planning for Washington specialty crop growers, this project performed three primary activities: development of a farm estate planning workbook, landowner workshops, and professional development.

The **first activity** was development of a comprehensive farm estate planning workbook titled *Planning the Future of the Farm – A workbook supporting specialty crop farm transfer decisions*.

The tasks necessary to achieve this activity included the project lead developing and coordinating a legal review team made up of estate planning specialists. The outcome was the 103 page workbook *Planning the Future of the Farm – A workbook supporting specialty crop farm transfer decisions*, available in English and Spanish. This 103 page workbook is available in print and online for both English and Spanish speaking farmers.

*Planning the Future of the Farm* is a tool for farm families to begin or enhance their farm estate planning process. To address the needs of farm families, the workbook includes narrative and worksheets throughout that assist in developing a vision for the farm, aide in evaluating farm resources, assist in initiating farm transfer tools, and focus the time and work farm families will need to do with estate planning professionals. The workbook also includes a comprehensive glossary with the various concepts and terms used in estate planning. To meet the needs of the Latino farm community, the 103 page workbook was translated into Spanish. One thousand English copies and 500 Spanish copies were printed.

The workbook was made available to landowners through multiple outreach efforts including in person meetings and conferences with farmers, press releases sent to statewide specialty crop organizations, local media, trade publications, and the state's 45 conservation districts, as well as advertising availability online and through agency display.

The **second activity** was a continuing legal education (CLE) event for estate planning professionals. This one day, 6-credit, event was available statewide for estate planning specialists and emphasized the challenges and opportunities around farm estate planning. This event drew 55 estate planning professionals from all across Washington.

The tasks necessary to achieve this activity included project sponsors partnering with the Washington State Bar Association (WSBA) and estate planning professionals to initiate a CLE program planning team. The project lead served as program chair and coordinated agenda development, speaker development, and planning logistics. The project lead worked with the WSBA on outreach to their estate planning attorney database. The event was designed to give professionals background on the challenges of passing a farm through the generations as well as tools to help families achieve their legacy goals. A specialty crop farm owner shared the 130 year story of their family farm with a particular focus on the tools employed through the generations to ensure the farm could remain a farm. The speaker also shared the family-related challenges of farm transition.

Program faculty provided information on evaluating farm resources with an emphasis on water rights, real property interests, regulatory issues, crop insurance, updates on recent case law, detailed farm transfer tools, farm entity planning, advanced planning, and tax planning. Faculty also provided information and scenarios of family dynamics and planning.

To give participants an in-depth look into the specialty crop industry, a keynote speaker representing the Washington State Tree Fruit Association provided a lunch time update on the status of the tree fruit industry in Washington.

The **third activity** was providing a series of landowner workshops in strategic locations in Washington to provide information and connect professional advisors with specialty crop growers.

The project sponsor identified strategic locations for workshops, which included Wenatchee, Yakima, Lynden, and Olympia. Staff then worked with local and statewide partners to bring in local attorneys to be faculty. These partners included the Center for Latino Farmers in Yakima, Oseran Hahn in Bellevue, Larson Berg & Perkins in Yakima, Davitt Law Group in Wenatchee, Waddell & Reed in Seattle, Van Ness Feldman in Seattle, Thurston Conservation District in Tumwater, Montoya Legal in Yakima, Britain & Vis in Lynden, and Whatcom County staff. Eight total workshops were held (three workshops in Yakima, two workshops in Wenatchee, two workshops in Lynden, and one workshop in Olympia).

As this project moved forward, several project partners were brought on to assist in executing activities and objectives. Partners are detailed in the table below:

<b>Project Partner</b>	<b>Project Partner Contributions</b>
Josh Giuntoli, Washington State Conservation Commission	Workbook facilitation, development and implementation
	Workshop facilitation, development and implementation
	Outreach facilitation, development and implementation
	CLE facilitation, development and implementation
Duncan Greene, Van Ness Feldman	Workbook development and writing contribution
	Workshops – speaker development
	CLE – served as faculty and event strategy building.
Dennis Brislawn, Oseran Hahn	Workbook development and writing contribution
	Workshops – speaker development
	CLE – served as faculty and event strategy building.
Ron Shultz, Washington State Conservation Commission	Workbook development
	Outreach at farmer events
	Workshop session design
	CLE - served as faculty and event strategy building.
Andrew Brannan, Brannan Law	Workbook adaptation
Karen Bishop, Whidbey Island Farmer	CLE - served as faculty
Center for Latino Farmers, Yakima WA	Survey translation
	Workshop coordination
	Direct farmer outreach as follow up to workbooks and workshops
	Workbook distribution
Christina Davitt, Davitt Law Group	Wenatchee Workshop faculty
	Workshop Session Design
Scott Snyder, Larson Berg & Perkins	Yakima and Wenatchee Workshop faculty
	Workshop Session Design
Tyler Hinckley, Montoya Legal	Yakima Workshop faculty
	Workshop Session Design
Jim Britain, Britain & Vis - Lynden, WA	Lynden Workshop faculty
	Workshop Session Design
Doug St. John, Waddell & Reed	Lynden and Olympia Workshop faculty
	Workshop Session Design
Cascade Harvest Coalition	Website assistance
	Workbook distribution
Specialty Crop statewide organizations	Workbook distribution
Thurston Conservation District	Olympia workshop partner
Whatcom County county staff	Lynden workshop partner
	Workshop Session Design
Washington State Bar Association	CLE partner – event host and event administration
Real Property Probate Trust section	CLE session design assistance, planning and outreach
Washington State Conservation Commission	Communication outreach design
	Outreach assistance at grower events
	Edit and review of workbook
	Workbook distribution

Staff only targeted specialty crop growers. This was achieved by targeted outreach with entities that work with specialty crop growers. The workbook title indicated this was a tool to support specialty crop farm transfer decisions. In addition, specialty crop growers were identified through surveys at workshops.

### **GOALS AND OUTCOMES ACHIEVED**

**Goal:** *Develop and provide resources to assist specialty crop producers and professionals with farm succession planning.*

This goal, target, and outcome were successfully accomplished through the following activities:

1. ***Workbook development and distribution;***
2. ***Workshops; and,***
3. ***Professional education event.***

**Activity 1 - Workbook development and distribution** – worked with estate planning professionals to develop content and produce a landowner workbook, *Planning the Future of the Farm – A workbook supporting specialty crop farm transfer decisions*, in English and Spanish. Fifteen hundred copies of the 103 page workbook were printed (1,000 in English, and 500 in Spanish). Workbooks were distributed at workshops, agricultural related meetings and events, via the mail at the request of individuals, and through agricultural organizations that work with specialty crop growers. In addition, a web based platform was developed for constituents to directly access the electronic version of *Planning the Future of the Farm*.

Out of the 1,500 workbooks, 300 Spanish workbooks have been distributed via Latino farm workshops, farm conferences, mail request and personal delivery and 800 English copies have been distributed via farm workshops, farm conferences, mail request and personal delivery.

#### ***Activity 2 - Workshops***

Eight workshops were held in strategic locations in Washington. In total, the eight workshops reached 190 specialty crop landowners and growers. The workshops occurred in Wenatchee (60 participants); Yakima (100 participants); Lynden (20 participants), and Olympia (10 participants).

Agenda topics included legal formation, basic estate planning, improving family communication, and business planning basics. The workshops were intended to improve the understanding of tools available to growers and specialty crop landowners.

#### ***Activity 3 - Professional education events***

A one day, 6-credit continuing legal education event for estate planning attorneys in Washington was held in Seattle and made available statewide via simulcast. Fifty-five professionals attended and received credits.

Agenda topics included how to engage the generations and commit to the follow-through, emotional side of planning, overview of real property interests, evaluating regulatory issues, wills and living trust planning, family farm issues, farm entity planning including gifting and succession issues, conservation easements and meeting with professional advisors. This CLE followed the general makeup of the *Planning the Future of the Farm* workbook.

**Target** – a target was established to gauge effectiveness of all three goals. The target was that 75% of landowners and 75% of professionals will report to utilizing the workbook to begin farm succession planning. This would be determined by a survey and in-person follow-ups.

Thirty percent of growers returned surveys. These were analyzed to determine if project sponsors met the target of 75% of landowners reporting to utilizing the workbook to begin farm succession planning.

Twenty-seven percent of professionals returned the surveys. These surveys were utilized to gauge effectiveness within the professional community.

## **Landowner Survey**

Landowner survey results indicate that 77% reported utilizing the workbook. After reviewing the workbook and attending a workshop, 80% of landowners strongly agreed they better understood the importance of having clear goals and using good communication in the transfer process. Ninety-six percent strongly agreed they better understood the various estate planning strategies available to them in the farm business transfer process. Project sponsors were able to conclude the subject matter of the workbooks and workshops was appropriate for the intended individuals.

These results indicate the information was relevant and timely.

In addition to these results, the average age of farmer returning the survey was 53 years old. The average farm family had four children and the average farm size was 41 acres. The majority of farms were structured as a sole proprietorship with 50% reporting they did not have a farm transition or succession plan. Ninety-eight percent reported a son or daughter as a potential successor. The workbook had a strong connection to family communications which led project sponsors to conclude the right information was getting to the right individuals.

An area for improvement for future work is around understanding tax issues with an estate. Only 50 percent agreed they better understood tax issues and strategies, with the remaining 50% feeling neutral on whether their understanding improved.

The survey also asked for comments. A majority of those providing comments responded that this was a great first step and that future workshop opportunities should be identified as a priority.

## **Professional Survey**

Due to the recent timing of the professional education event, we are not yet able to review follow-up survey results and determine if the workbook has been utilized. However, a survey was conducted at the conclusion of the CLE event to gauge effectiveness and interest in farm estate planning.

Nearly 80% of attorneys responded the information presented was a genuine value to their practice. This is viewed by project sponsors as a great success. Participants rated the value of the overall program and over 95% rated it "excellent". They commented this program helped recognize the complexity and sophistication of farming as a business and a challenge. Participants also highly rated the faculty and their ability to communicate the issues facing farming and agriculture businesses in Washington.

Survey results indicated nearly a 95% excellent rating for our speakers. Of particular note was the presentation by a farmer that operates a 130-year-old family farm. The speaker traced the roots of the farm back 130 years and the ups and downs of planning for the future of the farm. This perspective would prove valuable throughout the day as attorneys commented that this type of speaker was extremely valuable and provided practical experience often missing in CLEs. Other comments found her story extremely interesting and brought the topic to light providing useful insight to help lawyers better understand and serve the needs of this unique type of client.

Participants would like to see more of these type of farm-specific CLE events in the future. A suggested format was to have a follow-up program where people discuss cases, issues, and choices the family and non-family members need to consider.

Other feedback provided helped project sponsors understand how best to reach attorneys. Nearly 80% remarked that having webcast availability was very important to their participation. When originally conceived, this grant sought to hold two of these events. By joining the webcast with in-person, we were effectively able to reach the whole state. The resulting cost savings was put towards translating the workbook into Spanish to also reach a broader specialty crop audience.

An additional success and next step from the CLE and workshops is local estate planning entities in Whatcom County teamed up with the State Conservation Commission to bring this information to their clients. A January 2016 three-night event is being planned in Whatcom and Skagit counties based on the *Planning the Future of the Farm* workbook.

Estate planning is not typically a quick process or something that can be done over a two evening workshop. It takes time to engage in the necessary elements to planning – family communication, meetings, goal setting and plan execution. While many beneficiaries began taking steps to initiate a plan, the duration of the planning process fell outside the timelines of this grant. However, several planning activities were initiated due to this project. There were enough early activities by workshop participants to conclude that this type of effort was well received. Future follow up work with workshop participants will continue even at the conclusion of this grant cycle. The importance is recognized by the State Conservation Commission and its partners.

<b>K971 Work Plan</b>		
<b>Project Activity</b>	<b>Responsible Party</b>	<b>Progress</b>
Convene legal review team	SCC/OFP	Accomplished
Begin adapting workbook	SCC/OFP, Legal review team	Accomplished
Develop speaker list for CLE	SCC/OFP, Legal review team	Accomplished
Begin web development	Cascade Harvest Coalition	Accomplished
Develop and procure display and brochures	SCC/OFP	Accomplished
Finalize workbook, printing	SCC/OFP, Legal review team	Accomplished
Develop CLE materials for WA State Bar for accreditation	SCC/OFP, Legal review team	Accomplished
Finalize web page	Cascade Harvest Coalition	Accomplished
Two Rural Land Updates	SCC/OFP, presenters	Accomplished – partial change. Conducted a statewide in-person and web access CLE
Landowner outreach workshops with attorneys present	SCC/OFP, presenters	Accomplished – originally planned to do three, final outcome was eight.
Follow up survey	SCC/OFP	Accomplished
Final report - [Published workbook; Course materials of CLE and specialty crop mtgs; Link to resource web page for landowners and professionals; and Results of legal and landowners meeting surveys]	SCC/OFP	Accomplished

To the best of our knowledge, prior to this grant there were no detailed estate planning resources specifically designed and available for Washington’s specialty crop growers. None of our partners had previously offered similar resources or trainings. The baseline was effectively zero. Under Goals and Outcomes Achieved, we describe how progress was measured to achieve our targets.

**BENEFICIARIES**

Specialty crop growers and estate planning professionals were the beneficiaries of this project. This was achieved by producing a workbook, providing training to professionals, holding workshops, and having a lasting presence on the World Wide Web.

In addition to the targets met through this project, an underserved farmer population also benefited. By translating the workbook and holding Latino farmer-focused workshops, many underserved farmers were reached and ultimately benefited. This was determined by focused surveys to this demographic. This grant allowed for partnership building that would not have occurred if this grant had not been accomplished. A new partnership was developed due to this grant with the Center for Latino Farmers in Yakima, Washington. Due to this partnership, project sponsors were able to reach a broader audience than originally envisioned. Having workshops catered to Spanish speaking farmers helped bring needed education and technical resources to this traditionally underserved community.

Estate planning attorneys in Washington also benefited. The lasting impact of the workbook will be felt long after the completion of this grant. A robust network of estate attorneys interested in farm succession planning now have access to *Planning the Future of the Farm* to give to potential or existing clients. Staff at the State Conservation Commission have provided nearly 100 workbooks to attorneys in Washington.

Ultimately, all Washington farmers and landowners will see a lasting benefit from this effort as the workbook will continue to be published and updated.

With development of *Planning the Future of the Farm*, a resource not previously available to specialty crop growers, is now accessible online and in-print in both English and Spanish.

**Beneficiary – State Specialty crop growers**

- 1,500 copies of *Planning the Future of the Farm* developed.
- 1,000 available in English, 800 distributed to-date
- 500 available in Spanish, 300 distributed to-date

Conference and agricultural attendees benefited from learning about *Planning the Future of the Farm* and the importance of estate planning.

**Beneficiary – Annual conference and non-workshop meeting participants**

- One display was developed and taken to five outreach events
- Display includes information on how to access *Planning the Future of the Farm* workbook
- Translated panels developed for Latino farmer outreach

With implementation of this project, eight estate planning meetings for landowners were held where none were previously available.

**Beneficiary – Landowner workshop participants.**

- 190 total attendees

Growers who completed survey evaluations of the workbook, landowner workshop, and professional development effectiveness reported several benefits related to these resources.

**Beneficiary –Surveyed growers**

- 77% reported utilizing the workbook to begin estate planning.
- 80% of landowners strongly agreed that after reviewing the workbook and attending a workshop, they better understood the importance of having clear goals and the importance of good communication.
- 96% strongly agreed they better understood the various estate planning strategies available to them in the farm business transfer process after attending a workshop.

**Beneficiary – landowners - Latino**

- 77% reported utilizing the workbook.
- 66% have completed worksheets and read the entire workbook.
- 83% of farmers contacted did not have a last will and testament – a basic planning process.
- 55% reported the book difficult to understand but were committed to engage and learn more.
- Two participants reported amending a living will based on the workshop and workbook.

**Beneficiary – Estate Planning Professionals**

- Nearly 80% of attorneys responded the information presented was a genuine value to their practice.
- 95% rated the CLE event as excellent (the highest option).
- 95% provided an excellent rating for our speakers (the highest option).

## **LESSONS LEARNED**

There were several key lessons learned.

The challenge of getting the first year deliverable accomplished – production of *Planning the Future of the Farm*. While the project had a strong legal review team, competing client priorities delayed completion of the workbook in year one.

While the work was ultimately accomplished, the delay led to timing issues with workbook printing, layout, and design. This delay made the workbook unavailable for a CLE event. To address this, the CLE event was scheduled after the landowner workshops to better accommodate schedules of project partners and intended audiences.

The timing of CLE education events. Attorneys often find themselves needing credits towards the end of the calendar year, and by holding the event near the end of the year (September 2015), sponsors were able to boost participation. Most CLE topics are consistent year to year. This CLE topic was brand new and had not been previously available. With 55 attorneys participating in the CLE event, WSBA staff remarked that this was above what they would have expected for a new topic and said it was average to above average for these types of one day events.

The results from development of this workbook in Spanish were positive. This allowed sponsors to reach an underserved community in our state that represents the fastest growing farmer demographic. See more information on this outcome below, as this was an unexpected outcome that came from implementing this project.

One unexpected outcome of this project was the outreach and education of a traditionally underserved farm community, Latino farmers. Washington is home to the second highest concentration of Latino farmers in America. In addition, Latino farmers are the fastest growing farmer demographic in our state according to federal Ag Census data (2012). In 2012, Latino farmers made up around 5% of all farmers in Washington, a 20% increase from the previous Ag Census in 2007. The average age of Latino farmers increased 4% from 2007 to 54 years old. According to LexisNexis, 74% of Hispanic adults in the USA do not have a last will and testament.

As a result of this project, a partnership with the Center for Latino Farmers was established. This partnership led to 50 Latino farm families participating in two, 2-day workshops held in specialty crop growing regions in Central Washington (Wenatchee and Yakima). Pre-workshop surveys identified nearly half of farmers did not have a last will and testament, a basic estate planning document.

A pre and post workshop quiz was given to gauge effectiveness in presenting subject matter. Thirty-five percent of Latino farmers passed the quiz, and at the conclusion it was again given and 73% passed.

At the conclusion of these workshops, staff with the State Conservation Commission and the Center for Latino Farmers identified 18 of the 50 farmers to engage in direct, in-person follow up to gauge workshop and workbook effectiveness. Working with this farming community requires more investment of time due to cultural and language differences.

This follow up work and outreach occurred three months after the workshops to better understand how growers were utilizing information from the workshops and workbooks. This resulted in direct outreach to 18 Latino growers who represented 915 acres of specialty crops.

Outreach outcomes:

- 77% reported utilizing the workbook
- 66% have completed worksheets and read the entire workbook.
- 83% of farmers contacted did not have a last will and testament – a basic planning process.
- 55% reported the book difficult to understand but were committed to engage and learn more.
- 2 participants reported amending a living will based on the workshop and workbook
- 1 participant has completed the majority of worksheets evaluating farm resources.
- 2 participants have made arrangements to act on an estate plan via legal attorney.

While the workbook was written to be an entry level publication, there are still areas to improve how to present challenging concepts to a full time farmer. This will continue to be a challenge, but farmers did remark that while some of the information was difficult to understand, the majority of the information was timely, important, and flowed logically.

The following testimony has been shared in outreach materials from the Center for Latino Farmers.

E. Wenatchee, WA. Aug 26, 2015 - Nestled in the E. Wenatchee Valley, 148 miles East of Seattle in central Washington is one of the nation's premier areas for growing specialty crop fruit.

The Perez family settled in E. Wenatchee where Mr. Perez tended to many perennial specialty crops as a farm worker. It was here he purchased a 10-acre cherry farm and initiated his life-long dream of being a farm owner.

For the past several years, Mr. Perez began attending Spanish/English farmer workshops coordinated by the Center.

He got excited after attending the yearly conference and the Farm Sustainability & Succession Series, and wanted to learn more. "I liked everything from the conference all the way to the farm sustainability and succession planning workbook. I especially enjoyed engaging with other Latino farmers like myself. I'm thankful to the Center but most of all to the State Conservation Commission for taking the time to put this book together utilizing key knowledge for us small farmers."

Mr. Perez has requested additional workbooks to share with his farming neighbors. Mr. Perez and his wife will take time to amend their living will to make sure the land is forever protected, and can remain producing for the next generation of farmers.

One estimated activity was that each workshop would be followed by an additional day whereby participants would be able to have one-on-one time with estate planning professionals. This was not achieved as originally envisioned. To meet the spirit of this activity, participating professionals offered their time before, during, and after workshops for families to get questions answered that they may have been uncomfortable asking in the group setting. In debriefing each workshop, each attorney remarked they were approached, with several taking business cards to do even more follow up work.

**ADDITIONAL INFORMATION- See Attachment D 12-25-B-1495 Planning**

The total level of in-kind match was \$29,525.

The primary source was in-kind time provided by attorneys valued at an hourly billable rate to achieve this figure. The main contributors were the professional attorneys who provide time to plan and support the Continuing Legal Education Event. This included coordinating calls, material preparation, and presentations. Other professional attorneys provided time to plan and support the landowner workshops. This included coordinating calls, material preparation, and presentations. This project would not have succeeded without the generous contributions of the attorneys who provided their time.

The Attachment includes photographs of Planning the Future of the Farm, landowner workshops, landowner follow ups, and CLE event. Also includes example of survey, display, agendas, websites, and press release.

**CONTACT PERSON**

Josh Guintoli

WA State Conservation Commission

360-407-7474

[jguintoli@scc.wa.gov](mailto:jguintoli@scc.wa.gov)

**Project Title:** Enhancing Specialty Crop Producer Profitability

**Partner Organization:** Washington State University (WSU)

### **PROJECT SUMMARY**

The Enhancing Specialty Crop Producer Profitability Project targeted small-scale entrepreneurial growers in Grant, Adams, Klickitat, Skamania, and Stevens Counties in Washington State. This project sought to provide new entrepreneurs with both production and business knowledge, facilitating long-term sustainability. New small-scale producers need education on production topics as well as financial analysis and management. One barrier to profitability for producers in rural communities is access to markets. To be successful, rural producers need to become wizards at alternative marketing methods such as direct marketing, e-commerce, adding value to products and creating a loyal local customer base.

This project has also sought to help specialty crop producers address resource limitations. Limited resources could include land, water, markets, labor and/or capital. Many new agricultural businesses fail because a poor decision was made regarding what to grow where and/or lack of knowledge of how to monitor the financial health of the enterprise; workshops delivered by this project have addressed these common mistakes. Another challenge to specialty crop profitability this project has addressed are production limitations such as growing season extension, crop loss from pest damage and variety selection for direct markets.

Finally, the domestic market expansion component has focused on both consumer educational outreach and marketing education for producers. Producers have been encouraged to develop a marketing plan; have marketing options explained and clarified; encouraged to create a web site; and taught how to use social media to promote their products.

The objective of this project has been to develop and support new small-scale specialty crop producers into success and sustainability by introducing key educational resources and connecting growers to support. Long term, this will mean increased income and improved quality of life for producers and their families, increased prosperity for communities, increased access to healthful local foods, reduced conversion of farmland to development and a higher standard of living in rural areas.

In rural communities throughout eastern Washington, agriculture is often the main avenue for new entrepreneurial activity. However, these new entrepreneurs often lack both production and business knowledge, making long-term sustainability a challenge. These new small-scale producers need education on production topics as well as financial analysis and management, access to markets, alternative marketing strategies, adding value to products and creating a loyal local customer base. Few new producers have this knowledge or these skills. The Enhancing Specialty Crop Producer Profitability Project has delivered multiple workshops and resources as well as provided community coaches across five counties in Washington State to educate and advocate for small-scale entrepreneurial growers.

Although not a previously funded SCBGP project, the Enhancing Specialty Crop Producer Profitability Project evolved from the previously successful Horizons poverty reduction program funded by the Northwest Area Foundation. Using a community outreach tool from the Horizons program, this project has provided coaches for participants in each community for communication, encouragement, organization, and to keep the project moving forward in all five counties.

The Mid-Columbia food assessment of 2010 found that less than 1% of the food produced locally was consumed locally; as a response, a goal of 20% regional food security was targeted to be achieved by 2020. This cannot be achieved without the addition of many more specialty crop producers to the regional food network. Additionally, the demand for organic products expands annually as consumers choose to vote with their food dollars for food raised without chemicals or other conventional inputs.

Finally, this project overlapped some with the WSU Extension Community Vitality Team's 20/20 Columbia Basin-Gorge Rural Renaissance Program. The goal of that program was to increase individual, family and community wealth through diverse asset-building and community economic development strategies. The agricultural sector was identified by the Community Vitality Team as the highest priority for business development. In this way the Enhancing Specialty Crop Producer Profitability project has built upon recent community vitality programs using their outreach models to support agricultural entrepreneurship.

The project did interface with other SCBG projects. The Specialty Crop Shipping System Modeling and Analysis: Working in partnership with the Northeast Washington Hunger Coalition farm-to-food bank Purchasing Pilot program and in conjunction with Specialty Crop Block Grant K1496 (Processing Facility Feasibility Study), Stevens County team worked on analysis and mapping of the Specialty Crop food bank and farmers market delivery system in Stevens County. A data collection scenario has been put into place which will inform local growers about shipment weight, timing, and distance of travel for Specialty Crops grown on local operations and delivered by the NEW Hunger Coalition to local food banks. The end result will be a shipping modeling and analysis useful to decrease small scale shipping costs and therefore enhance profitability for local Specialty Crop producers. Shipping data collection continued through the 2015 growing season.

### **PROJECT APPROACH**

The Enhancing Specialty Crop Producer Profitability Project has provided educational outreach and support to new and small-scale producers in five eastern Washington counties (Grant, Adams, Klickitat, Skamania and Stevens). This three-year project took a three-pronged approach to increasing specialty crop profitability: enhancing markets for specialty crop producers (especially via direct marketing and farmers' markets); developing organic and sustainable practices (primarily through appropriate variety selection, integrated pest management, improved production methods, application of researched-based organic practices and season extension techniques); and promoting profitability through financial and business management education. WSU Extension faculty and other research-based resource personnel have delivered educational programs to help producers gain the skills and knowledge needed to be successful. The Cultivating Success Agricultural Entrepreneurism series was conducted to support participants in their development of marketing and business plans. This project expanded on previously successful community and economic development partnerships in each county.

Activities performed and tasks achieved during the project period include:

**Establish Project Conferences:** Project teleconferences were held in January, March, July, August and September to present regional updates, discuss project needs and develop evaluation plans. Fifteen team teleconferences were conducted in total.

**Establish Facebook page, social media and eNewsletter:** Program news and updates were delivered through two newsletters (February and September), email lists, and the project Facebook page. The Facebook page serves as a reference for current, research based information, to deliver news about upcoming project workshops, share relevant outside learning opportunities, and is a way for participating growers and organizations to connect. Team communication has been helpful in targeting shared issues, instructor resources and workshop ideas between the three regions.

**Attend WA State Farmers Market Conference:** Project members, Susan Kerr and Linda Williams attended WA State Farmers Market Association Conference in 2013. There members made contact with speakers for project events, including Vance Corum and Robin Crowder. Topics learned were the FSMA, "Cottage Law", direct marketing, risk management, and more to incorporate in the following educational series Cultivating Success and specific specialty crop outreach events. In 2014, three market managers from Stevens and Skamania County attended the Farmers Market Conference to recruit more participation in WIC and SNAP and adoption of credit/debit capabilities to increase sales. Market manager delegates also used this effort to increase record-keeping skills. One farmer workshop was delivered in Stevenson WA and two Farmers Market Manager meetings delivered gained conference materials. *Three producers in one market now have EBT readers and participate in WIC after market managers disseminated education from the WA State Farmers Market Conference.*

**Needs assessments:** Grower need assessments were completed in all locations. Stevens County held two planning meetings for 1) Reviewing assessment from Robin Crowder workshop for Increasing Farmers Market Sales workshop with 32 growers, and 2) Organizing the Cultivating Success Program based on that assessment. The team started identifying speakers, testimonial farmers and ways to keep the work going through partners. Grant/Adams county collected needs during the delivery of Cultivating Success and regularly requests feedback to help identify areas of educational need. The Columbia Gorge region (Klickitat and Skamania County) collected needs during Cultivating Success and began to develop the second year's activities using the data. Topics such as Quicken book-keeping and Shitake mushroom production were identified.

**Cultivating Success Ag Entrepreneurism workshops:** Grant/Adams County began the Specialty Crop Grant in 2013 with the Cultivating Success Agricultural Entrepreneurship Workshop series February 19-March 26 including 7 engaged

students and 3 observers. The Columbia Gorge region (Klickitat/Skamania) delivered Cultivating Success in the spring of 2013 for six weeks. Thirteen people attended all the classes, went through the marketing and production, and finished a business plan. Cultivating Success's Agricultural Entrepreneurism 6-week Course was offered in Stevens County hosting between 27 to 34 participants, representing 23 farms. Cultivating Success participant survey (N=15) indicated the course has increased awareness of current issues and concerns facing small specialty crop producers - 4.20 on a scale from 1 (poor) to 5 (excellent). The number of participants who have taken action on the following components include: 10 who have developed or improved Business Plans; 11 who have developed or improved their marketing plans or strategies; 9 have done the same with a whole farm; 1 has explored organic certification and 7 have started planning for a new farm enterprise. The most positive validation was that 100% would recommend this course to others.

**Conduct production workshops:** A total of 14 workshops were held across the three regions and included the topics: calculating crop production costs, cold storage techniques, soil testing, mushroom production and wild harvesting, season extension, organic soil management and soil health, high and low-tunnel construction, brown marmorated stink bug and spotted winged drosophila management, grafting vegetables and biodegradable mulches. Most workshops provided post evaluations. Trends from the workshops included that *87% of participants learned new knowledge and 56% will implement a practice change*. Other impacts were anecdotal such as developing cost of production workshops revealed a grower losing money on sweet corn and resulting in a public presentation entitled "Why Does My Sweet Corn Cost 50¢ per Ear", intended to answer a common question asked by farmers market buyers who also compare farm sales and grocery store prices. The proposed target was to provide eight marketing workshops. The target benchmark was exceeded.

**Conduct marketing workshops:** A total of 12 marketing workshops were delivered across the three regions and topics included: value-added agriculture products from specialty crops, WSDA Organic certification, Bio-dynamic certification, increasing market sales and diversifying vendors at farmers markets, cottage industry permits and food processing, buying wholesale and buying locally. Funding made it possible to bring highquality and impactful instructors such as Vance Corum and Robin Crowder to teach market managers and vendors. Dr. Girish Ganjyal (WSU) was engaged in the project to assess needs in two regions and deliver appropriate outreach. Sixteen specialty crop producers received one-on-one counseling to develop existing product lines and discover new product lines. Twenty-five people attended value-added production workshops for specialty crop producers. Participants were surveyed to guide future workshop content. All responded positively to learning new information. The proposed target was to provide six marketing workshops. The target benchmark was exceeded.

**Develop public education and outreach materials:** Educational outreach materials were developed for all workshops and included region specific support that summarized business and economic development agencies, production supporting grants from USDA-NRCS Value Added Producer Grant program, USDA NRSC EQIP, FSA loaning opportunities, USDA SARE and more. With support from this project, Dr. Ganjyal developed four specialty crop factsheets on cabbage, green peas, peach and pear. The factsheet summarize the crop production techniques, harvest and handling and potential value-added products. These will be available to download for free at <http://pubs.wsu.edu>

**Evaluation:** Evaluation activities included attempts at initial gathering of base-line data and data organization. Grant/Adams developed grower data-bases to track participation, needs and contact information. Self reporting of income was given at educational events at the beginning of the program. None were reported. In order to develop measurement plan to record impacts of the of the project, the WSU Division of Governmental Studies and Services was engaged to collect evaluation data to reflect the goals and outcome targets. This was accomplished by a self, reflective survey. One hundred and eleven program participants were documented with an email address in Klickitat and Skamania County. Seventy-three participants were documented in Stevens County. Sixty project participants were documented in Grant and Adams County. Electronic surveys were sent out to the 244 project participants that provided email addresses during the months of August and September. The survey collected demographic information, income classifications, specialty crops grown and farming practices. The participants were asked to compare aspects of production and finances in 2011 (before the project) and 2015. Thirty-one participants completed the entire survey giving a response rate of thirteen percent. The number of certified organic producers and acreage was compared annually with reported data to WSDA Organic Certification program. Organic production and acreage was also surveyed with project participants.

In **Stevens County**, Debra Ann Hansen, WSU Extension Director, Krisan LeHew, WSU Community Coach, and Nils Johnson, WSU Agriculture Program Coordinator delivered the program and partnered with the Community Agriculture Development Center (CADC), Chambers of Commerce, Stevens County Conservation District, Spokane County

Conservation, NE Washington Hunger Coalitions and area Farmers Market managers to disseminate outreach opportunities and assist in collecting base-line data and capturing program impacts.

In **Grant/Adams Counties**, Jenelle Ottmar has been the lead coordinator for the region and leveraged regional partners such as the Moses Lake Farmers Market, Small Business Development Center, Farm Service Agency, USDA, and community development agency the Prosperity Center. Jenelle also engaged statewide resources from WSDA and WSU Small Farms Team to assist in delivering education and outreach, and used social media as a “partner” to engage regional growers and grow program awareness.

In **Klickitack/Skamania Counties**, Susan Kerr, WSU Extension Director, Linda Williams, WSU Community Coach and Todd Murray, WSU Extension Director jointly delivered the programming. Strong partnerships were leveraged with the non-profit Gorge Grown Network to disseminate educational opportunities to specialty crop growers through established peer networks.

In 2014 all counties partnered with Dr. Girish Ganjyal, **WSU Value Added Specialist** from the Food Safety program at Washington State University. Drs. Ganjyal developed value-added agriculture products from specialty crops curricula to all sites and produced three peer-reviewed factsheets.

**WSU Division of Governmental Studies and Services** served to advise data collection and evaluation of the accomplished activities to reflect the proposed goals.

During all outreach events supported by this grant, participants are asked to identify production areas and interest areas. Within this targeted group, diversified growers are the most common participant. While some diversified growers also produce livestock, livestock support is not the focus of this project. Using livestock in diversified production as a best management practice may be covered in materials. Producers who grow non-specialty crops such as alfalfa, range grasses, eggs, livestock products, hay, wheat, barley, triticale, oats, etc. are served through traditional Extension workshops and programs for commodity producers. This is communicated at the beginning of all outreach events. The project began to include this statement "Enhancing Specialty Crop Producer Profitability" on all outreach products along with definition resources (<http://www.ams.usda.gov/AMSV1.0/scbgpdefinitions>) during the fall of 2013 to ensure clarification and avoid confusion. Challenges were faced by the programs in Klickitack and Skamania County due to their proximity to Oregon and difficulty excluding Oregon farmers. In order to maintain funding support just for Washington State specialty crop producers, most, if not all programming was synchronized with other grant funds to accommodate out of state participation. For example, the efforts to produce value added workshops with Dr. Ganjyal, the project offered programming with another grant effort (Investing in Manufacturing Communities Project) and billed efforts appropriately to reflect participation from Oregon farmers.

## **GOALS AND OUTCOMES ACHIEVED**

### **Outcome 1 & 2:**

*Goal: Enhance specialty crop producer profitability and increase product yields*

Eighteen workshops were delivered to educate, equip and inspire specialty crop producers to adopt new practices or change practices to increase profitability. Production and marketing workshops were provided.

### **Outcome 3:**

*Goal: Increase number of certified organic producers*

Three workshops and multiple one-on-one consultations were provided to assist specialty crop producers decision-making to certify their crops organically.

### **Outcome 4 & 5:**

*Goal: Increase direct marketing of specialty crops and increase local sales and consumption of locally-produced fruits and vegetables*

Four marketing workshops were delivered that specifically targeted market managers and vendors assisted participants with avenues to increase sales. Additional marketing support was provided to targeted markets such as advertising, banner and sign construction and in-market classes.

Overall, each task was accomplished and in some cases exceeded. With the change of PI's on this project, an no-cost extension was applied to provide an additional year. This allowed for additional time to develop program tasks and activities. Below is a summary of activities proposed versus accomplished. This is also summarized above in the project approach.

- **Monthly project teleconferences** were changed to include five calls annually for a total of 15 calls. When coordinating value-added programming, additional team calls were made.
- **Establish project Facebook page** was created and available here: <https://www.facebook.com/Enhancing-Specialty-Crop-Producer-Profitability-242476982547230/?fref=ts>
- Conduct marketing workshops were exceeded with twelve marketing workshops completed of the proposed six.
- **Conduct Cultivating Success Ag Entrepreneurism** workshops were delivered in region.
- **Obtain baseline data** from participating producers was not accomplished due to the reluctance of most growers sharing income and financial data as a base line. This problem was addressed by surveying project participants retrospectively.
- **Attend WA State Farmers' Market conference** was completed and the project was able to send area market managers.
- **Conduct production workshops** was exceeded by delivering 14 instead of the proposed eight workshops.
- **Develop public education outreach materials** was completed and the project was also able to develop novel outreach materials to educate growers about value added specialty crop products through four factsheets.
- **Deliver public education outreach programming** was completed. No specific amount was proposed.
- **Project evaluation** was addressed through the implementation and deployment of a retrospected survey.

The base-lined data that was proposed was unattainable due to grower reluctance to share financial information prior to context of participation in this grant. An electronic survey was developed by WSU Division of Governmental Studies and Services to measure outcomes retrospectively and sent to 244 project participants. A response rate of 13% was achieved. While the activities of the project will have direct influence over the outcome trends, the authors acknowledge that a culmination of support impacts the below outcomes in the three regions. Being said, the three regions have very little other small farm and direct sales support compared to other regions in the state.

### **Outcome 1:**

Goal: Enhance specialty crop producer profitability

Target: Increase profits of existing producers by 15% (average).

Benchmark: 2011 self-reported income data will be used as a baseline for existing producers

Performance Measures: Compare 2011 baseline data and income reported in the final year of the project

Coaches on the Enhancing Specialty Crop Producer Profitability Project have partnered with the WSU Division of Governmental Studies and Services to gather this data via online anonymous survey emailed to project participants as project coaches and authors were unsuccessful at collecting financial data from producers. A self-reflective survey captured the profit increases. Forty-five percent of respondents reported an increase in farming profits since 2011. Of those, **25.7% reported an increase of profit over 15%** since 2011.

### **Outcome 2:**

Goal: Increase product yields

Target: Increase average production by 10% per product per producer

Benchmark: 2011 production records

Performance Measures: Compare production records from 2011 and 2012, 2013, and 2014.

Most of the small to medium sized specialty crop producers do not track yields. For this outcome, the authors measured the increase of acreage planted. This outcome also was completed through the self-assessment survey comparing product acreage from 2011 to 2015. **Forty-two percent of the respondents reported an increase of acreage.** Most of the acreage increase was small with 32% of the respondents reporting an acreage increase of less than 10 acres.

### **Outcome 3:**

Goal: Increase number of certified organic producers

Target: Increase by two new certified organic producers per county

Benchmark: 2011 WSDA database of certified organic producers in target counties

Performance Measure: Compare 2011 and 2014 WSDA database of certified organic producers in target counties. Using data from WSDA Organic Certification program, the number of certified farms and the total number of acreage was tracked through the project period. In most cases the number of certified organic farms decreased. Only the Adams and Stevens County increased the number of certified organic producers. The number of certified acreage either declined or remained the same for each county. Twenty-six percent of survey respondents reported as Organic Certified producers. Thirteen percent of those that are not certified reported that cost of certification was a barrier and not necessary.

#### **Outcome 4:**

Goal: Increase direct marketing of specialty crops

Target: Two new specialty crop producer vendors at local farmers markets in target counties

Benchmark: 2011 vendor databases from farmers' markets in target counties

Performance Measure: Compare 2011 and 2014 vendor databases from farmers markets in target counties.

Coaches on the Enhancing Specialty Crop Producer Profitability Project have partnered with local and regional farmers markets to gather this data in Skamania, Klickitat, Grant and Adams counties. A relationship with the farmers market in Stevens County was not available. The number of vendors in Skamania and Klickitat County started at 69 vendors at five markets in 2011. This rose to 80 at four markets in 2014 **increase the number of vendors by 14%** during the duration of this project. Moses Lake Farmers Market reported an opposite trend. The number of vendors decreased by 25% going from 69 vendors in 2011 to 52 vendors in 2014.

#### **Outcome 5:**

Goal: Increase local sales and consumption of locally-produced fruits and vegetables

Target: 10% increase in sales at farm stands, farmers' markets, CSAs and other direct market venues

Benchmark: 2011 marketing records from producers

Performance Measure: Compare 2011 and 2014 marketing records from producers

Participants from the project were surveyed for increased local sales; 48% of the respondents reported an increase in local sales. Of those respondents, all reported over a 10% increase in sales. **Forty-two percent reported an increase in sales of over 20%**. Twelve percent of the respondents reported new direct markets used since 2011, and increase of 16% to direct farm sales, 10% internet sales, 6% whole sale, 6% to restaurants, 10% at farmers markets, and 13% at CSA's. Farmer's market sales were tracked in Skamania and Klickitat counties. **Gross market sales increased 66%** from \$47,000 in 2011 to \$137,685 2015.

#### **BENEFICIARIES**

This project has impacted specialty crop producers, value-added product manufacturers and consumers of specialty crop products. The target audience for measuring impacts and outcomes is specific to specialty crop producers. In retrospect, additional survey efforts could have also captured the impacts the project had on value added manufacturers and consumers directly. Demographic data was collected from those that participated in the survey. Data is available on request or can be downloaded at:

[https://www.dropbox.com/sh/u4rqxbecz59m5wn/AAAIhr\\_zd8\\_h2\\_E0dBqTFaQCa?dl=0](https://www.dropbox.com/sh/u4rqxbecz59m5wn/AAAIhr_zd8_h2_E0dBqTFaQCa?dl=0)

Forty-five percent of survey respondents reported an increase in farming profits since 2011. Of those, 25.7% reported an increase of profit over 15% since 2011. Participants from the project were surveyed for increased local sales; 48% of the respondents reported an increase in local sales. Of those respondents, all reported over a 10% increase in sales. Forty-two percent reported an increase in sales of over 20%. Twelve percent of the respondents reported new direct markets used since 2011, and increase of 16% to direct farm sales, 10% internet sales, 6% whole sale, 6% to restaurants, 10% at farmers markets, and 13% at CSA's. Farmer's market sales were tracked in Skamania and Klickitat counties. Gross market sales increased 66% from \$47,000 in 2011 to \$137,685 2015.

#### **LESSONS LEARNED**

This is an ambitious and well-intentioned project capable of delivering good and solid outcomes in the communities it served. The largest lesson learned is that the sharing and provision of financial data by growers is reluctant. This is due to two significant influences; some growers of specialty crops are proprietary and small farmers do not track gross profits and yields. Self-assessments in retrospective surveys in the context of a workshop or other learning environment is more conducive for collecting this information. Additionally, census data on specialty crops are another source of this information.

Unexpected outcomes in Grant/Adams area included meetings with Samaritan Hospital in Moses Lake to present on stocking their kitchen and cafeteria with items from local growers, meetings with a local artist-owned co-op, Made in Moses Lake, to talk about offering a few shelf-stable value-added food items from local growers, and meetings with a new local Moses Lake restaurant, Simmer, who's owner has the goal of sourcing exclusively from regional growers.

WSU Stevens County Extension was able to leverage the hiring of a new agricultural specialist for the first time to service specialty crop producers of that county.

WSU Skamania and Klickitat County were able to develop a regional relationship with Oregon State University Extension to navigate the barriers of the state line. OSU and WSU have considered sharing small farmer and specialty crop producer resources to expand the four county region due to this grant project.

Producing a monthly newsletter proved difficult with sporadic attendance and geographically dispersed growers. The issues and challenges are so varied that there was no clear indication that a newsletter would result in positive education. The newsletter was suspended after the second issue.

Gathering financial baseline information from small farmers and specialty crop producers was not possible with the abilities of the WSU Extension. The authors and project managers found that collecting financial information as base line was met with resistance and growers had no incentive to share the information. The evaluation tool developed was a good alternative to capture retrospective information as a reflective comparison of financial growth, organic certification and yields produced. The evaluation tool to obtain financial profitability from participating producers was revised to accommodate each region's programming.

Feedback has noted that some growers markets and farming size would be cost-prohibitive to be certified organic. In 2014 the projec team revisited this issue and developed programming to address this perspective. Two approaches were taken. First approach was to educate area growers about cost-share opportunities with USDA NRCS. The second approach was to match value-added producers with locally-sourced organic products. Value-added producers need certified produce to maintain certification, thus offering a venue for small growers to sell certified produce.

#### **ADDITIONAL INFORMATION**

An investing in Manufacturing Communities Project from the US Department of Commerce was awarded in the amount of \$135,000 to the Mid Columbia Economic Development District and WSU to assess and develop economic clusters in the Columbia River Gorge, one of which is value-added agriculture. Due to this effort, the project leveraged expertise of Dr. Girish Ganjyal of WSU Food Science to assess the needs and deliver new market opportunities to specialty crop producers in two of the three regions. Washington State University Extension funded \$50,000 for small business support through an internal RFP and awarded regional efforts that supported efforts not funded through the specialty crop producers project.

16. Provide any additional information available (i.e. publications, websites, photographs) that was not applicable to any of the prior sections.

The project did not run a website but did manage a Facebook page for growers to connect and coaches to share relevant information, located at [facebook.com/Enhancing-Specialty-Crop-Producer-Profitability-242476982547230/](https://facebook.com/Enhancing-Specialty-Crop-Producer-Profitability-242476982547230/).

Stevens County created a Soil Supplementation Calculator tool.

Excess funds resulting from the departure of two employees in Jan/Feb 2015 were diverted to develop peer-reviewed factsheets. These include:

Ganjyal, G and I.G. 2016 Medina-Meza. Value-Added Food Products: Cabbage. Washington State University Publications. *In preparation.*

Ganjyal, G and I.G. 2016 Medina-Meza. Value-Added Food Products: Green Peas. Washington State University Publications. *In preparation.*

Ganjyal, G and I.G. 2016 Medina-Meza. Value-Added Food Products: Peaches. Washington State University Publications. *In preparation.*

Ganjyal, G and I.G. 2016 Medina-Meza. Value-Added Food Products: Pears. Washington State University Publications. *In preparation.*

#### **CONTACT PERSON**

Susan Kerr

509-773-5817

[kerrs@wsu.edu](mailto:kerrs@wsu.edu)

**Project Title:** Plant Something

**Partner Organization:** Washington State Nursery & Landscape Association (WSNLA)

### **PROJECT SUMMARY**

Because of the failed economy, the Plant Something program, solely funded through USDA Specialty Crop Grant funds and Washington State Nursery and Landscape Association matching funds, worked to establish a cohesive marketing program for the nursery industry in Washington State. The local nursery industry was dramatically impacted by the recent economic collapse because it relies both on new home construction and the availability of discretionary income. It is also heavily reliant on good spring weather – which until about 2014 had not been good for sales in the nursery and landscape industry.

To that extent, the Washington State Nursery & Landscape Association established the Plant something message in Washington State by engaging in a marketing campaign that links retail and wholesale nurseries with Washington gardeners through radio, print, web, and in-store displays that promote Plant Something. Plant Something is a cross-media consumer marketing and education campaign targeted at a specific consumer action-buy and plant plants. Washington State Nursery and Landscape Association developed a new website for this campaign, [www.GardenWashington.com](http://www.GardenWashington.com), with cash match funds, with the goals to imprint on Washington consumers that it is important to buy locally grown and sold plants and plant them and promote Washington producers of plant material to the retail and landscape industry. The funds requested were used to produce signage, support promotion of Washington growers and retailers through online, radio, print and person to person marketing, over the life of the grant, and beyond, as a self-sustaining marketing program. Grant funds also allowed new Washington plant producers to promote themselves as Washington Growers to the retail and landscape sectors of the industry.

The Plant Something program launched a long-term, focused campaign that has helped to improve market conditions with its goal of increasing sales of specialty crop-nursery plants, in both wholesale and retail sectors by 10-25% over the three year life of the requested grant. Timing of this campaign has been very important and valued to the industry during the economic downturn. As the economy begins to improve, Plant Something continues to remind consumers of the benefits of nursery products, all of which are specialty crops under USDA categorization. The objective of the Plant Something marketing campaign proposed was to increase sales of nursery plants by 10% the first year and continue increasing sales to 25% over the life of the campaign.

This project has not received previous Specialty Crop Block Grant funding. However, because Plant Something is a partner marketing campaign that spans 20 states and one province, other states may or may not have received funding to support similar marketing efforts. Most definitely the investment in the Plant Something program here in Washington State has enhanced the work being done nationwide by other organizations.

### **PROJECT APPROACH**

Washington State Nursery & Landscape Association's Plant Something marketing campaign links retail and wholesale nurseries with Washington gardeners through radio, print, web and in-store displays that promote Plant Something. Plant Something is a cross-media consumer marketing and education campaign that promotes the environmental and health benefits of plants and is targeted at a specific consumer action – to buy and plant plants. WSNLA developed a new consumer focused website for this campaign: [www.GardenWashington.com](http://www.GardenWashington.com), with grant funding supporting the development of a searchable online map to locate retail and wholesale nurseries.

Goals of this campaign include: to imprint on Washington consumers the environmental and health benefits of plants and trees, to encourage consumers to buy locally grown and sold plants and trees; and promote Washington wholesale and retail nurseries. Grant funds supporting this effort are being used to produce signage and support promotion of Washington growers and retailers through online, radio, print and business-to-business marketing. Below please find a summary of activities, including quantitative and qualitative data, significant results, accomplishments, conclusions and recommendations.

**Marketing Materials included:** Plant Something seed stakes; Printed Garden Washington Locator Guide, Printed Buyer's Guide, and banners and signage.

## GARDENWASHINGTON LOCATOR GUIDE



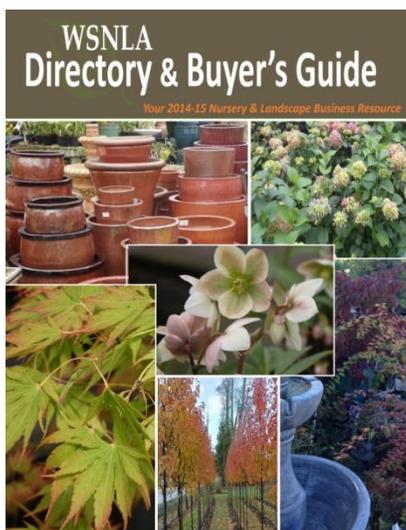
Washington State Nursery and Landscape Association produced the GardenWashington Locator Guide. (2013, 2014 & 2015 Guides pictured above.) The Guide featured Plant Something messaging focused on educating the user on the environmental and health benefits of plants and trees, as well as a listing of retail nurseries. In addition, the Guide included a Plant Something Green Passport of nursery coupons (20 participating nurseries in 2013, 16 participating nurseries in 2014, 17 participating nurseries in 2015). The decrease in nursery participation from 2013 to 2014 can be attributed to nurseries closing their doors. Collectively the nurseries estimated over \$130,000 in nursery sales from the coupons over the life of the grant.

16,000 Guides were printed and distributed to gardeners and homeowners throughout Western and Eastern Washington each year in 2013, 2014 and 2015. Washington State Nursery and Landscape Association utilized select home and garden shows as the main distribution tool for the GardenWashington Locator Guides. At each event, WSNLA included additional activities to promote Plant Something and the nursery and landscape industry. It is notable that in 2015 a spike in consumer awareness of the Guide was observed through requests for the Guide at events, via the Washington State Nursery and Landscape office and GardenWashington.com.

### PRINTED BUYERS GUIDE

An increase in retail nursery sales is directly linked to an increase in wholesale nursery sales. To that extent, WSNLA is working to connect retail and landscape professionals with availability of wholesale nursery plant material.

In 2013 and 2014, a printed wholesale Buyers' Guide targeted at marketing wholesale nurseries and their plant availability was produced and distributed to over 500 retail and landscape businesses throughout Washington. (See picture of Buyers Guide to left.) This Guide is a source for businesses to locate specific plant material to sell at their retail nursery or use in landscape projects.



January 2013 and 2014, Washington State Nursery and Landscape Association and Washington Association of Landscape Professionals, jointly host the NW Green Industry Conference, the largest nursery and landscape conference in Washington State. One scholarship was given out to Washington wholesale nurseries to participate in this event as vendors. The scholarships provided an opportunity for these wholesale nurseries to connect with the industry and promote their plants and business. Criteria for selection, all scholarship recipients were required to be a new nursery or a new nursery to this event. The participating nurseries reported no sales during the event. In following up conversations, participating nurseries did communicate value in the benefit of promotion to the industry as a huge opportunity. In 2015, the scholarships were eliminated from the grant program because data showed low effectiveness in achieving program goals of increased sales.

**MAJOR GARDEN SHOW SPONSORSHIPS.** Targeted shows included:

- Tacoma Home & Garden Show
- Northwest Flower & Garden Show, Seattle
- Everett Home & Garden Show
- Olympia Master Builders BIG Home & Garden Show
- Pt. Defiance Garden Party, Tacoma
- Spring Puyallup Fair, Puyallup



### Tacoma Home & Garden Show

In 2013 Washington State Nursery and Landscape Association designed Plant Something containers that were staged strategically throughout the show, as well as supported a display garden. The single goal of the containers and display garden was to deliver an experience to attendees that connected them with their outdoor space. The effectiveness of this was difficult to track. Therefore in 2014, Washington State Nursery and Landscape Association sponsored the education stage which directly linked Plant Something and the industry as a resource. In addition, a display garden was installed, and a home makeover contest was implemented through a partnership with the Tacoma News Tribune. Above is a picture of the garden at the 2014 show, which was also featured on Washington State Nursery and Landscape Association's *B&B Magazine* cover, a monthly trade magazine. In the backdrop you can see signage announcing the \$25,000 home makeover. The education stage featured Plant Something graphics on the screen between sessions. The contest preformed less than expected with 60 entrants. A winner was selected and they provided no response in accepting the award. Because of this, the Tacoma News Tribune was unable to provide additional media via a follow-up story about how easy it is to Plant Something. After reviewing the effectiveness of these activities, it was determined to streamline efforts to focus on the goal of driving traffic to GardenWashington.com to educate consumers on the benefits of plants and trees and ultimately connecting them with local nurseries to purchase plant materials. In 2015, Washington State Nursery & Landscape Association supported the installation of a display garden at this event, distributed GardenWashington Guides and placed a print ad in the garden show guide which was distributed to 20,000 attendees. The ad, which can be seen above right, directs readers to GardenWashington.com.



### Northwest Flower & Garden Show

In 2013, Washington State Nursery & Landscape Association designed and installed a volunteer led display garden front and center at the Northwest Flower & Garden Show. 'Living Amongst The Stars'. This award winning garden was reviewed by *Fine Gardening* magazine.

In 2014, WSNLA partnered with Washington Association of Landscape Professional to create a display garden that inspired homeowners to get out and "Plant Something". This partnership, let by volunteers, was a huge success and received much recognition from garden writers, peers, and was honored with a long list of awards, including: **Recipient Founder's Cup (Best in Show) Award, Ethel Moss People's Choice Award, Golden Palette Award, X Factor Award, Pacific Horticultural Society Award and the 425 magazine Editor's Choice Award.** (Garden is pictured above.)



**PLANT SOMETHING SEED STAKE**



**PLANT SOMETHING SEED STAKE**

A Plant Something video, broken out into 3 editions, was produced documenting the efforts that go into creating such a garden and worked to further promote Plant Something on social media. To date, the videos have received a total of 1774 plays. (Breakdown: Video I = 554 plays, video II = 1058 plays, video III = 425 plays). In addition, a garden brochure was created sharing further details about the Plant Material used and where it can be sourced.

**Video I:** <http://www.youtube.com/watch?v=BWCaEZvidU0>

**Video II:** <http://www.youtube.com/watch?v=vFjvyCYcme4>

**Video III:** <http://vimeo.com/86198757>

In 2015, our involvement in this show adapted to support the launch of the Plant Something commercial developed with grant funding, and other lessons learned. Volunteers once again led the effort to create a display garden for attendees to enjoy - this year opting to design and build a show wine garden that attendees could experience the garden setting from inside and be encouraged to plant something. The garden was widely successful and packed full throughout the event. The GardenWashington Locator Guide was distributed at the garden directing attendees to local nurseries, educating them on local growers and included information on the benefits of plants and trees. A record number of Guides were distributed with over 12,000. A print ad (same design as Tacoma Home & Garden Show) was placed in the show guide and distributed to 40,000 attendees.

Additional activities at the Northwest Flower & Garden Show included a WSNLA Plant Market, where 12 nurseries – both retail and wholesale – were given an opportunity to sell plants and market their business. Sponsorship funds supported providing signage and promotion of this activity. (See picture of plant market signage at middle right.) Overall sales for the plant market were: \$25,011. This was an increase of nearly \$7,000.

A total of 9000 Guides were distributed at the Northwest Flower & Garden Show in 2013 and 2014, with nearly 3000 Plant Something seeds stakes given out in 2015. This show by far was the most effective in driving traffic to GardenWashington.com. This is demonstrated in the peak traffic analysis in February 2015.

**Everett Home & Garden Show.**

Washington State Nursery and Landscaping Association utilized member involvement as the engine for participation in this show in 2013, 2014 and 2015. 2000 Guides were distributed at this show each year. Plant Something stand-up banner was displayed at member booths. (Signage is picture to the left.)

**Olympia Master Builders BIG Home & Garden Show**

As a first time participant the involvement in this show paid off well. With little nursery representation at the show, Washington State Nursery and Landscaping Association’s Plant Something booth in 2014 and 2015, drew much interaction with attendees who continually reported wanting more access to plant material at the show. There were approximately 2500 attendees at the show and 1500 Guides were distributed. Nursery sales were noted at \$500 – \$1500 each year of the show. (Booth signage included pull up banner seen at left.)

**Pt. Defiance Garden Party**

In 2014, Washington State Nursery & Landscape Association was secured as the education sponsor. Plant Something banner signage was displayed throughout the lecture area. GardenWashington Locator Guides were distributed to all seminar attendees. WSNLA also facilitated a session on Sustainable Landscape Management, including the Plant Something messaging. GardenWashington was showcased as the garden resource. Because of low attendance this show was eliminated from grant activities in 2015.

In 2014, Washington State Nursery and Landscape Association had the unexpected opportunity to promote Plant Something on the national level. Jamie Durie, a star on HGTV, was presenting at local



nurseries and Washington State Nursery and Landscape Association was invited to be a part of the event. Durie was very interested in the campaign and was supportive of the efforts to promote the environmental and health benefits of plants and trees and local nurseries. GardenWashington Guides and Plant Something seed stakes were handed out to over 200 guests at the event. (Jamie Durie is pictured to the right with the Plant Something signage.)

All of the above mentioned activities assisted in promoting the Washington nursery and landscape industry, environmental and health benefits of plants and trees, and promotion of Washington wholesale nurseries. Further impacting these efforts, from April 2013 to September 2015, Washington State Nursery and Landscape Association embarked on a multimedia marketing campaign that utilized television, print, radio, online and mobile platforms. The scope of the campaign reached statewide and targeted first time homebuyers and new gardeners.

Using the initial year as a baseline, Washington State Nursery & Landscape Association reviewed and made changes to media purchasing to maximize effectiveness of grant dollars.

#### **RADIO ADVERTISING:**

- **103.7FM the Mountain.**

This station provided a new audience for our industry. It included younger demographics with a median age of 43, that enjoyed outdoor activities, but were not notable gardeners. 84 radio spots were delivered, 84 streaming spots were delivered reaching over 500,000 listeners. In addition, Plant Something message was sent to 36,000 listeners. In 2014 the format changed and did not seem like a good fit for engaging first time homebuyers regarding gardening.

- **KIRO radio (Ciscoe's Plant of the Week).**

In 2013, Washington State Nursery & Landscape Association partnered with Ciscoe's Plant of the Week. While the program was well received, there were several logistical issues with nurseries being about to source plant material being promoted. In 2014 and 2015, Washington State Nursery and Landscape Association partnered with Great Plant Picks ([www.greatplantpicks.org](http://www.greatplantpicks.org)) to promote on the KIRO radio 'Plant of the Week' campaign. Great Plant Picks is a local non profit that is an educational program of the Elisabeth C. Miller Botanical Garden which debuted in 2001 with the first recommendations for a comprehensive palette of outstanding plants for the maritime Pacific Northwest. To date over 900 exceptional plants have been selected for gardeners living west of the Cascade Mountains from Eugene, Oregon, USA to Vancouver, British Columbia and Canada. This partnership provided nurseries an opportunity to stock many Great Plant Picks instead of just one plant. Because many Great Plant Picks are already stocked in nurseries this streamlined the programs effort. With that being said, logistics and communication continued to prove to be an issue. However, when reviewing GardenWashington site analytics, KIRO radio was a leading referral driving traffic to the site.

- **88.5FM**, has proven effective as listeners of public radio tune in for longer durations and listen to sponsorship and support messaging. In 2014, twenty-two spots were delivered over a two week period, and in 2015 seventy-six spots were delivered over a four week period in 2015.

Listen to our radio spots at: <https://soundcloud.com/wsnla/sets/plant-something>

**The Perks of Plants**

- Greener is Cleaner**  
One tree can remove 26 pounds of carbon dioxide from the atmosphere annually.
- Shady Deal**  
Just 3 properly placed trees can save an average household between \$100-\$150.
- Growth Investments**  
Adding a beautiful landscape to a home can increase its value by up to 15%.
- Local Color**  
Better landscaping in common areas of a neighborhood, the more use they receive.

**DON'T JUST STAND THERE**

**PLANT SOMETHING.**  
plant-something.org

GardenWashington.com

**Celebrate Earth Month...  
Plant Something!**  
April 22 is Earth Day!

**Did You Know?** One tree can remove 26 pounds of carbon dioxide from the atmosphere annually.

**PLANT SOMETHING.**  
plant-something.org

Your local nursery & landscape resource  
GardenWashington.com

**PLANT SOMETHING.**

**JOIN OUR CAUSE**  
Click here to get started.

**WSNLA**  
Washington State Nursery & Landscape Association  
www.GardenWashington.com

**WATCH VIDEO**

**JOIN OUR CAUSE**

**PLANT SOMETHING.**

Click here to get started.

**WATCH VIDEO**

**WSNLA**  
Washington State Nursery & Landscape Association  
www.GardenWashington.com

**ONLINE & MOBILE MEDIA:** Seattletimes.com; Olympian; Spokesman Review; Sequim Gazette, Kitsap Reporter; myNorthwest.com (KIRO), Comcast.com, Pinterest and Facebook.

Washington State Nursery and Landscape Association’s online advertising was targeted to key regions throughout Washington. Each year it was analyzed and adjustments were made. The leading platform was Seattle Times online and mobile platform, which was targeted throughout Washington. For example, in 2014 Seattle Times delivered 197,757 impressions, with a 10% click through. Seattle Times was a leading referral to GardenWashington.com. In 2014, Washington State Nursery and Landscape Association launched into social media to help drive the Plant Something message. In addition, a GardenWashington Facebook and Pinterest page was created. Outlying platforms performed at low levels, therefore they were eliminated in 2015. All online ads have been posted on social media and shared and utilized by nurseries. Above you can see various online ads that appeared on mobile and online platforms. Additional examples of social media graphics used on Pinterest and Facebook graphics are below.

**PLAY DIRTY**

**PLANT SOMETHING.**  
plant-something.org

**JOIN OUR CAUSE. #PLANTSOMETHING**

**WSNLA**  
Washington State Nursery & Landscape Association

**DO SOMETHING SHADY**

**PLANT SOMETHING.**  
plant-something.org

**WSNLA**  
Washington State Nursery & Landscape Association

these show guides targeted our tried and true audience. It Something message with prequalified customers seeking improvements. 425 Magazine and South Sound Magazine. (Art

**TELEVISION:** Ad spots were placed with Comcast Cable on homebuyers. Television networks included: Bravo, DIY, HGTV, June 28, 2015 the Plant Something received 252 hours viewed. It 31,057 watches with driving 684 people to

**GET GROWING**  
www.GardenWashington.com

**PLANT SOMETHING.**

**WSNLA**  
KNOW YOUR RESOURCES

**PRINT MEDIA:** Tacoma Home & Garden Show Guide (circulation 20,000), Northwest Flower & Garden Show Guide (40,000). Advertising in connected the Plant interest in garden and home can be viewed at the left.)

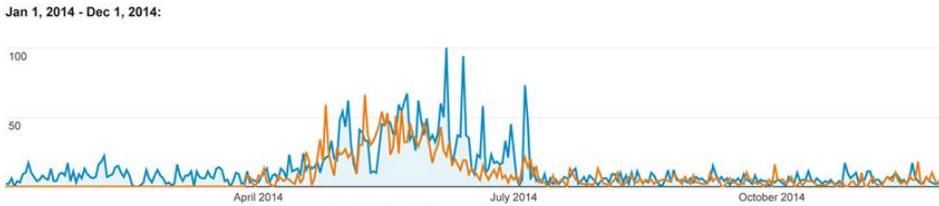
shows targeting first time and E!. Between May 14 – noted 243,234 views, and GardenWashington.com.

View Commercial: [https://www.youtube.com/watch?v=a\\_ZEqFsroMQ](https://www.youtube.com/watch?v=a_ZEqFsroMQ)  
 Alternative versions can be viewed by accessing links in the video section.

All media included a call to action to Plant Something and visit GardenWashington.com. The website includes a searchable tool to locate nurseries and information about the environmental and health benefits of plants. GardenWashington.com reinforced Plant Something messaging. GardenWashington.com site analytics data for the duration of the campaign is:

**Audience Overview** Jan 1, 2014 - Dec 1, 2014  
Compare to: Jan 1, 2013 - Dec 1, 2013

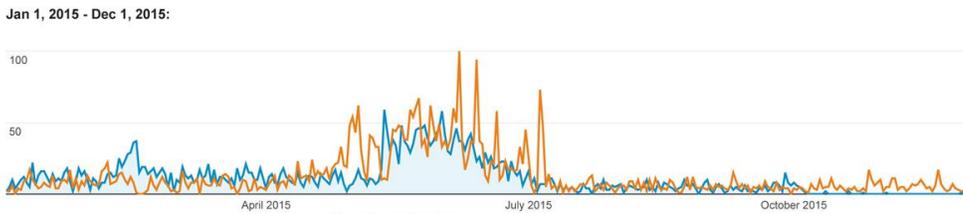
Overview



*\* In this graph, 2013 activity is shown in Orange. 2014 in Blue*

**Audience Overview** Jan 1, 2015 - Dec 1, 2015  
Compare to: Jan 1, 2014 - Dec 1, 2014

Overview



*\* In this graph, 2014 activity is shown in orange. 2015 in Blue.*

**General Site Analytics Data**

	<b>2013</b>	<b>2014</b>	<b>2014</b>
<b>Page Views</b>	2698	4453	3679
<b>Peak Viewing</b>	May 6 – June 10	May 3 – June 13	February 14, May 13 – June 10
<b>New vs. Returning</b>	88% vs. 11%	87% vs. %13	87% vs. 13%
<b>Referral vs. Direct vs. Organic Search</b> (additional access via social media or other channels.)	47% referral 42% direct 3% organic	54% referral 28% direct 16% organic	41% referral 34% direct 23% organic

**Most Popular Pages**

- Find a Nursery Near You Search Tool
- Plant Something - Learn more about the benefits of plants and trees
- Download a GardenWashington Locator Guide
- PRO tips Calendar

The GardenWashington.com site analytics provide a broad overview of the effectiveness of the Plant Something campaign and provided direction on how to target and fine tune WSNLA efforts each year. Overall, the visitor demographics show the media used is relevant for reaching new audiences. It is noted that traffic increased more than 100% from 2013 to 2014. It is also noted that traffic had a slight decrease from 2014 to 2015. With that being said, the way in which people are accessing the site has become more diversified showing the GardenWashington is becoming established with improved search engine optimization for organic search results. It is also important to note that with the launch of the Plant Something commercial and video in 2015 some viewers were directed to the Plant Something video hosted on YouTube which notes 6038 views. This demonstrates traffic was tripled to the Plant Something message and is seen as a success in increasing traffic each year of the grant. With that being said, in future years, all advertising will be directed to GardenWashington.com, including video links.



### **Plant Something Commercial & Grower Videos**

Washington State Nursery and Landscape Association worked with Rusty George Creative to develop a Plant Something commercial that launched Spring 2015 expanding the Plant Something message. Versions of the video can be found at [www.YouTube.com/WSNLA](http://www.YouTube.com/WSNLA) or by clicking the link below.

- [WSNLA Plant Something Commercial = 6038 views](#)
- [WSNLA Plant Something “Get Growing” video = 351 views](#)
- [WSNLA Plant Something “Get Dirty, Get Social, Get Playful” video = 46 views](#)

The television commercial aired Spring 2015 on cable. Between May 14 – June 28, 2015 the Plant Something received 252 hours viewed. It noted 243,234 views, and 31,057 watches with driving 684 people to GardenWashington.com. The videos were also shared with the industry via social media, GardenWashington.com and email communications for personal use and distribution.

Utilizing the content marketing concept, nursery grower videos were created. After lengthy discussion on various topics to be featured, the industry settled on educating the consumer on ‘How a Plant is Comes to Market’. This grant task proved to be unexpectedly more expensive and time intensive than planned. Factors that played a role in the delay of this grant element include: seasonal access to filming sites, products, and experts; and lack of industry knowledge by video production team in editing process. Because of these factors, the videos were completed near the end of the granting period and have not received officials views. However, the videos have debuted to the industry with positive reviews and will be distributed via all channels and platforms to consumers. The videos include:

#### **Bringing a Plant to Market**

- Planning & Plant Selection
- Environmental Growing Practices
- Propagation Selection

Significant roles of project partners include, Washington Association of Landscape Professionals as a co-host of the NW Green Industry Conference, shared in the overall investment made in putting on this premier industry event where wholesale nurseries are given an opportunity to promote their business and plants to the trade. In addition, Washington Association of Landscape Professionals was also a partner with Washington State Nursery and Landscape Association in the creation of the 2014 Northwest Flower & Garden Show display garden.

### **GOALS AND OUTCOMES ACHIEVED**

Goals of this campaign include: to imprint on Washington consumers the environmental and health benefits of plants and trees, promote Washington wholesale and retail nurseries; and to encourage the purchase of Washington grown plants.

In its first year of execution, WSNLA’s Plant Something campaign, brought awareness to new audiences about the environmental and health benefits of plants and trees. In subsequent years, the Plant Something campaign worked to increase these efforts through expanding and diversifying

outreach efforts. Here are a few notable highlights of this year’s WSNLA’s campaign:

- An increase of over 100% of visitors to GardenWashington.com between 2013 and 2014.
- Traffic to Plant Something messaging tripled in 2015 with the combination of traffic to GardenWashington.com and the Plant Something video.
- Increase in exposure of GardenWashington Guide from show garden sponsorships. 2015 noted a record distribution of 12,000.
- Unexpected opportunity to connect with national gardening expert.
- Production of Plant Something commercial and grower videos

**Goal #1:** To increase gross nursery sales in 2013, 2014, and 2015 seasons.

**Target #1:** To increase gross nursery sales by 25% over a three year grant period. The initial target is a 10% increase in gross sales from the beginning of the grant period to the completion of the first year of the grant period. Thereafter, if further grant funding is available, the goal will move to a 25% increase in gross sales by the end of the grant.

**Benchmark #1:** Washington State Department of Revenue data from the date preceding the beginning of the grant period.

**Performance Measure #1:** The Washington state statistics from the Department of Revenue for nursery product tax categories. The most recent statistics will be compared with statistics at the end of the grant reporting period.

	2012	2013	2014	2015
<b>Gross Business Income by Industry</b> <i>* NAISC code data provided by Washington State Department of Revenue. Codes: 1114, 1142, 111421, 111422.</i>	\$402,575,066	\$421,201,554	\$462,879,337	\$201,792,381 <i>(Total reflects total sales for quarter 1 &amp; 2 only. Quarter 3 &amp; 4 not available at time of report.)</i>

2012 data from Washington State Department of Revenue as a baseline reports total business sales for nursery, greenhouse and floriculture production at \$402,575,066 in total business sales. This data is used as a baseline. In 2013, Washington State Department of Revenue reported a \$421,201,554 in total business sales, which represents a 5% increase from the previous year. In 2014, an increase 10% increase in total business sales is noted with total business sales coming in at \$462,879,337. At the time of grant reporting, total business sales for 2015 was not available. Analyzing the data available, 2015 quarter 1 and quarter 2 totals, a 4% increase in sales was demonstrated over 2014 quarter 1 and quarter 2 total sales of \$116,494,207. It is important to also note that nursery sales peak in quarter 3 and 4. In communicating with local nurseries many reported 2015 as a record year.

**Goal# 2:** To increase wholesale nursery sales of Plant Something – Great Plant Picks plant selections during a 16 week, *Plant Something – Great Plant Picks*, marketing campaign.

**Benchmark #2:** *Plant Something – Great Plant Picks* campaign.

**Target#2:** Increase sales by 10% over the base year and reach 30% by the completion of the third grant year.

**Performance Measure#2:** To gather data from member wholesale and retail nurseries regarding *Plant Something – Great Plant Pick* plant selections for the entire duration of campaign.

Due to problems with communication and logistics, the radio station and the industry were not able to collect data on overall sales of Great Plant Picks plant material. In the first year of this program, the radio partner switched gears and eliminated the Plant of the Week program. In response, Washington State Nursery and Landscape Association presented a secondary option to promote Great Plant Picks as a whole, which are proven selections for the maritime climate and are already stocked at local nurseries. Doing so would eliminate the logistics of plant availability and communication, while enhancing efforts already occurring. In 2014, the radio partner moved forward with the new idea, but was slow to implement, which impacted nursery involvement. Washington State Nursery and Landscape Association partnered again in 2015. However, the radio host promoted individual Great Plant Pick selections instead of ALL selections. This impacted the sales as people were only seeking the plant mentioned that month. Furthermore, details regarding the plant

selection were not communicated to the nurseries. Therefore in some cases, the plant was not available for purchase. Overall nurseries express support of promoting these specific plant selections proven for Washington’s maritime climate. Wholesale nurseries have invested in growing more varieties and some are including branding elements on their tags.

**Goal #3:** To increase traffic to GardenWashington.com, specifically during the gardening season. (April – June). Therefore driving consumer’s to more information about the environmental and health benefits of plants and trees, as well as a resource for them to locate them.

**Target #3:** To increase traffic to GardenWashington.com by 10%

**Benchmark #3:** Google Analytics data reporting for specified months.

**Performance Measure #3:** Statistics will be analyzed and compared at the end of each reporting period. Overall site traffic will be noted, as will be the data collected from the search tool to locate Plant Something nurseries.

**General Site Analytics Data**

	<b>2013</b>	<b>2014</b>	<b>2014</b>
<b>Page Views</b>	2698	4453	3679
<b>Peak Viewing</b>	May 6 – June 10	May 3 – June 13	February 14, May 13 – June 10
<b>New vs. Returning</b>	88% vs. 11%	87% vs. %13	87% vs. 13%
<b>Referral vs. Direct vs. Organic Search</b> (additional access via social media or other channels.)	47% referral 42% direct 3% organic	54% referral 28% direct 16% organic	41% referral 34% direct 23% organic

The GardenWashington.com site analytics provide a broad overview of the effectiveness of the Plant Something campaign and provided direction on how to target and fine tune WSNLA efforts each year. It is noted that traffic increased more than 100% from 2013 to 2014. It is also noted that traffic had a slight decrease from 2014 to 2015. With that being said, the way in which people are accessing the site has become more diversified showing GardenWashington is becoming established with improved search engine optimization for organic search results. It is also important to note that with the launch of the Plant Something commercial and video in 2015 some viewers were directed to the Plant Something video hosted on YouTube which notes 6038 views. This demonstrates traffic was tripled to the Plant Something message and is seen as a success in increasing traffic each year of the grant.

**BENEFICIARIES**

Washington State has 739 licensed wholesale growers of nursery plants and 5,835 registered retailers of nursery plants. Those businesses are widespread across the state, west to east and south to north. Since nearly every town has these businesses, increased sales brings economic benefit to a broad area across the state. By polling both wholesalers and retailers WSNLA has confirmed that an increase in retail sales means an increase in wholesale grower sales. Wholesale growers benefit from this type of program because they confirm that they market almost exclusively in State to the retail nursery community. Wholesalers are convinced a program that increases retail sales will increase their sales from 5 to 50%. Retailers confirmed that they will buy from Washington plant producers and sell at retail from 25 to 95% more plants as result of this strong marketing of plants and planting. An increase of just 10-25% in nursery sales on a base of \$327,046,000-as posted in NASS data in 2010 with a 10% increase amounts to \$330,316,400 distributed widely across the state. At the increased rate of a modest 25% over the base, the amount will be \$408,807,500. The increase in sales is expected to be greatest during the period between March and July of each year as a result of the winter flower and home shows and the concentrated show, print, web, and radio marketing.

As a secondary audience, Washington landscape businesses will benefit from inclusion on GardenWashington.com and the printed Garden Washington Locator Guide. However, by driving customers to landscape professionals, Washington wholesale and retail nursery sales will ultimately benefit with increased sales.

**LESSONS LEARNED**  
**POSITIVE**

1. **The collaboration of an industry to market them at a time that was dire.** The Plant Something campaign worked to change the marketing paradigm and help supported an industry on a large level when some nurseries businesses were shutting down because of the failed economy. The messaging intersected with consumers in news ways and inspired individual business to rethink their own message platform and distribution techniques.

2. **The power of cable television.** During the granting period much focus was given to digital advertising. However, the effectiveness of television is still very real. This is demonstrated through our YouTube views driven primarily by Comcast Cable. A lesson learned for future efforts is to create the video sooner rather than later so that television could be utilized two years rather than just one.

3. **Reviewing data and adapting strategies.** Having an advisory team is helpful in reviewing data and strategizing to streamline efforts. It was very helpful to have key that individuals are flexible and are willing to think outside the box. The first year of this grant was by far the most time extensive. Learning from what worked and what did not, enabled activities and time to be more effective and purposeful.

4. **Production of industry videos and commercial.** Grant funding supported the development of professionally produced video, which had never been done historically on behalf of the Washington State nursery industry. These tools will live on to communicate the value of our industry.

## **NEGATIVE**

1. **Constant need to communicate on all levels.** Communication is an ongoing effort that is never quite achieved to perfection. Managing several intersects of people, businesses, vendors to ensure a cohesive message and approach is achieved and delivered is an ongoing struggle. Keep in mind communicate early and often.
2. **Identify and work with supporting partners and vendors.** During the production of the grower videos it was an ongoing struggle to explain the detail and message being communicated by the industry. The vendor was very professional and capable creatively and technically, but lacked ability to tell the story even after months of meetings and outlines. Because of this it took an excessive amount of time to micromanage the effort to produce and finalize the videos. This again can be demonstrated in the radio partnership. Even with good intentions, logistics were a challenge. It is recommended to not include a goal that is in the hands of a supporting partner. Capturing the date from the Plant Something radio campaign sales was nearly impossible because of the logistics and communication being handled by the radio station.
3. **Unexpected cost barriers.** This grant noted a change request in its final year due to cost barriers with an online trade vs. grower videos. Because of this, the advisory committee determined to allocate money from the online trade show to support the production of three grower videos. This was approved through a change request. However, having exact costs on both activities would have eliminated this need. Again, this could be further supported by good vendor relationships.

## **ADDITIONAL INFORMATION**

### **CASH MATCH: \$155,298**

- Initial set up of [www.GardenWashington.com](http://www.GardenWashington.com) - \$1650. Source: Washington State Nursery & Landscaping Association.
- Plant Something License - \$3000. Source: Washington State Nursery & Landscape Association. There is a \$1000 annual partnership fee to participate in the Plant Something marketing campaign.
- Nursery radio campaign sponsorships - \$17,200. Source: Washington State Nursery & Landscaping Association member nurseries. This investment was used to expand our radio campaign. Through individual sponsorships, nurseries were able to link their business name and location with the Plant Something message.
- Convention cash spent to promote producers to industry -\$113,020. Source: Washington State Nursery & Landscape Association and Washington Association of Landscape Professionals. Money was utilized to cover expenses for 3-day conference, including rental and speaker fees, food and beverage, printing and marketing, etc. Events costs are offset by registration, as well.
- Publication & Printing Costs: \$20,428. Source: Washington State Nursery & Landscape Association. Money was spent producing GardenWashington Locator Guide and Buyers' Guide.

### **IN KIND: \$71,238**

- Staff salaries and benefits \$12,856 for each of 3 years – \$38,568. Source: Washington State Nursery & Landscape Association.
- Volunteer time for garden shows activities throughout Washington \$8850 (590 volunteer hours) for each of 3 years – \$26,550. Source: Washington State Nursery & Landscape Association.
- *B & B* ad donations for Plant Something – \$6120. A print ad in various sizes and formats ran in issues of the *B&B Magazine* which is distributed to over 1300 nursery and landscape professionals. Source: Washington State Nursery & Landscape Association.

**CONTACT PERSON**

Breanne Chavez

WA State Nursery & Landscape Association

[Breanne@wsnla.org](mailto:Breanne@wsnla.org)

**Project Title:** Strengthening food safety management systems for specialty crop production

**Partner Organization:** Washington State University (WSU)

### **PROJECT SUMMARY**

Food safety education for specialty crop stakeholders was a high priority due to outcomes of the Food Safety Modernization Act (FSMA). The project objective was to increase understanding and implementation of food safety management systems and documentation through interactive workshops with Washington growers, packers and processors. This objective was important and timely; during this period, proposed food safety regulations were open for comment and will significantly change approaches to food safety in the food industry and on farms. Producers, packers and processors will have an immediate need to implement food safety management systems to meet regulatory and buyer requirements. Targeted workshops assisted stakeholders to develop food safety practices and documentation for their operations.

Timeliness of this project revolves around the new Food Safety Modernization Act Rules that were published in 2015. Growers in the future will be required to have new food safety practices at their farms, packaging and processing facilities. For the last several years the Food and Drug Administration has been taking input through stakeholder comments on proposed rules. This was the grower's and food manufacturer's opportunity to have real input on the content of the rules and how they will be implemented. The impact of the new FSMA requirements are broader than previous guidelines for food safety in produce production.

This project built on the previously funded SCBGP, "Advancing food safety Good Agricultural Practices (GAPs) among Washington specialty crops growers". The purpose of the previous project was to increase knowledge and implementation of on-farm food safety practices and food safety documentation through interactive workshops. Project evaluations from this project demonstrated that project targets for measureable outcomes were exceeded during this project. Workshop participants (214 total) increased knowledge of food safety in at least 13 categories. Workshop participations also implemented food safety practices as an outcome of participation, specifically in risk assessment and recordkeeping. This project introduced and advanced grower knowledge of food safety principles as well as implementation of food safety practices on their farms. Implementation of food safety is a long-term process, with growers implementing aspects of food safety practices each year, so for those seeking third-party GAPs certification it often takes several years to prepare for a successful certification audit. The Standards for Growing, Harvesting, Packing and Holding Produce for Human Foods associated with FSMA represents a significant shift for growers in food safety practices that will be required. Therefore, the previous project provides 214 food industry stakeholders in the Pacific Northwest with momentum to prepare for FSMA food safety requirements.

### **PROJECT APPROACH**

Specialty crop growers were provided several opportunities to better understand the new FSMA guidelines. Two series of presentations were provided, one after the originally proposed standards and one the supplemental notice for the proposed FSMA rules. Ten workshops were provided to growers in both Oregon and Washington. A total of 852 persons attended the workshops. This exceeded expectations on this grant by over 200%. A survey was taken by individuals attending the workshops. Questions included how this helped the participants understand the proposed FSMA rules. The attendees came from a range of size of facilities ranging from small to quite large <10 to >500 employees (Figure 1.) Participants had a range of responsibilities on the farm including farm owner, farm employee, manager as a packer, manager as a processor, other agricultural professionals (Figure 2.) Attendees had a range of years of experience from new employees to those with greater than 40 years of experience (Figure 3.) Workshops primarily consisted of individuals that worked with a variety of specialty crops including tree fruit, berries, nuts, root crops, leafy greens, mixed vegetables, and herbs (Figure 4.) There was an increase in understanding of the proposed requirements for the produce rule including record keeping, water, biological soil amendments of animal origin, domestic and wild life, health and hygiene, and training (Figure 5.) Attendees were going to use what they learned and start at least one food safety technique learned at the workshop (Figure 6.) Greater than 68% of attendees responded that they will be making comments to proposed FSMA rules (Figure 8.)

This grant was done in conjunction with a SCBG grant in Oregon on Food Safety Modernization Act education. Project team member, Dr. Michael Morrissey, led the efforts in Oregon. The project team had numerous conference calls and several in-person meetings to coordinate efforts and streamline the educational efforts in both states. Team members from Washington and Oregon actively participated in workshops in both states. The WSDA, OCO Program was also an active partner on project activities. They coordinated efforts involving other WSDA staff, participated in conference calls, and delivered presentations at the workshops. The WSDA provided copies of the proposed rules for participants in

Washington. This was a significant contribution; the documents were quite long and providing hard copies during the presentations allowed participants not only to follow along during the presentations, but also to become more comfortable and familiar with navigating regulatory documents. The FDA District Office in Seattle also provided a speaker for five of the workshops; this commitment was not expected, and was greatly appreciated by the project team. The grant had a number of partners that have cooperated in grants previously. Many of these partners assisted with promotion and communication among their respective groups, including Northwest Food Processors Association, Cascade Harvest Coalition, Washington State Farmers Market Association, Washington Red Raspberry Commission, Washington Tree Fruit Research Commission and Stemilt Growers LLC. All listed as partners complied with the different objectives that were assigned to them with the grant proposal.

Data were collected from participants when they registered for the events and in evaluation tools to ensure that participants were involved in specialty crop production.

### **GOALS AND OUTCOMES ACHIEVED**

Ten workshops were held over the life of the grant with 852 participants. This exceeded expectations of participants for the project. The project team completed 5 workshops (2 in Washington and 3 in Oregon) between March and May 2013; the workshops outlined standards proposed in the originally proposed Produce Rule and Preventive Controls Rule for Human Foods. In August 2013, the project team, along with Washington, Oregon and Idaho State Departments of Agriculture, hosted FDA listening sessions and tours. These meetings featured FDA and USDA representatives, including Mr. Michael Taylor, FDA Deputy Commissioner for Foods and Veterinary Medicine along with members of the CFSAN produce safety staff. In November 2014, two workshops were held to review and discuss the supplemental notice associated with aspects of the proposed Produce Rule and Preventive Controls for Human Foods Rules. In March of 2015, a post-harvest food safety workshop was conducted to discuss preparation for FSMA.

Additionally, parts of these presentations were incorporated into other presentations with stakeholders throughout the life, of the grant which increased the number of growers and stakeholders that were exposed to the proposed Food Safety Modernization Act requirements.

Numerous project team meetings were conducted to prepare for these workshops in both 2013 and 2014, workshops were planned, curriculum developed, promoted and delivered within approximately 7 weeks after the proposals were released; this is an extremely short window for workshop development and delivery. Evaluations were also prepared and analyzed in order to understand measureable impacts associated with the workshops.

Long term outcomes are difficult to measure. Workshop evaluations captured the intent among participants to perform long-term outcomes. Over 45% of participants reported that they intended to submit comments on the proposed rules. Reports from the Food and Drug Administration were that thousands of comments pertaining to the proposed Food Safety Modernization Act rules were received. It is likely that some of these comments were from participants that attended workshops. Additionally, workshop participants indicated that they were likely to communicate about workshop content with others, with approximately 45% of participants planning to share information with 1-9 individuals, 15% planned to share with 10-24 individuals and approximately 15% planned to share with more than 100 individuals. Overall response to the evaluation used in the workshops was that those attending the workshops will take the information learned and integrate that into their food safety plans. Gathering and sharing information had the highest response in both 2013 and 2014. In 2013, employee training and testing water quality were the next highest responses for long-term implementation. In 2014, improvement of food safety practices was the next highest response.

The project exceeded expectations of the number of attendees participating in the workshops, with a project target for workshop participants being 400 in Washington and Oregon combined and the number of workshop participants was 852. This exceeded expectations on this project by over 200%. The project met expectations on a total of 10 total workshops. The project exceeded the target, that over 50% of participants would increase knowledge and awareness of food safety and food safety regulations, with participants reporting an average increase in knowledge in all categories examined. For the Produce Rule, these categories included training, agricultural water, biological soil amendments of animal origin, wild and domesticated animals, buildings, equipment, tools and sanitation, and worker health and hygiene. The remaining project targets of implementation of food safety practices and third-party certification, regulatory inspections, economic impacts and buyer requirements were longer-term outcomes due to alterations in timelines associated with release of the final rules.

The project team measured the number of participants at each workshop. Attendance exceeded expectations with 852 participants attending workshops during the project, and the target being 400 participants. This exceeded expectation by over 200%.

Several methods of measuring workshop achievement are from 1) their improved knowledge of food safety practices and the new food safety modernization act guidelines and 2) the number of people that workshop participants are going to share the information with.

At the workshops an evaluation was used to document knowledge increase in levels of understanding on what will be involved under the new proposed rules (Figure 5.) As part of the workshop evaluation the participants self-rated their before and after knowledge on food safety and the / food safety modernization act topics. The different levels of ratings are as follows 1) very low, 2) low, 3) moderate, 4) high, and 5) very high. All areas showed an improvement from 2-3 low to moderate knowledge before the workshops to 3-4 moderate to high after the workshops (Figure 5.) The project exceeded the target that over 50% of participants would increase knowledge and awareness of food safety and food safety regulations, with participants reporting an average increase in knowledge in all categories examined.

All participants documented that they would share the information learned at the workshop with others they work with. The majority of participants would share information between 1-9 people at the places they work and the remaining would share the information with more people which will depend on the work place they work at and there level of responsibility (Figure 7.)

Some of the project targets became longer-term outcomes due to changes associated with the timeline for publication of the final rules. Workshop evaluations asked participants about changes that will be made based on attending the workshops in all categories. Many participants reported that they intended to implement or improve a variety of food safety practices in their operations. Gathering and sharing information was the most frequent response in both 2013 and 2014 (between 16-20% of participants). Other trends differed between years. In 2013, 11% of participants reported recordkeeping and testing agricultural water was an intended outcome, and 10% reported improving food safety practices was an intended outcome. In 2014, 13% reported improving food safety practices was an intended outcome, while 10% reported enhancing preventive controls was an intended outcome. Although these percentages appear low, it is important to consider that a fairly large number of participants completed evaluations.

### **BENEFICIARIES**

All those attending the workshop benefited from increased understanding of expectations required under the new Food Safety Modernization Act. They are more informed on proposed requirements associated with the rules and are more aware of their ability to comply with the new rules. The project outcomes reached several specialty crops of economic importance in Washington. Workshops were dominated by tree fruit and berry producers and packers (Figure 4.) The information garnered by attending the workshops will also be shared with a large number of employees that work for workshop attendees. Workshop participants indicated that they were likely to communicate about workshop content with others, with approximately 45% of participants planning to share information with 1-9 individuals, 15% planned to share with 10-24 individuals and approximately 15% planned to share with more than 100 individuals.

Workshops were predominantly attended by tree fruit (30-50% of participants in 2013 and 2014, respectively) and berry (15-18% of participants in 2013 and 2014, respectively) producers and packers. Other specialty crop producers attended the workshops including, nuts, root crop, leafy greens, mixed vegetables and herb producers and packers (Figure 4.)

The demographics of workshop attendees covered all ranges of different sized operation, ranging from < 10 employees to those with >500 employees (Figure 1.) A range of types of professions were represented at the workshops from farm owners, employees or farm and packing house managers (Figure 2.) Workshop participants had a range of agricultural experience average 15% from each class ranging from new employees, 0-4 years agricultural experience to those employees with over 40 years' experience (Figure 3.)

### **LESSONS LEARNED**

This series of workshops reached a tremendous amount of specialty crop grant producers, packers and processors and demonstrates the importance of food safety already be conducted at specialty crop grant facilities already being conducted.

An outcome of the first five workshops included engagement with FDA CFSAN. Through cooperation with FDA and the Washington, Oregon and Idaho Departments of Agriculture, our project team engaged with these organizations to host

FDA listening sessions and tours in year 1. These meetings featured FDA and USDA representatives, including Mr. Michael Taylor, FDA Deputy Commissioner for Foods and Veterinary Medicine along with members of the CFSAN produce safety staff; this provided FDA and USDA representatives an opportunity to understand issues and concerns of agricultural stakeholders in the Pacific Northwest related to the originally proposed produce and preventive controls for human foods rules. FDA and USDA representatives also had the opportunity to tour farms and engage directly with stakeholders in agricultural settings featuring all three states in the Pacific Northwest. Furthermore, these listening sessions and tours highlighted the high level of cooperation and collaboration between the Washington, Oregon and Idaho Departments of Agriculture, Washington State University-University of Idaho School of Food Science and Oregon State University as well as stakeholder groups. The degree of collaboration between regulatory, academic and industry partners in the Pacific Northwest is unique.

The supplemental versions of the proposed produce and preventive controls for human foods were expected to be released in year 2 of the project (FDA originally released a target of June – August 2014). The supplemental versions were released September 29, 2014. The project team greatly appreciated the project extension to perform additional outreach in Year 3 associated with the supplemental notice. It was not anticipated that FDA would issue a supplemental notice which impacted the original targets for measurable outcomes for this project; the ability to measure implementation of food safety practices and economic impacts associated with preparation and compliance with final rules became long-term outcomes.

Project metrics aligned or exceeded expected measurable outcomes.

#### **ADDITIONAL INFORMATION**

Total in-kind and cash match was \$52,039. Dr. Killinger provided on-going leadership on the project, including project management activities involving scheduling of meetings, oversight of progress on data entry and analysis and her salary represented \$3,238 of cash match. Claudia Coles communicated with the project team, attending and presenting at meetings and developed strategies for WSDA participation in events; her salary represented \$11,184.98 of cash match. WSDA also printed copies of the proposed original and supplemental notice for workshop participants, representing \$4,500 in cash match. WSU waived F&A for this grant for in-kind match, \$32,120.

**Appendix**

Figure 1. Size of attendee's facility.

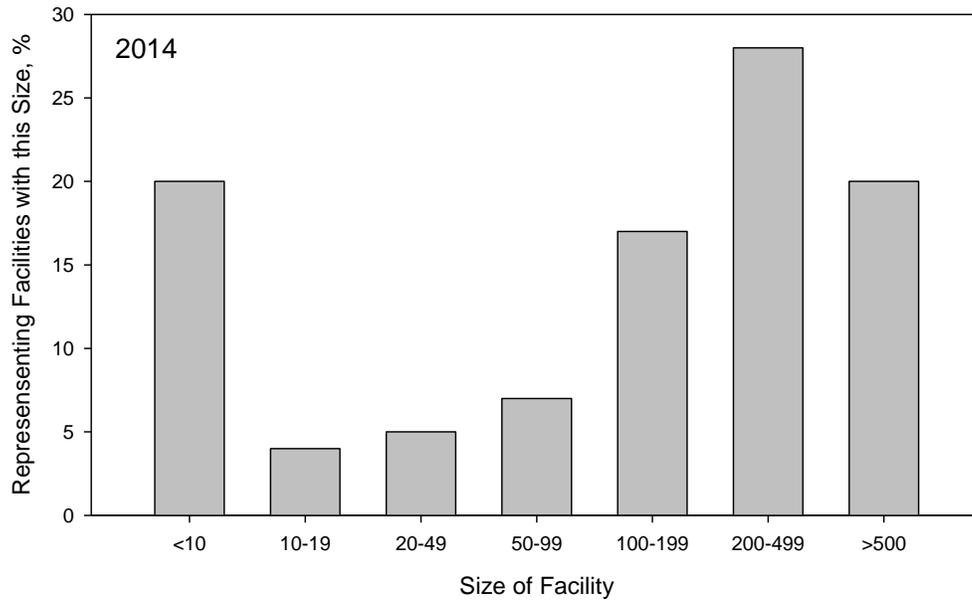
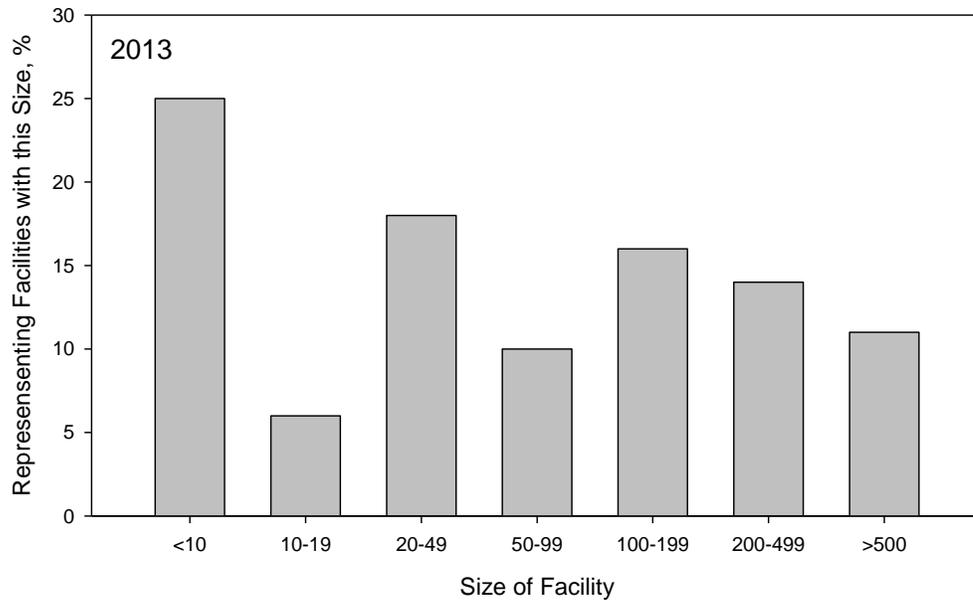


Figure 2. What is your profession of workshop attendee?

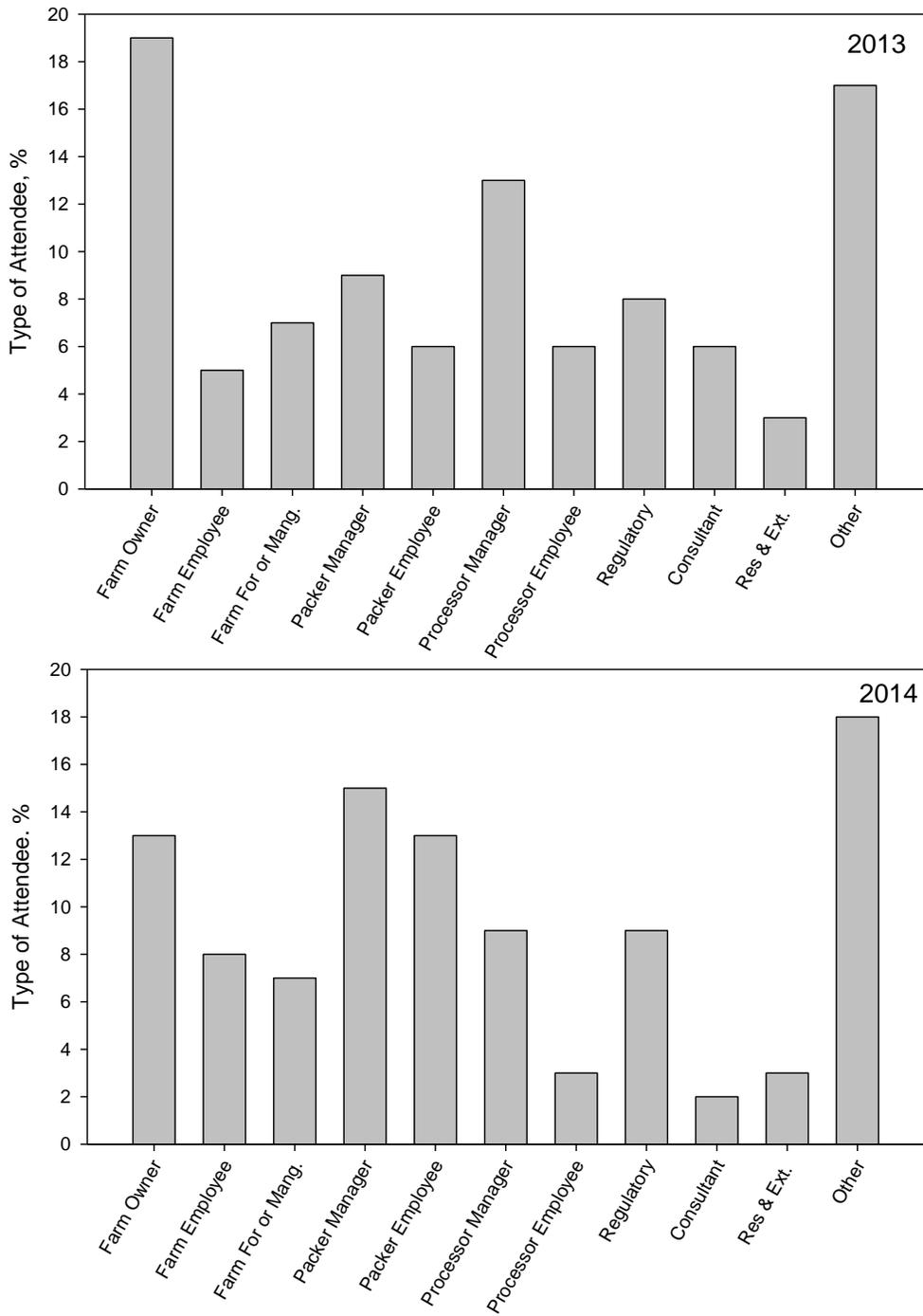


Figure 3 Attendee's number of years of agricultural experience.

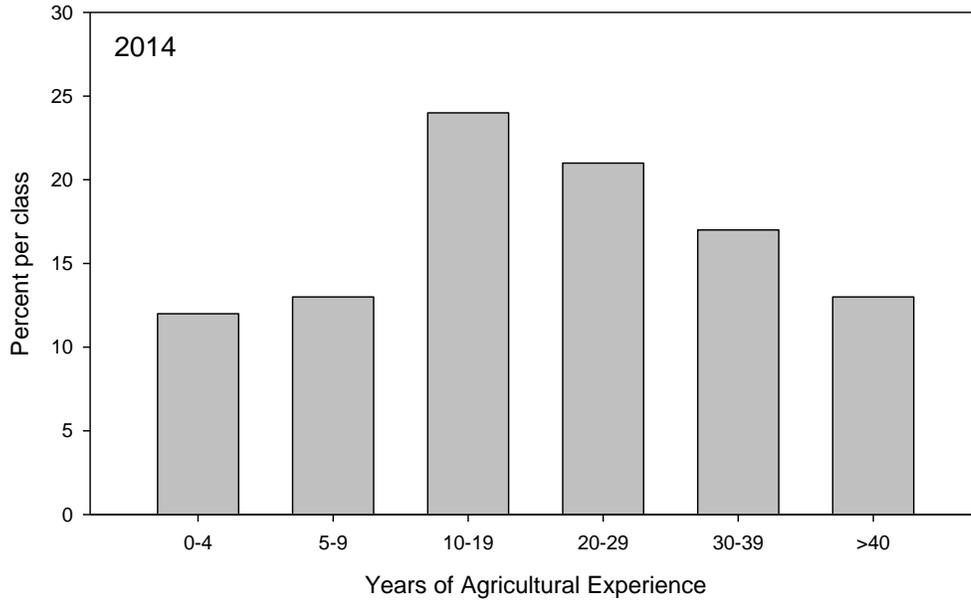
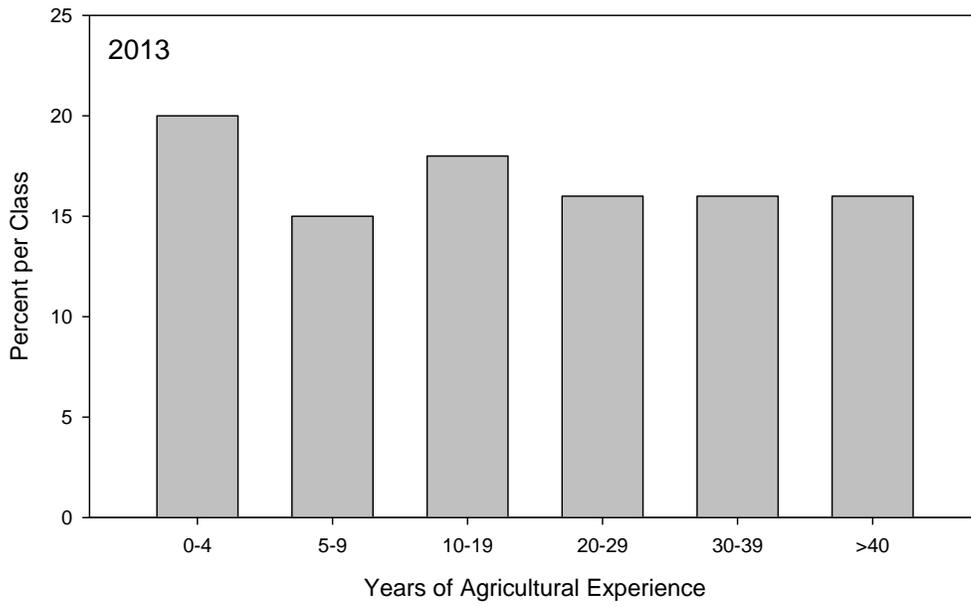


Figure 4. What specialty crop does attendee produce?

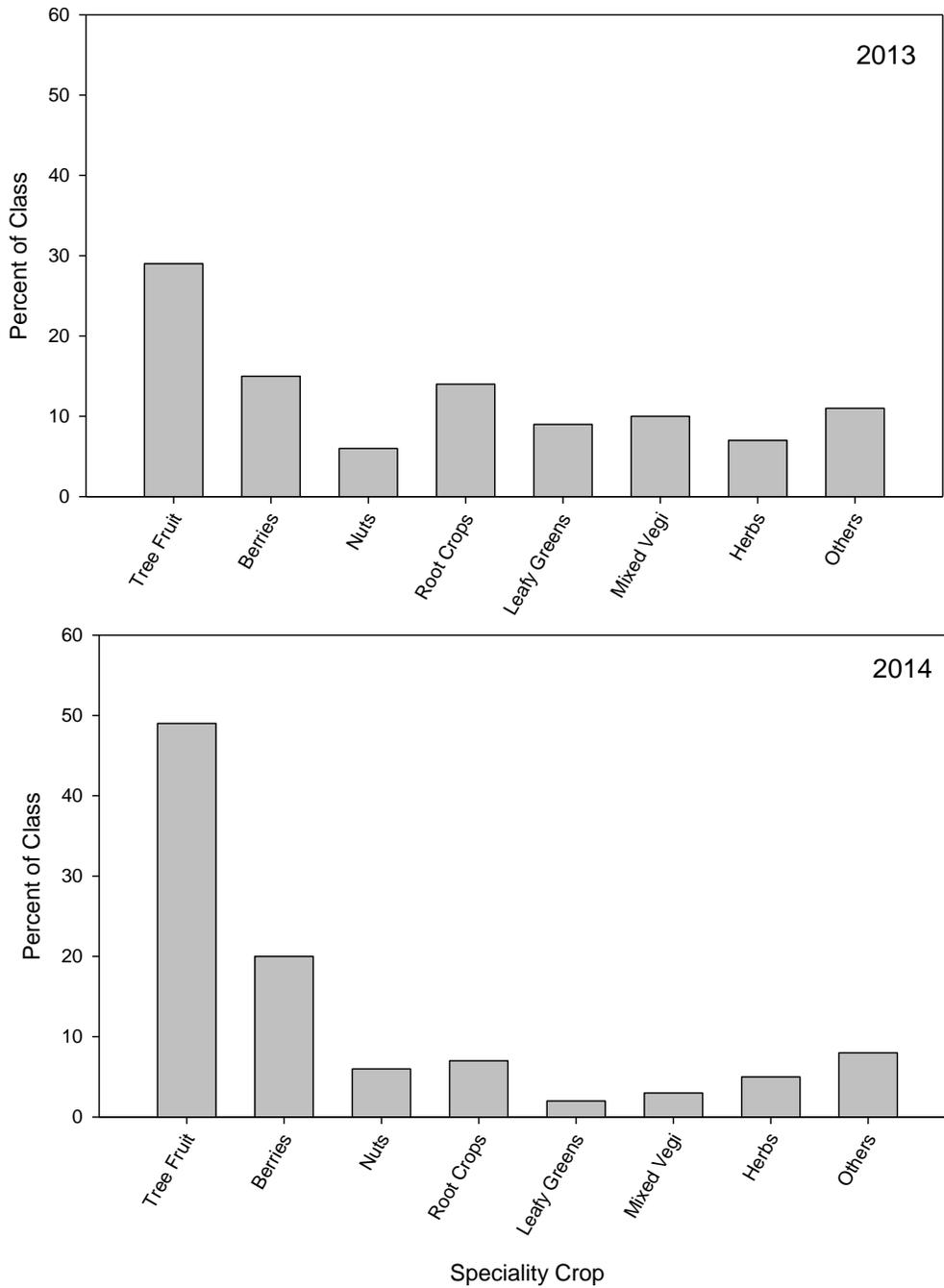
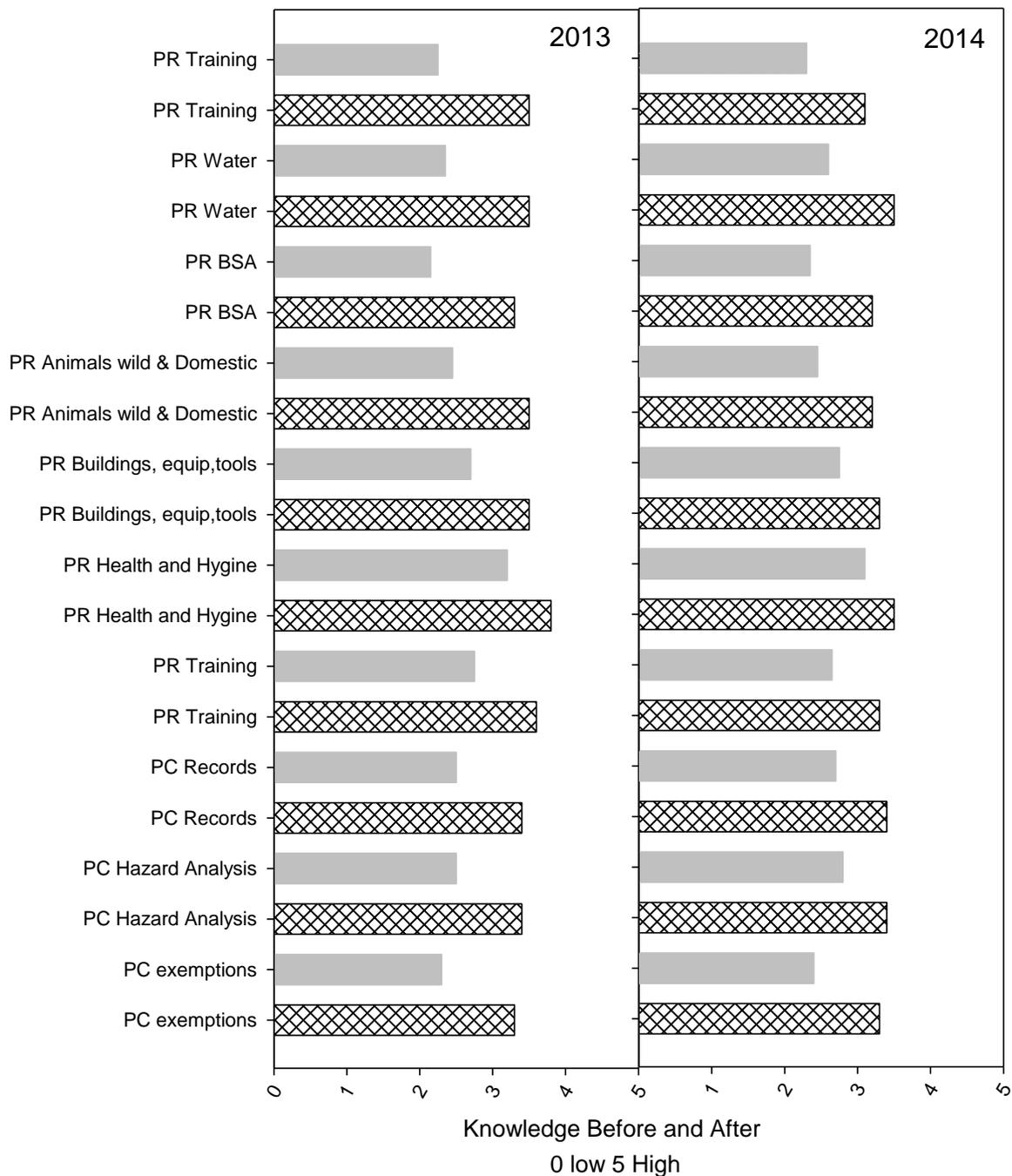


Figure 5. Level of awareness and knowledge of the food safety practices prior to and after attending the workshop. Numbered levels are described as 1) very low, 2) low, 3) moderate, 4) high and 5) very high).



PC=Preventive Controls    Knowledge After Workshop  
 PR=Produce Rule        Knowledge Before Workshop

Figure 6. What food safety practice do you plan on doing when arrive home after the workshop.

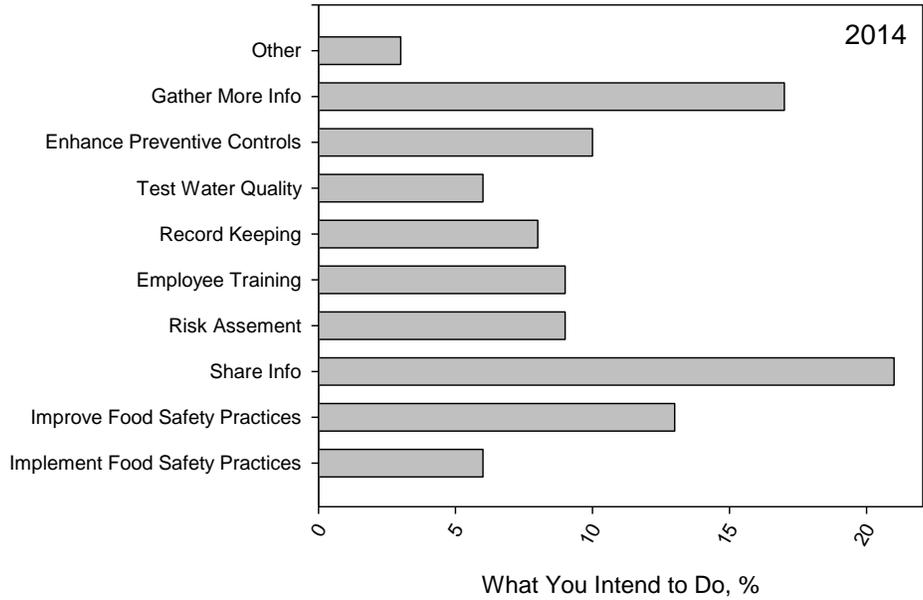
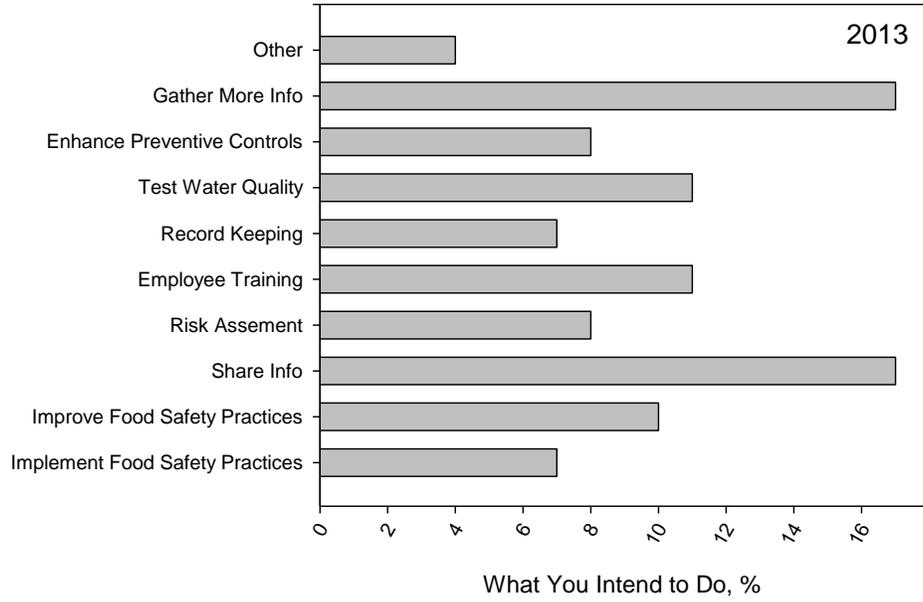


Figure 7 How many people do you plan to share what you learned with.

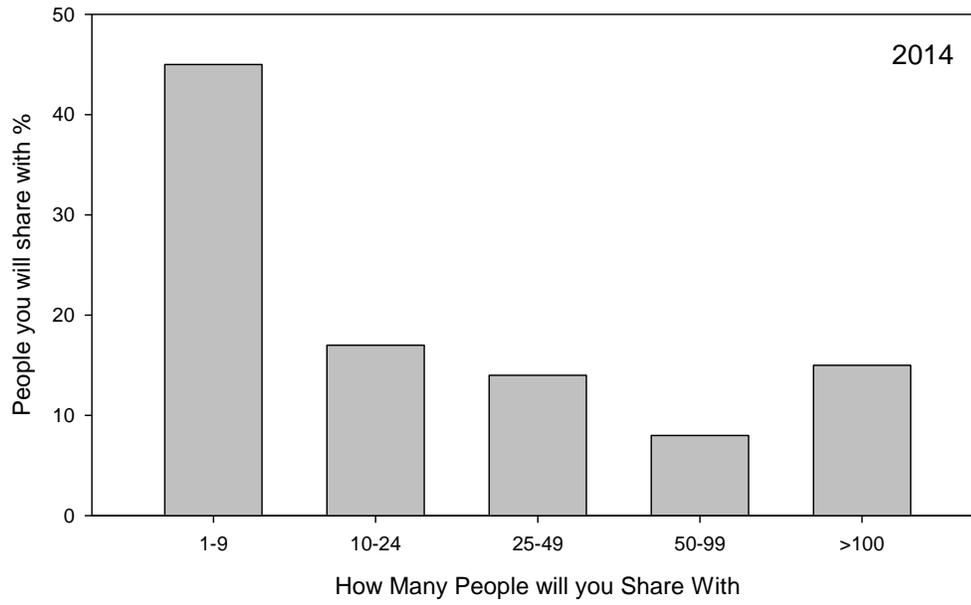
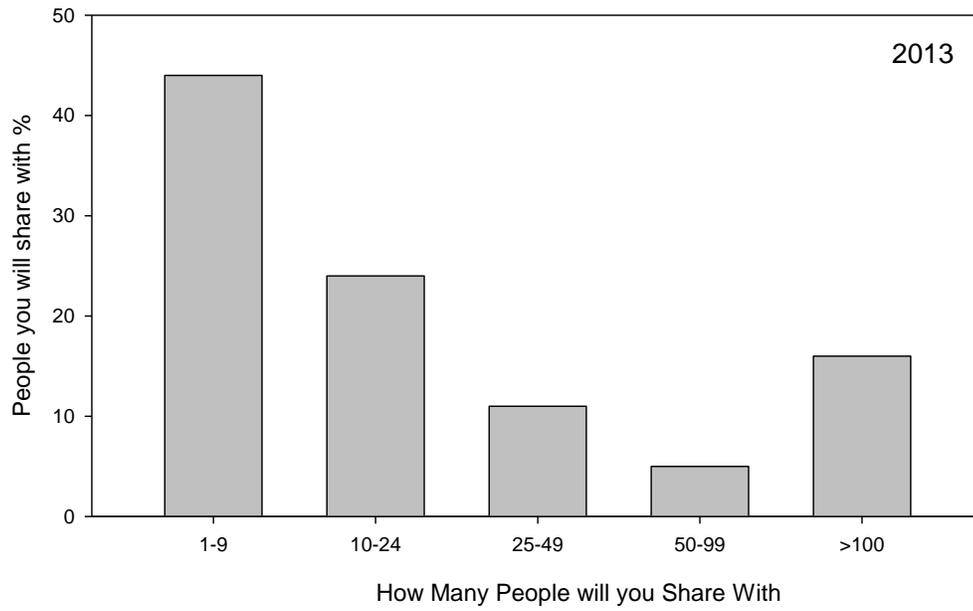
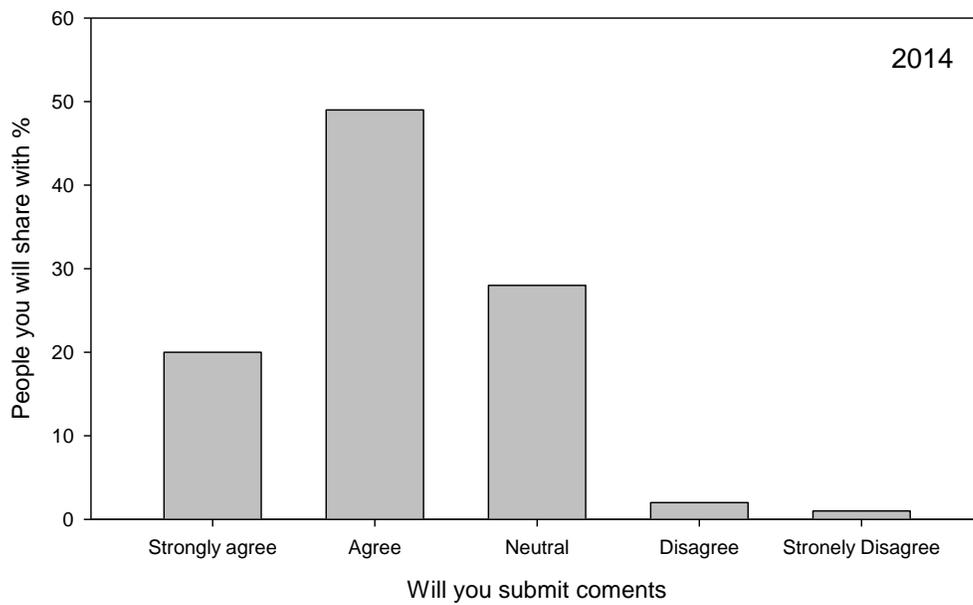
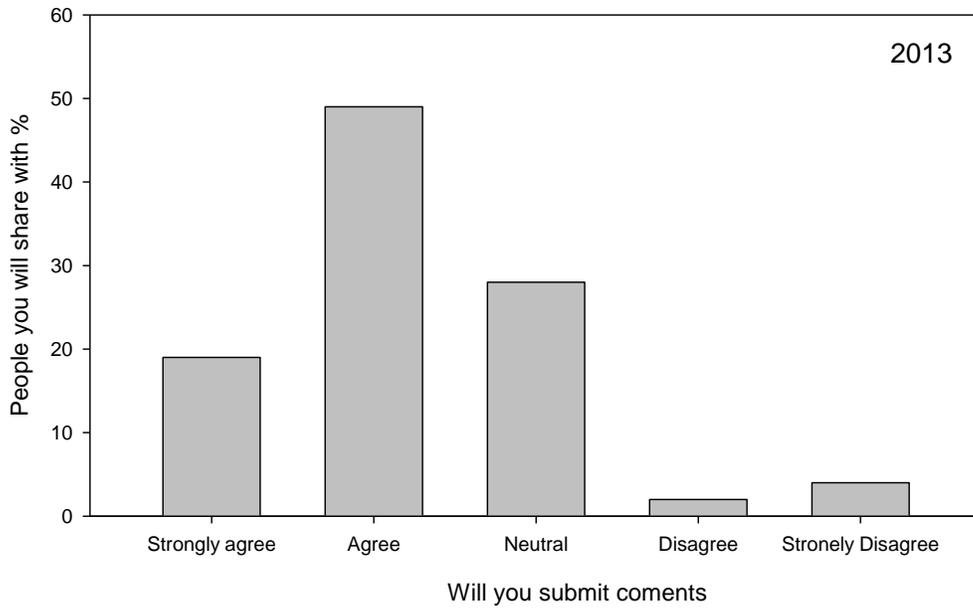


Figure 8. Will you submit comments on the propose Food Safety Moderation Act.



**CONTACT PERSON**  
Karen Killinger  
WSU  
509-335-2970  
[Karen\\_Killinger@wsu.edu](mailto:Karen_Killinger@wsu.edu)

**Project Title:** Southeast Asia Trade Mission

**Partner Organization:** Washington State Potato Commission

### **PROJECT SUMMARY**

Washington State is home to nearly 250 potato farming families. These families are able to make Washington home to the most productive potato fields in the world. However, Washington's potato farmers need to see markets continue to expand as domestic consumption of potatoes continues to trend flat to negative during the course of the past several years. With Washington's advantage of being home to the deep water ports of Seattle and Tacoma Washington potato farmers continue to target the ever expanding Asian markets. The growth in sales to many Asian countries for Washington potatoes has been on the steady incline and helped to compensate for declining domestic sales.

The specific interest within the Philippines and Vietnam was driven by the recent market access granted to fresh potatoes from the United States. Fresh market potato access was granted to the U.S. in 2010 by Vietnam, while fresh U.S. table stock potato access was approved by the Philippines in 2013. In addition to this timing, the trade mission also proved to be an excellent opportunity to further developing relationships and knowledge of the Myanmar market. Specifically, understanding how the industry can best serve this region with fresh potatoes.

The timing for Myanmar is such that the country in 2010 went through a democratic reform and is just now being exposed to more western culture and products. It is a country of nearly 51 million people with a growing GDP. There had been interest from the potato industry in understanding more what the opportunity might look like and how Washington potatoes may be able to be sold and imported into the country and enjoyed by their consumers.

Many consumers within these markets have never been exposed or introduced to potato varieties produced in Washington and the Pacific Northwest (PNW). The trade mission provided a wonderful platform to demonstrate these varieties to customers in these countries. It also provided the opportunity to demonstrate potato dishes that chefs in the U.S. create using the potato types commonly grown in the PNW. Just as many culinary trends from Asia can be seen throughout the U.S. past experience has shown that many U.S. food trends can also be seen throughout Asia. These trends will seemingly help potato sales from Washington to the region.

The timing of the project was critical since the opportunity to have your product available within the infancy of market acceptance can truly make the difference for how well your product may be adopted. Not only in the short term but also in the long-term as well. The trade mission also provided the ability to demonstrate to importers and customers as to the differentiating factors of Washington state potatoes compared to product from other competing countries and regions. Potato companies and organizations from other countries will also be using the timing of the announcement to further position their potato products with each country and do what they can to keep U.S. potatoes from gaining any market share.

The other motivating factor in the trade mission was to be able to conduct it jointly between the states of Washington and Oregon. The trade mission was led by Director Koba from the Oregon Department of Agriculture (ODA) and Director Hover from the Washington State Department of Agriculture (WSDA). The Oregon Potato Commission (OPC) and Washington State Potato Commission (WSPC) each jointly helped to coordinate the trip and worked directly with the contractors. This model of jointly promoting agriculture products from both states had proven valuable in the past and also was very beneficial for helping accomplish this trade mission's objectives. Along with these parties the delegation was also able to involve a Chef to help with culinary seminars conducted with the Philippines and Vietnam for local culinary professionals. This model provided a well-rounded approach that would allow us to accomplish both governmental objectives and marketing and promotional work.

This work had not been previously funded by an SCBGP Grant.

### **PROJECT APPROACH**

To accomplish the goal of the trade mission both potato commissions looked at undertaking a wide variety of activities. Some of the activities involved governmental meetings to discuss access issues including tariffs and duties on product. Other activities included educational work with influencers to help them decide and choose to use and buy PNW potatoes, namely these were part of the culinary seminars. Additionally the potato commissions also did promotional work with

retailers to help stimulate interest and knowledge of potatoes with local consumers. Throughout were various meetings that provided further insight into intricacies of the markets and how to best serve them with potatoes from the PNW area such as transportation and cold chain information. The following provides an overview of the key events of the project broken out by each country.

Philippines- Culinary trends will often begin with fine dining and then eventually transition to casual dining then ultimately enter the quick service realm and home cooking trends. The ability to involve Chef Benson within the trade mission allowed us to conduct culinary seminars for local chefs. Chef Benson was able to showcase all of the key types of fresh potatoes grown in the PNW and then demonstrate what the attributes they provide so the audience could have a better understanding of the best way to prepare each type of potato. He was able to prepare recipes and share with the seminar attendees in an effort to stimulate their thinking of how they could best use PNW potatoes within their own cultural dishes. The seminar was well received not only for its culinary aspect but because participants were also able to learn about how the perfect combination of sun, irrigation and mineral rich soils make the ideal conditions for potato farming in Washington state and Oregon and how these elements allow us to grow the highest quality of potatoes in the world.

Additionally, while in the Philippines the delegation was able to meet with representatives from the Port of Manila and learn more about the massive growth they are seeing. This information allows us to better advise shippers of how to best be prepared for those issues when shipping product into the country. Back up at the port is not uncommon and because of congestion within Manila, trucks are restricted from driving in and out of the port until the overnight hours. This causes even more issues when shipping items into the Port of Manila, which is the main port for the entire country.

Vietnam- The model of a trade mission led by both directors of agriculture allows for a very broad approach to the type of activities the programs looked to accomplish. Their presence allowed the delegation to obtain a higher level of governmental meetings than would have been possible to access if they were not participating on the trade mission. Vietnam currently has a 20 percent tariff on all imported potatoes plus a 5 percent import tax. Lowering these extra expenses will be extremely beneficial to the PNW's potato industry especially considering potato imports from China currently are able to enter the market without any such tariffs or duties. As a result the delegation learned that potato products from the PNW are priced at over twice the amount of competing products. Due to the director's involvement the delegation was able to address this issue directly with the Ministry of Agriculture while in Hanoi. Along with discussion around this issue the delegation also involved the U.S. Foreign Agricultural Services (FAS) from the embassy in Hanoi within the meeting and FAS will continue to address the issue on their end.

Also within Vietnam the potato commissions were able to facilitate and run a retail potato display contest. The contest was run in conjunction with Big C Supermarket Chain. Big C was able to challenge each of their individual retail locations with building the best display of Washington/Oregon Potatoes (set up as "West Coast U.S. Potatoes"). The ceremony to award the winner was done at one of the store locations that had a display. In addition to the prize money, samples of the product were prepared and shared with customers who were at the retail store at the time.

Finally while in Vietnam the group held culinary seminars in Hanoi and Ho Chi Minh City. The seminars were designed to help chefs understand the types of potatoes that are grown in Washington and most importantly how they could be used and prepared for their customers. The seminar talked about the best preparation method for each type of potato while providing a firsthand look at a recipe that could easily be adapted and incorporated on any food service menu. The seminars were well received by all those who attended. The local media in Ho Chi Minh City also found the seminars to be of interest and sent a news crew to cover the event. You can see that report in the links found later in this report.

Myanmar- Myanmar is the largest geographic country in mainland Southeast Asia. The population is estimated to be growing at a rate of about 2% annually and currently has around 51 million residents. Although Myanmar has one of the smallest economies in Asia (GDP \$56.9 billion), their GDP is forecasted to grow at a rate of 5-6% a year. Yangon is the key distribution place for their local potatoes and other agricultural products. Local production is exclusively for local consumption. The near-term opportunities that appeared as part of the fact finding mission included an understanding that the country is already importing potato products from Holland and Bangladesh. Some of the main challenges are that logistics are very expensive due to their poor transportation system and infrastructure found throughout the country.

The delegation found that the most interest within Myanmar was from their local potato chip processing companies who were looking for a more consistent quality crop that they could use in their processing facilities. The challenge they are facing is increased competition from potato chip and snack products manufactured in the neighboring country of Thailand. Many of those products are now entering Myanmar and causing stiffer competition with Myanmar's local chip making companies. The product from the U.S. would allow for greater quality in their manufactured product. Also there may be some interest in hotels and a few high-end restaurants for non-chipping potato varieties, but these will only be used in relatively small amounts and may take more time to develop.

The following is a list of the individuals that participated on the trade mission from Washington State and a description of their role on each element of the project.

Attendees representing Washington State:

Bud Hover- Director, WSDA / *Director Hover was the most senior official from Washington state on the trade mission and represented Washington agriculture industry as a spokesperson throughout the trade mission.*

Joe Bippert- International Program Manager, WSDA / *Helped manage various elements of the mission including the coordination of governmental meetings.*

Hector Castro- Communications Director, WSDA / *Provided communication updates regarding the trade mission across various platforms as well as provide support to Director Hover with speaking opportunities.*

Jared Balcom- Potato Farmer and Commissioner WSPC / *Was a spokesperson regarding potato farming in Washington state and learned about various market opportunities for his farm and the state's potato industry.*

Ted Tschirky- Potato Farmer and Commissioner WSPC / *Was a spokesperson regarding potato farming in Washington state and learned about various market opportunities for his farm and the state's potato industry.*

Chef Leif Benson- Executive Chef / *Provided training and insight on how to use fresh potatoes in Manila, Philippines and Hanoi and Ho Chi Minh City, Vietnam to local chefs.*

Chris Voigt- Executive Director WSPC / *Served as presenter within seminars and provided overall support throughout the entire program.*

Ryan Holterhoff- Director of Marketing and Industry Affairs WSPC / *Helped to coordinate the program and events with Bill Brewer from the Oregon Potato Commission. Worked with contractors within each market to develop schedules and ensure everything was properly arranged.*

The following is a list of the individuals that participated on the trade mission from Oregon. Their roles were defined by Katy Coba, ODA and Bill Brewer, Oregon Potato Commission.

Attendees representing Oregon:

Katy Coba- Director of Oregon Department of Agriculture (ODA)

Lauren Henderson- Assistant Director ODA

Theresa Yoshioka- International Trade Manager ODA

Jeff Urbach- Potato Farmer / Commissioner Oregon Potato Commission (OPC)

Rob Wagstaff- Potato Farmer / Commissioner OPC

Mark Ward- Potato Farmer / Commissioner OPC

Bill Brewer- Executive Director OPC

Barry Horowitz- Port of Portland Consultant

Bryan Ostlund- Administrator, Oregon Blueberry Commission

The only focus of this project was specifically specialty crops. No other commodities received any benefit.

**GOALS AND OUTCOMES ACHIEVED**

As the project was a joint effort between both Washington State and Oregon there were many activities that required coordination in an effort to ensure the trade mission and project overall were successful. The WSPC and OPC took the lead to organize for the introduction and further market penetration of fresh potatoes to the specified markets by arranging for specialty product technical seminars with product preparation, handling and proper storage presentations along with buyer meetings and addressing market access issues.

The mission was led jointly by Bud Hover, Director of the Washington State Department of Agriculture and Katy Coba, Director of the Oregon Department of Agriculture. Additionally, the trade mission also consisted of growers, packers and shippers of fresh potato products. The specific tasks are outlined below that were used to ensure a positive result for the trade mission.

- Arranging and selecting for overseas contractor. RFP's were sent and reviewed by both the WSPC and OPC with input from the WSDA and ODA.
- Following the selection of contractors, project kick-off meetings were held with contractors to review goals, timelines, and other details regarding the trade mission and project.
- An itinerary for the project was drafted and reviewed by all parties.
- Once the draft itinerary was in place, trade mission participants were finalized and travel arrangements were arranged. Arrangements included both air travel plans and in market travel with help from the contractors. One key aspect was working on appropriate visa's for all participants who were entering into Vietnam and Myanmar.
- Trip planning and coordination.
  - Work with all parties to determine key talking points and items to highlight about the growing region including:
    - A brochure was developed for use in each market and also translated into Vietnamese. (see attached)
    - Two different seminar presentations were developed.
    - Country briefs were developed and shared with all for use in government meetings regarding specific potato issues. (see attached)
  - Determining which types of potatoes to highlight during the culinary training seminars.
  - Arranging for product delivery to ensure training could be conducted. The delegation was able to find quality product to work with in the Philippines. However, the commissions were unable to locate any product to work with that was already in country in Vietnam. Therefore it was arranged with a shipping company to airlift potatoes to Vietnam from the PNW.
  - Arranging activities and points of emphasis for Chef Benson regarding his agenda of his culinary seminars.
- Trade mission
  - See the included itinerary that provides an overview of each day's events. (see attached)
- Post mission follow-up was done with all key contacts met during the trade mission.

The long term expected results of the trade mission and these efforts are to help build brand awareness and generate a deeper understanding of key decision makers in each country regarding fresh potatoes from Washington. The trade mission did accomplish this as the delegation was able to meet with influencers in each market. Specifically the group had significant engagement with produce importers, government officials, chefs, grocery retail managers, local media and other local buyers.

These meetings and interactions will all help to influence these decision makers and create a greater awareness of potatoes from Washington State. Specifically, it allowed us to showcase the benefits Washington potatoes will bring to their operations and the customers they serve.

The purpose of the trade mission was to be able to develop new export trading opportunities for potatoes in Washington to each region. The work both prior to the trade mission and then also the trade mission itself was to help with the overall success of achieving this goal. The work within the grant activities allowed us to connect with influential decision makers in each market, who can then take the opportunity to purchase and expand the use and preference for Washington potatoes.

Regarding the actual accomplishments of each of the activities described above, within a week of returning from the trade mission the West Coast port slowdown hit and significantly hampered follow-up efforts. There was no room at the port to move any shipments to these countries, specifically in what would be used for an introductory type of trial. When the port slowdown ended and the back log of products cleared in late spring of 2015, the potato season was already finished up and most of the initial contacts made within each region needed to be re-established and informed of the open channels. The group also provided assurance that at least in the short-term things are solved and once again and potatoes will be able to arrive into each region again.

Sales within each region did not meet up with anticipated results with the main reasoning due to the West Coast port slowdown. According to WSDA shipping information the number of potatoes shipped to each country was as follows:

Vietnam-

2013-2014 marketing year: 18,078 CWT

2014-2015 marketing year: 25 CWT

Philippines-

2013-2014 marketing year: 24,025 CWT

2014-2015 marketing year: 850,630 CWT

Although you see a substantial growth in product shipped to the Philippines this marketing year, the majority of those shipments were chipping potatoes and not the same focus of the trade mission while in country. Additionally, most of those shipments were sent at the beginning of the marketing year before the slowdown took full effect after last summer's harvest.

### **BENEFICIARIES**

Even though sales numbers didn't meet expectations due to extenuating circumstances, the potato industry in Washington still benefited from the trade mission as the opportunity to further create connections with those who will be in the position to purchase potatoes was developed. Additionally, information was gathered, learned and shared about the markets. The true benefit lies in future efforts and opportunities to see additional potato sales to each country.

Although not specifically related to the work plan Ryan Holterhoff provided a report back to the Washington and Oregon potato industries regarding the trade mission during the WA-OR Potato Conference on January 29, 2015. It was an opportunity to provide a presentation to the audience attending the conference about what was achieved and learned during the trade mission. Also other reports were provided to the WSPC Commissioners during their committee and quarterly meetings.

Approximately 17% of fresh potatoes are shipped outside of the U.S. and it is vital to maintain and expand export marketing opportunities. A recent study by Washington State University's School of Economic Sciences showed that the potato industry has a \$4.6 billion economic impact on Washington State and contributes to nearly 23,500 jobs throughout the state. This impact goes beyond just the farms and can be felt in a variety of industries including suppliers, transportation groups and general service providers.

This project continues to help develop business relationships with the export markets in Philippines, Vietnam and Myanmar. Although sales didn't add up to anything more substantial, this project provided the building blocks to increase sales to this region. These sales will contribute to both current and future sales opportunities and drive Washington's local economy and the many facets the Washington potato industry supports.

### **LESSONS LEARNED**

Some of the positive learnings from the project were that the model of working jointly with Oregon and being able to involve the agricultural directors from each state with the trade mission is a proven model that truly attracts the attention of many individuals. It allows for us to secure valuable meetings with government officials to address issues such as trade barriers while at the same time provide the opportunity to help with the various marketing/promotional activities. The other positive learning is that when new products are available in certain countries it is important to be there early on in the process and capitalize on the opportunity.

Some of the lessons learned from the trade mission that were not as positive included the importance of ensuring you have the logistical issues sorted in advance as soon as possible. As described since issues arose with finding product in Vietnam, it caused for the air shipment of potatoes and last minute clearing of product at customs. There was product in transport to Vietnam at the time of the trade mission but wasn't due to arrive in the country until after the project and trade mission had finished.

In the end the project went as well as expected and anticipated, with the exception of follow-up activities due to the West Coast port slowdown. Without being able to ship potatoes from any West Coast Port, fresh potatoes were not able to make it to any country to have sales achieve their desired levels.

Some of the follow-up sales goals were not achieved due to issues truly beyond the control of anyone within the industry. The main learning from this is that it is key to try to follow-up and explain to those met regarding the delay. That way when things to get back to normal there will be the opportunity to further work with them on exporting opportunities.

### **ADDITIONAL INFORMATION - See Attachment E 12-25-B-1495 Asia**

The following table provides an overview of the matching donation that was provided by the WSPC and to which category.

Airfare- \$30,575  
Misc. Travel Expenses- \$5,281.61  
Contractual/Seminar- \$3,356.35  
Supplies- \$7,988.47  
Total Cash- \$47,201.43

Additionally, it is estimated that staff time spent on the project totaled 175 hours between planning, trade mission participation and follow-up activities

The following are links to a few of the key coverage from various media outlets regarding the trade mission:

Asia Fruit (International) - <http://www.fruitnet.com/asiafruit/article/163350/nw-potatoes-pushing-for-se-asia>

Fresh Plaza (USA) - <http://www.freshplaza.com/article/131130/US-NW-potato-growers-return-for-SE-Asia-trade-mission>

Capital Press (USA) - <http://www.capitalpress.com/Business/20141111/washington-oregon-tout-spuds-again-in-se-asia>

Business Mirror (Philippines) - <http://www.businessmirror.com.ph/feeling-good-about-being-wooded/>

Myanmar Business Today (Myanmar) - <http://www.mmbiztoday.com/articles/us-states-aim-promote-potatoes-myanmar-se-asia>

Potato Grower (USA) - <http://www.potatogrower.com/2014/10/washington-commission-joins-asia-trade>

HTV9 National TV (Vietnam) - <https://www.youtube.com/watch?v=4zDMuECofg&feature=youtu.be>

#### **CONTACT PESRON**

Ryan Holterhoff  
Washington State Potato Commission  
509-765-8845  
[rholtterhoff@potatoes.com](mailto:rholtterhoff@potatoes.com)

**END OF REPORT**