COLORADO
Department of Agriculture

FFY2014 Specialty Crop Block Grant

Annual Report

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*Reports listed in bold were previously finalized. All other reports are new or updated.

Final Report: Development of Potato Virus Y Testing Program Using PCR (Polymerase Chain Reaction) Testing
Project Partner: Colorado Potato Administrative Committee (CPAC)

Project Summary

The potato industry in Colorado's San Luis Valley (SLV) has an opportunity to export large volumes of potatoes to Mexico with the opening of the interior of Mexico to fresh potatoes. Because of political reasons, the entire country of Mexico has not been open for potato trade and SLV potato shippers are only allowed to ship to a 26 km region along the Mexico - U.S. border. Potatoes shipped into the 26 km region are still required to meet the phytosanitary requirements. The phytosanitary requirements include zero tolerance for PVY^N strains. These PVY^N strains did not exist in the SLV as recently as 2009, but have become more established.

Why are these strains important? PVY is a virus comprising multiple strains and serotypes that affects many crops, including potatoes. The older, ordinary strain of PVY is known as PVYO. This strain is quite predictable and many cultivars of potatoes currently produced in North America either have resistance to this strain, or have very easily identifiable symptoms. Now, newer strains of the virus have become more commonplace in North America. These strains, $PVYN^O$ (a recombinant strain between the old O and the newer N type), PVYWilga, and PVYNTN bring a different set of problems to the table. These problems include: milder mosaic or disease symptoms, causing latent (non-detectable) symptoms, more aggressive disease progression, infection of more cultivars since there is little resistance to these viral strains in most North American cultivars currently grown, greater chance of vector spread, greater translocation of the virus to the tubers, thus more tuber infection, and, most importantly, a high chance for tuber necrosis on many cultivars when infected with the NTN strain. In Europe, where these newer strains of PVY have existed longer, there are numerous problems with tuber necrosis and as a result the inability to raise some of their preferred cultivars due to disease pressure. The presence of this virus is putting great pressure on the potato industry to control the virus, but, at the same time, it is more difficult to do since currently much of the disease screening is done visually in the field looking for mosaic symptoms. The only effective method to really determine how much PVY infection is present in the field and which of the virus strains are infecting the plant is through extensive disease testing using laboratory methods.

The PCR (Polymerase Chain Reaction) testing program project had two goals. The first was to assess and understand the level of disease infection within the San Luis Valley (SLV). The second was to develop a screening tool for PVY^N type strains using PCR testing. Our objectives were to test potato fields for Potato Virus Y^N strains and strains other than PVY^O (the ordinary strain of PVY) in order to increase potato export shipments to the interior of Mexico and other export markets. Since PVY^N strains are a zero tolerance disease for shipping potatoes to Mexico, PCR testing allowed potato growers to pre-test lots to verify the absence of the PVY^N strains to reduce risk and limit shipment rejections at the border. PCR is currently the only appropriate way to verify which strains of PVY are present. The addition of a quantitative, real-time PCR machine at the Colorado State University Potato Certification Testing Laboratory allowed us to address these goals.

The second year of the two-year project compared seasonal variation of PVY strain infection during the growing season versus infection at harvest. During the first year of this two-year survey, we

primarily concentrated on in-season leaf tissue for sampling. During the second of the two-year survey, we targeted more harvest tubers for assessment of late season virus spread. This second year data complimented the data gathered in the first year by indicating potential late acquired infections that model potential testing by export/import agencies at the time of shipment or receipt.

Project Approach

A survey of multiple commercial and seed potato lots in the San Luis Valley was conducted in 2015 and 2016 for the presence of PVY and its viral variants: N, O, N:O, N:Wi, and NTN. This project included marketing and promotion for the survey in order to obtain maximum participation. The overall collection of potato plant material came from growers in three formats: leaves during the peak season, summer inspection leaf samples, and tuber samples at harvest. Below is a description of the approach:

A. Marketing of RT-PCR testing program for PVY:

Two years of PCR testing for the San Luis Valley was promoted through educational meetings, printed/digital materials, social media, and outreach delivered through regular committee meetings, periodicals (CPAC's newsletter), the Southern Rocky Mountain Agricultural Conference, San Luis Valley Research Center Open House, and direct marketing through telephone, mail, and electronic-mail. This promotion was undertaken by a broad base of collaborators. With the facilitation of Jim Ehrlich, Executive Director of CPAC, participation of the Colorado Certified Potato Growers Association (CCPGA), oversight of Andrew Houser, Potato Certification Service Manager (prior Asst. Manager), and assistance of Kent Sather (prior Potato Certification Service Manager), we promoted the opportunity for commercial and seed growers to receive reduced or no-cost testing at monthly grower meetings (both CPAC and CCPGA), in print, and through personal communications with growers.

B. Testing of commercial and seed fields for PVY and PVY^N:

Due to experienced field inspectors, we were able to reduce our blind random sampling to efficiently target symptomatic leaves, saving on laboratory testing reagents and supplies, which allowed us to conduct more sampling. During year one, we were able to achieve a roughly 50 percent positive detection on the selected samples. However, the efficiency of detecting positives as a ratio in summer leaves increased positive detection (data not shown), though not necessarily strain specificity. The overall objective of gauging the strain types of PVY virus present in the San Luis Valley requires additional research.

Season 2015: With the goal of a broad representation of the San Luis Valley, an estimated total of 5,147 acres over four counties were scouted, sampled, and 3,150 samples collected. Though individual lots or growers may be represented amongst multiple sources, fields, or counties, the sum is adjusted for single instances (Table 1, bottom). In total, 40 commercial and 105 certified seed lot samples came from 31 operations growing various generations of 48 different varieties (Table 1), with 14 lots being derived from out-of-state/country sources while 131 lots were planted from Colorado sources (Table 2).

Season 2016: With the goal of increasing post-harvest testing, there was an increase to an estimated total of 5,356 acres scouted, sampled over four counties, and 1,256 samples collected. Participation diminished from 2015. There was a significant decrease in total seed lot samples from season 2015, with 71 unique singular seed lots investigated, but an increase to 45 individually independent commercial lots from 24 operations growing various generations of 31 different varieties (Table 1). Twenty-eight lots were derived from out-of-state/country sources, while 90 lots were planted from Colorado sources (Table 2).

Combining the 2015 and 2016 seasons, 38 individual operations were sampled resulting in testing of 59 varieties of multiple generations Through both years of the survey, the majority of samples were limited to visually symptomatic leaves during summer scouting, with the intent to limit testing to 15 leaves per lot in years one and two. However, at harvest, to compare latent virus in the tubers, a random 400 tuber sample was collected from 12 lots for follow-up in year one, and increased to 27 lots in year two.

Table 1: Lots by County over two seasons

COUNTY	YEAR	GROWERS	VARIETIES	LOTS:	COMMERCIAL	SEED	ACRES	PLANTS (leaves)	TUBERS (cores)
ALAMOSA	2015	11	19	40	15	25	1,775	702	2,000
	2016	8	10	24	1	23	847	183	800
COSTILLA	2015	2	3	5	4	1	412	65	0
	2016	2	3	5	3	2	452	70	0
RIO GRANDE	2015	9	23	48	11	37	1,275	1,543	2,000
	2016	8	14	38	28	10	2,177	440	5,185
SAGUACHE	2015	12	27	52	10	42	1,685	840	800
	2016	11	19	49	13	36	1,880	563	1,800
Singular	2015	31	48	145	40	105	5,147	3,150	4,800
Instances	2016	24	31	116	45	71	5,356	1,256	7,785
TWO YEAR SUM		38	59	261	67	196	10,503	4,406	12,585

Table 2: Original Source of Lots from two seasons

LOTS	YEAR	IN STATE	OUT OF STATE						Total
		CO	ID	MT	ND	NE	AB	MB	SK	
COMMERCE	2015	40	0	0	0	0	0	0	0	40
	2016	30	0	11	4	0	0	0	0	45
SEED	2015	92	2	3	2	3	2	0	1	105
	2016	60	2	4	1	1	1	1	1	71
Total	2015	132	2	3	2	3	2	0	1	145
	2016	90	2	15	5	1	1	1	1	116
SURVEY TOTAL		222	4	18	7	4	3	1	2	261

Additional testing is needed in the lab to fine-tune procedures to consistently extract delicate RNA virus from various tissues. Samples can be impacted by environmental conditions during collection, storage, and transport, affecting testing results. There are many variables to work with, but the following observations come from PCR work from the last two years.

Room for improvement:

- Random sampling of asymptomatic plants during the season may be costly, but would give a greater likelihood of finding infections we cannot see because of latent virus. Continued work on correlation of tuber sampling with leaf sampling is now needed to improve testing efficiency.
- Sample consistency has been enhanced by using ice packs during field visits, but still requires better management, especially of large sample quantities within a limited deadline.
- Sample processing has improved, especially with the homogenizing equipment, but there still is a bottleneck between the mass influx of samples and sample preparation. Determining the time necessary to derive an optimal procedure for homogenizing various tissues is a work in progress. Another year of sampling is recommended for validation of the testing.

Data continuity is still an issue:

The busy summer growing season, immediately followed by a hectic harvest period, provided us a lot of disparate data that was warehoused in different locations, both written and digital. Inspector error importing data introduced variation in sample identification and location that led to incompatible data sets on occasion. One recommendation to improve data acquisition is to utilize a single process so there is a standard for data acquisition/entry. Additionally, personnel turn-over contributed to less than optimal team communication.

PCR and reagent parameters need further study:

In 2015 we relied on an immune-capture method of trapping RNA virus out of leaf extract. Although fresh leaf material, when processed correctly, will yield repeatable results, there are quite a few barriers to consistent success. This is even more difficult when extracting material from tubers.

- Master mix: We have been using 12 primers (Chikh-Ali 2010) in combination to amplify products ranging between 300-1300bp of RNA. More study is needed to look at the other assays with less inhibition to PCR reactions, such as Lorenz 2006, which amplifies products below 1000bp. The reverse transcriptase (RT) efficiency (Figure 1) is greatly assisted with optimized conditions, which include 1) starting material: leaf extractions have less PCR inhibitors than starchy-tubers; 2) sample handling: constant cold processing protects RNA virus during transport, storage, and extract; and 3) limiting or reducing amplicon size: the enzyme transcription efficiency is inversely related to target size, especially when comparing a master-mix containing 12 primers' interactions versus four or six primers with fluorescent probes.
- qPCR: Not only should standard PCR targeting smaller amplicons of RNA be easier to achieve under difficult conditions, but using fluorescence PCR for the amplification of even smaller amplicons is now possible with our equipment. Our recommendation is to design Taq-man type probes for the different recombination junction sites of PVY. By using different fluorophore reporting dyes for each strain that only amplify 150bp each, not only would we increase our amplification efficiency of viral RNA with small amplicons, but the

cost of reagents would be justified by the savings with this method versus electrophoresis. qPCR when utilized fully eliminates the need to run agarose gels. One-Step RT-PCR could be performed from the beginning of the reverse transcribing of the virus to amplifying cDNA with these small amplicons. The value of doing it all in one real-time PCR reaction is that not only would it save time, labor, and reagents, it would, most importantly, reduce routes of contamination observed from a two-step qPCR process. The data from the qPCR could be easily exported to a computer as a digital output file for easier annotating and dissemination.

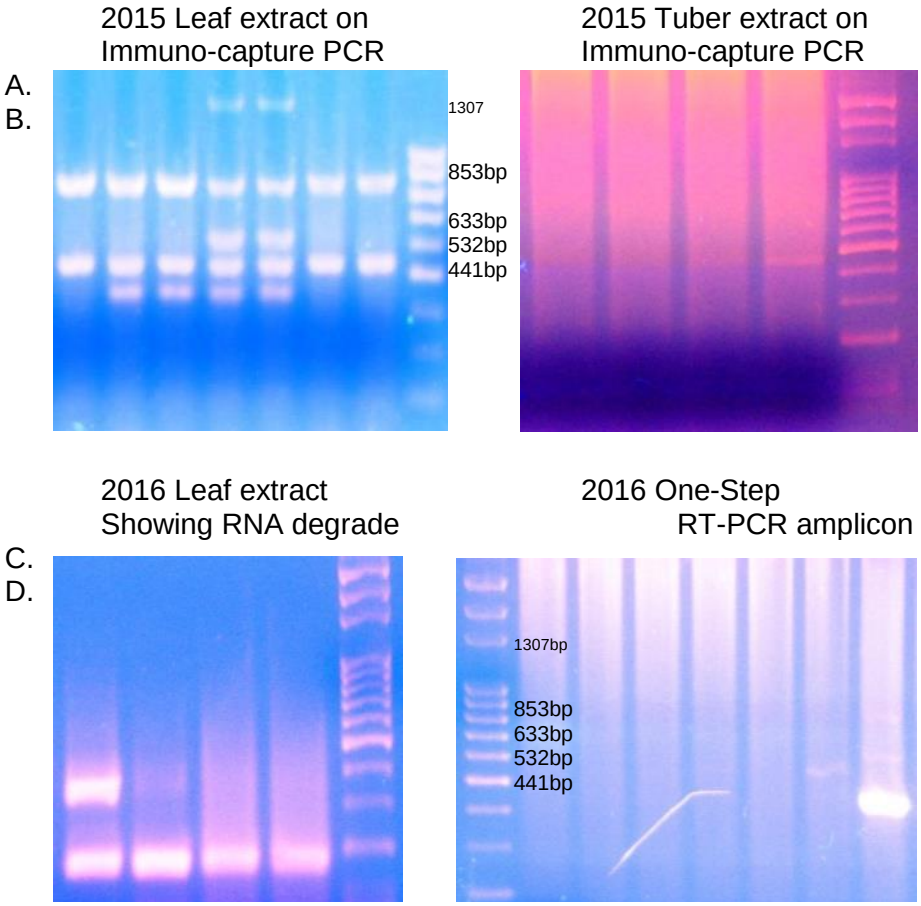


Figure 1: A) fresh leaf virus extract from immuno-capture RT-PCR, largest amplicon (1307bp) gets amplified (top bands in lanes 4 & 5); B) tuber core slurry phenolics competing with immuno-capture and PCR reactions with no large amplicons easily observed (only 441bp in lane 4); C) 2016 leaf extract on immuno-capture PCR showing breakdown among samples of RNA amplification of even medium size products, lanes 2-4 should have larger band included in lane 1; D) Far lane 8 is the qPCR amplicon from a Single-Step RT-PCR reaction, showing greater amplification intensity, due to a smaller product (441bp), and avoiding larger ones (faint bands of 633 and 853bp). Using smaller targets (i.e. <500bp) in qPCR will better ensure amplification during the harsher of conditions involved for RNA recovery from field samples.

C. Mapping of potato fields for PVY and PVY^{N}- Diagram 1:

During the 2015 season, initial field location data by street cross section were collected through multiple sources and associated with sample data. As a buffer for participant anonymity, ¼ mile

crop-circles are designated within a square mile. This square may have more than one field sampled. As a template for continued mapping, data was compiled from archives, historic inspection data, and direct grower contact. Multiple avenues of research were used to cross-check grower locations with field street reference, sample collection, and current farms that remain in commercial or seed potato production. This data may serve as a template for mapping future samples with GPS/GIS at the time of sampling for the ease of download into mapping software.

In 2016, fewer farm locations were added to the map scaffold, since there was an overlap of geographical sampling between seasons. This initial representation of the San Luis Valley now demonstrates geographical sampling overlaid with infection data. Areas surveyed in 2015 are indicated by dashed lines whereas the 2016 new areas not previously surveyed, are notated in solid lines. Updates to the map, for internal archive and future comparison to aphid data, will include color coding to discriminate strain ID (ie. Red for N/NTN, Blue for N:O, or Green for O & N:Wi.

Goals and Outcomes Achieved

Some of the project goals were met but not all of them. In brief summary:

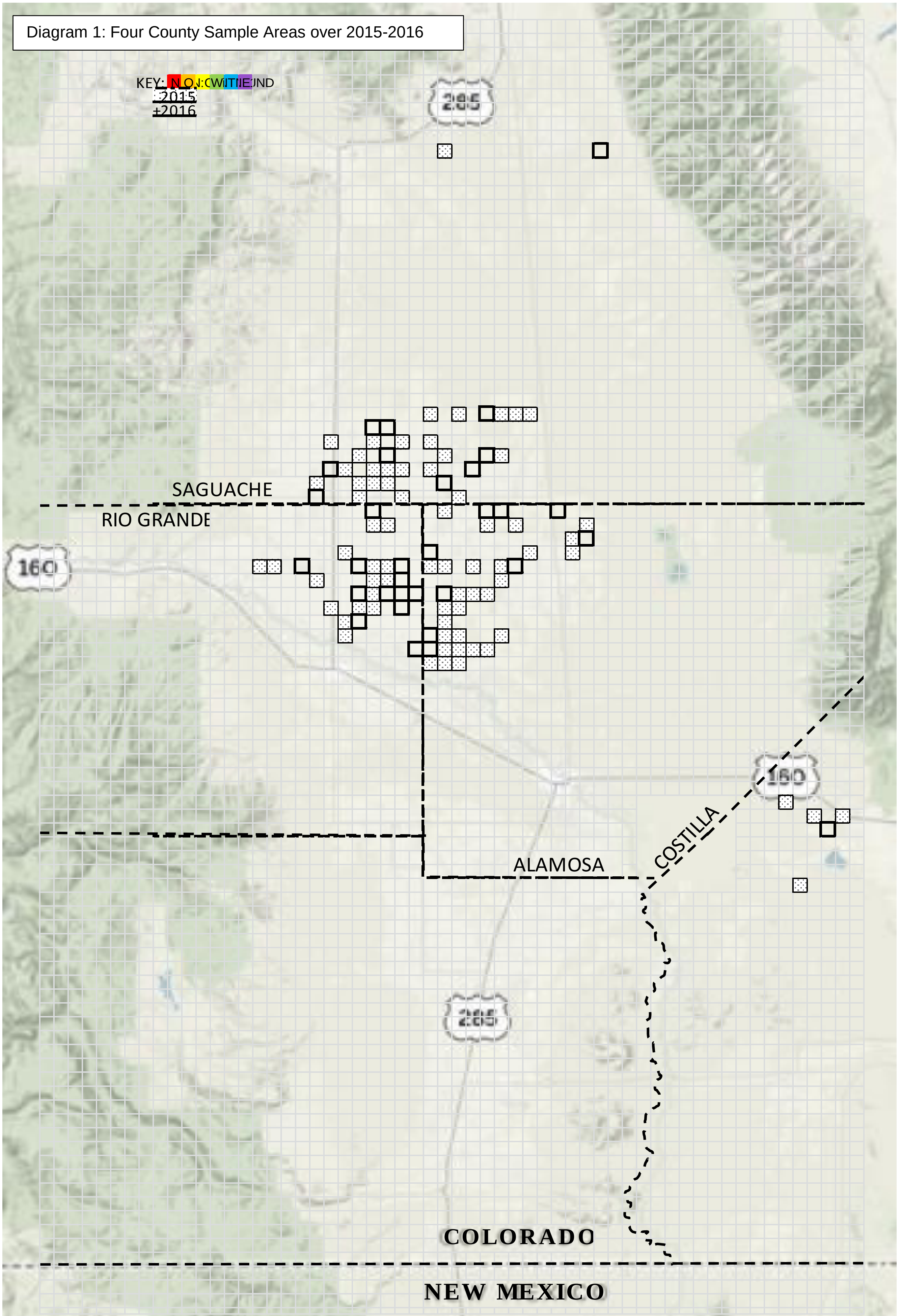
- The goal of marketing the testing reached its benchmark but the limited increase in acreage tested indicates that this marketing wasn't as successful as we hoped.
- We increased the volume of commercial potato lots tested to 45 but did not reach the goal of 50. This can partially be explained by a general decrease in commercial shipments exported to Mexico in 2016.
- The project did not meet the goal of increasing seed lot testing. Again, there were fewer seed potatoes grown in 2016 versus 2015.
- The fourth goal proved to be too ambitious but we slightly increased the total acres that were tested in 2016.

With broad cooperation from growers, we were able to reach a wide area encompassing four counties and surpassing most of our benchmarks; however, more investigation and shipment tracking are necessary to gauge true export follow-through going forward. Results for the 2015 summer season were disseminated in early December, well before spring shipments. Likewise, the 2016 results are expected to be completed and passed on to participant growers by December 31, 2016.

Goal	Performance Measure	Benchmark	2015		2016	
			Target	Actual	Target	Actual
Market RT-PCR testing program to SLV potato growers through educational meetings, printed materials, and social media.	The number of educational outreach meetings and articles developed.	0	3	4	3	6
To increase the	The number of	0	25	40	50	45

volume of commercial potato shipments tested for PVY^N strains before being exported.	commercial potato lots exported to Mexico that are PCR tested for PVY^N strains verified by the PCS laboratory.					
To increase the volume of seed potato shipments tested for PVY^N strains before being exported.	The number of seed potato lots PCR tested for PVY^N strains verified by the PCS laboratory.	3	5	105	10	71
To develop a program to survey commercial potato fields for PVY^N strains using PCR testing.	The number of acres of commercial and seed potato fields tested for PVY^N strains mapped geographically.	4,000	10,000	5,147	15,000	5,356

Diagram 1: Four County Sample Areas over 2015-2016



The number of acres of commercial and seed potato fields tested had a reachable benchmark of 4000 acres in 2015, but ambitious targets of 10K in 2015 and 15K acres in 2016. Due to labor, reagents, and consumable costs involved with testing, we originally overestimated the number of total acres available to be sampled with subsidy. Because the sample cost was greater than originally planned, there was less incentive funding to encourage growers to participate in the testing. In addition, we failed to take into account that many of the seed lots being tested are actually very small acreage. Seed lots can be less than an acre where a commercial potato field is typically 120 acres. Another factor is an overall decrease of commercial potato shipments from Colorado to the Mexican market in 2016 vs. 2015. This is primarily driven by less profit in exporting potatoes to Mexico due to a strong dollar vs. the peso, and an overall smaller volume of commercial potatoes produced in 2016.

Beneficiaries

There were a total of 38 unique growers served over the two year survey.

Commercial growers: 2015 saw a very small amount of PVY^{NTN} and an even lesser amount of PVY^{N} detections. In 2016, none of the necrotic strains were detected in commercial lots; however, to fully protect the industry, we recommend one more year of study to overcome testing development and procedural limitations.

Seed growers : PCR helped seed growers know of infection during the season and at harvest. This allowed them to make better shipping and planting decisions.

The testing provided the ability to verify what certification inspectors were seeing visually. Lab staff became cross-trained in multiple procedures, enhancing their commitment to the outcome.

Growers Served:	Commercial	Seed
2015	8	29
2016	9	19

Lessons Learned

Though we increased our acreage scouted in 2016, as compared to 2015, there was a loss of two full-time staff and failure and/or breakdown of critical lab equipment (centrifuge, PCR, cryo-storage), putting a burden on the remaining staff and potentially contributing to loss of sample integrity and process/assay optimization. Although we were under warranty for two items that stopped working at the peak time (PCR & centrifuge), we still had bottlenecks during the centrifugation stage with only benchtop units. A potential solution to this issue may be the addition of a bucket-rotor for a floor size centrifuge. An add-on component to the current unit would alleviate the need to process individual reactions in series, versus a large number in tandem, or parallel.

Additional problems included the loss of the personnel integral to the project, one of the original grant cooperators, the PCS Manager Kent Sather, and a seasoned inspector, Steve Keller, who was also responsible for accurate collection of symptomatic plants sampled during the growing

season. These key persons were responsible for mentoring inspectors and providing guidance to the laboratory supervisor. Due to the sudden loss of Steve Keller it was necessary to reassign lab staff to priority seasonal Post Harvest Testing. Because growers can't submit harvest tuber samples until October, this staff shortage created a timing issue getting results completed to comply with the end of the project cycle.

The challenge remains to reach growers where their needs are. More study is necessary to assist the Colorado Potato Certification Service Disease Laboratory to meet national standards for high throughput processing of submitted samples that coincide with the end of year harvest samples. One recommendation is to reduce variables that go into the processing of RNA virus. These include the complex sets of reagents, i.e., monoclonal antibodies and consumables, ubiquitous RNA degradation, multi-step PCR, etc., to simplifying ingredients and reducing user error by investigating ONE-STEP qPCR for the detection of necrotic viruses and their variants, focusing on smaller size RNA particles that may better survive the process from field to lab.

Lessons are still being learned. Great attention should be given to the many variables. Due to safety concerns and many gels to run, we modified our staining procedure to use a less toxic staining gel called GelRed. This allowed us to dispose of our gels instead of spending days to weeks making sure the previous gels with carcinogenic ethidium bromide had been desiccated and prepared for disposal.

Overall, outcomes were achieved. There are still pending analyses of the processed sample runs. The electrophoresis gels have been performed and invoiced. More time is necessary to complete data analysis. It is important to do this right to create industry confidence in the PCR testing. For this reason, we recommend one more year of assay building.

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Final Report: Branding and Promoting Pueblo Chile
Project Partner: Pueblo County

Project Summary

The Branding and Promoting Pueblo Chile project was highly successful, and has greatly evolved our regional fresh chile market. The project sought to promote and expand sales of Pueblo Chile. Pueblo County, in cooperation with area chile growers, sought out to better promote area crops, expanding their availability to additional markets. We created a unified "brand" for the chile. Using this brand, we added wayfinding road signs at key locations along principal corridors (in cooperation with the Colorado Department of Transportation (CDOT) contractor) and county roads, guiding travelers to farm stands. We also invested in numerous advertising methods, including interstate billboard advertising to reinforce the brand to residents and visitors. And finally, we constructed a demonstration garden on the front lawn of the Pueblo County Courthouse, growing several variants of Pueblo Chile. This demonstration garden provides fantastic educational opportunities in water-wise practices, demonstrates how citizens can grow their own chile, and serves as a symbol that Pueblo County recognizes the importance of chile to our economic wellbeing.

The vast majority of fresh chile peppers produced in Pueblo County are Mirasol chile. This is a flavorful, unique chile species that grows upward, pointing toward the sun. Due to the popularity of the Pueblo Chile and Frijole Festival every September, this chile has gotten good press across the nation. In-the-know chile aficionados seek this variant out, due to its robust flavor. However, for those who don't know much about the chile, it can be difficult to find and purchase.

The importance of Pueblo Chile to our region is twofold. First, Pueblo County has identified that agriculture is one of the top industry sectors in our economy that creates considerable "spin off" jobs. Improving agriculture's profitability improves economic conditions for multiple ancillary businesses. Second, agricultural producers in southeastern Colorado are under constant pressure, and are highly motivated, to sell their water rights for municipal use. Pueblo County recognizes that this practice jeopardizes our own water supply, our community economics, our way of life, and sustainable access to fresh food in our region.

It has been said numerous times that if farming remains profitable, it will continue. However, commodity crops are becoming increasingly less profitable for farmers. Therefore, recognizing that Pueblo Chile is a high dollar crop that could be highly marketable seemed like a great opportunity for Pueblo County to make substantive economic gains, while protecting our irrigated lands.

To our knowledge, this project was the first time Pueblo Chile was supported by SCBGP grant dollars. We hope to continue this relationship, and leverage these dollars again as our work continues to grow Pueblo Chile's market.

Project Approach

Develop Pueblo Chile Brand

Working together with the newly-formed Pueblo Chile Growers' Association, Pueblo County successfully promoted the brand established in 2015 for Pueblo Chile, thanks to this grant program. The new brand is a smashing success, and is recognized throughout the region, extending throughout El Paso County and into northern New Mexico. Teresa Vito, a local artist, was commissioned in 2015 to implement the branding strategy through a highly-recognizable, unique brand. In 2016, we worked to trademark the brand and its associated text, and to proliferate the brand throughout the market region. Two additional growers joined the Pueblo Chile Growers' Association as members in 2016 to be able to leverage the brand, bringing membership to 21 members. Again, we've heard nothing but acclaim for the brand from member growers, Pueblo County residents, tourists, chile consumers and the media.

Pueblo Chile Demonstration Garden

This spring (2016), we planted the second annual crop of Pueblo Chile in the demonstration garden on the lawn of the Pueblo County courthouse. This garden has been extremely popular, and has been noted multiple times in media reports. It has provided an up-close, hands-on window into the Pueblo Chile crop to visitors to the courthouse (every vehicle owner sees the garden when renewing license plates). And, we've again observed an average of 25-30 individuals per day picking chile, pulling weeds and examining plants. The garden has served as a backdrop for numerous press interviews this summer and fall (including many that weren't even focused on Pueblo Chile). With the assistance of the Colorado State University Extension Office, we also planted a cover crop during the winter months of 2015-2016. Soil tests done by CSU Extension show that a few of our experimental cover crops (multiple seeds were tested in

18 separate divisions of the garden beds) provided valuable nutrients to the soil, and our garden harvest this fall yielded a very large volume of chiles.

Installation of Farm Stand Wayfinding Signage

Pueblo County worked with the Colorado Department of Transportation's contractor, Colorado Logos, Inc. who administers the Tourist Oriented Directional Signs (TODS) sign program. After numerous discussions with CDOT, we found that this program was the best (and likely the only) method to get road signs installed to navigate tourists to farm stands. There have been multiple delays. However, the signs are being installed, and will guide tourists to each farm stand year-round. The TODS signs are blue signs, and include the Pueblo Chile Growers' Association logo (Mirasol chiles, growing upward) for each farm stand.

Deployment of Branded Advertising in targeted markets/media

Pueblo County successfully deployed the Pueblo Chile brand in the regional market, and greatly extended brand awareness of Pueblo Chile. We employed a data-driven marketing strategy, reaching consumers in southeastern Colorado through both paid and "earned media" advertising. Due to overwhelming positive response and excitement, we leveraged considerable "earned media" (regional media articles and interviews) in 2016 to tell the story of the brand extensively. Our paid advertising included National Public Radio ads, Interstate and highway billboards, large 4'x8' signs placed in fields and businesses, mobile billboards (semi-permanent advertising on truck trailers), print (tourist magazine ads and convention/event rack cards) and Facebook advertising, as well as signage at a few key events. In total, we estimate our collective advertising and earned media was seen and/or heard over 20,000,000 times in 2016.

Our project partners, and their roles are as follows:

Pueblo Chile Growers Association

All the chile growers from Pueblo County have, spurred by this grant, created a growers' association. The Association is our primary partner, whom we have worked with to create the Pueblo Chile brand. Likewise, the Association has assisted us in developing a road signage plan, and they have been consulted on all marketing and outreach opportunities. Likewise, we are working together to collect several thousand petition signatures to enact legislation to establish a Pueblo Chile license plate. (No specialty crop funding was used in this effort.)

BrandWerks Group – private (contract) partner

In 2015, BrandWerks assisted us in preparing the branding strategy. BrandWerks brought chile growers, the Colorado Department of Agriculture and Pueblo County staff together, facilitating an information-gathering session that drove the brand creation. (See appendix A)

Aspire ip – private law firm

Together with the Pueblo Chile Growers' Association and the Pueblo Chamber of Commerce, Pueblo County worked to establish trademarks for the Pueblo Chile brand and associated text in 2016. We contracted with Aspire ip, a Colorado Springs intellectual property law firm, to do the trademarking work.

Teresa Vito – artist

Ms. Vito was the artist we hired to paint the brand image in 2015. A key attribute to the branding initiative was to visually show consumers that Pueblo Chile has been around for a while. We did this through commissioning artwork that resembled old wooden vegetable crate branding. And, as our data showed, Pueblo Chile consumers have responded with overwhelming positivity toward the brand.

Multi-Designs, LLC – private (contract) partner
We enlisted Multi-Designs to assist us in implementing the branding into signs, billboards, print advertising, website elements and Facebook ads.

My Friend the Printer
We contracted with My Friend the Printer to produce rack cards that were (and continue to be) used by chile growers to advertise wholesale contracting ability and farm stands. These cards proved very helpful at the Pueblo Chile booth at the Colorado State Fair. Individuals visiting the booth sampled a Pueblo Chile wrap (tortilla with chile), and received a rack card, highlighting the unique attributes of Pueblo Chile, where additional chile could be purchased, and contact information for the Association.

Goals and Outcomes Achieved

Goal 1: Increase non-residential monthly vehicle traffic to Pueblo area farm stands by 9%
Measurement of this goal has been harder than anticipated. Our plans to do zip-code tracking at farm stands proved to be nearly impossible. Farm stands are largely open-air locations, which makes paper and/or electronic data collection methods extremely difficult. We plan to continue to work with growers, and find a good way to evaluate out-of-town visitorship, but we're not sure how to do this.

However, anecdotal information from the farm stand operators noted a continued higher traffic volume at stands than before we started the Pueblo Chile advertising initiative. Again, most of the farm stands noted they had lines of 25-30 customers at all hours during their peak sales (August-September) season, similar to 2015's lines. This year, however, saw more people visiting farm stands in October, which was unexpected. Our billboard advertisements ran through mid-October, which may have influenced this.

Goal 2: Increase sales at farm stands by 9%
Preliminary sales tax numbers indicate that August-September sales at farm stands were 7.8% higher than 2015.

While this number was lower than we anticipated, we believe the devastating 2016 grasshopper infestation played a significant role in lower-than anticipated sales tax receipts. Likewise, overall tourist visitation to the region was down from 2015 (preliminary numbers), which likely played a role in lower than forecasted numbers. We are pleased that the number was still up from 2015, but missed our target by about 1.2%.

Goal 3: Increase wholesale sales outside of Pueblo County by 9% annually

As in 2015, we had a difficult time quantifying this number. A main impediment to collecting this data is that Pueblo County doesn't administer sales or excise taxes. Those taxes are administered by the State of Colorado. As such, it's unclear to us exactly how and when our growers are actually charged sales or excise taxes on wholesale chiles, or if the taxes are coded in a way by the State that we can't generate reports from. We will continue working to uncover this number.

Goal 4: Expand trade area of retail and wholesale chile sales by 9% annually
Due to difficulties with Goal 1 (above), only limited data is currently available to measure this goal.

Wholesale sales (Goal 3, above) data is also not available for the 2014, 2015 and 2016 seasons.

Attendance at the Pueblo Chile and Frijoles Festival, although not itemized as a potential performance measure of the project, can serve as an approximation of the success of our branding and marketing. Attendance was over 130,000 people. This number dropped a bit from 2015's 140,000 visitors number, but was still much higher than 2014, which was attended by 100,000 people. We believe that two main factors are to blame in the decrease in attendance. The wind on the first day of the festival was sharp and cold, which is highly unusual in September. And, the Pueblo Chamber of Commerce cited the Denver Broncos football game on the festival's Sunday kept many people at home watching television.

Goal 1: Increase non-residential monthly vehicle traffic to Pueblo area farm stands by 9%
- No data available.

Goal 2: Increase sales at farm stands by 9%
- 2015 sales tax figure: $143,800 (estimate, per calculation from Pueblo County Budget Office); sales season analyzed was Aug-Sept, 2015.
- Preliminary, estimated August-September 2016 sales tax: $155,000.
- Pueblo County sales tax is 1%. Therefore, the above number translates into total sales of $15.5 Million in the 2016 sales season. This is up from the $14.8 Million sales in 2015.

Goal 3: Increase wholesale sales outside of Pueblo County by 9% annually
- No data available.

Goal 4: Expand trade area of retail and wholesale chile sales by 9% annually
- 2014 estimated Pueblo Chile Festival attendance: 100,000.
- 2015 estimated Pueblo Chile Festival attendance: 140,000
  - http://www.koaa.com/story/30136203/pueblo-chile-festival-sets-attendance-record.
- 2016 estimated Pueblo Chile Festival attendance: 130,000
  - http://www.chieftain.com/news/pueblo/5187850-120/festival-pueblo-attendance-bit.
- In 2016, 22 local restaurants utilized the Pueblo Chile brand with permission of the Chile Growers' Association in their restaurants in a variety of ways. This ranged from distinct labels on menus, signs hung throughout the

restaurant, to table tent cards. We don't have data that directly notes increased sales at area restaurants due to this collaborative advertising, however, countywide sales tax is markedly increased from 2015 (preliminary estimates only). We believe the advertising in restaurants was beneficial to those businesses, because they continue to display the chile brand, and more restaurants are inquiring about doing the same. Likewise, we are excited that this is happening, and believe this will solidify supply chains between farms, wholesale food distributors and restaurants.

Beneficiaries

Beneficiaries were the Pueblo County chile growers, farm stands, food distributors, restaurants, grocers and Chile Festival merchants. There are now 19 members of the Association (growers).

The estimated total economic impact:

- $30.3 Million total sales 2015-2016 (estimated).
- Multiplier effect for chile isn't known, so we can't compute indirect estimated economic impact.
- No reported (to our knowledge) job gains.
- Economic impact of the grant:
  - 2014 total sales estimate: $13 Million (pre-grant).
  - 2015 sales estimate: $14.38 Million (grant year 1).
  - 2016 sales estimate: $15.5 Million (grant year 2).
  - Total gain 2014-2016: $2.5 Million.

Lessons Learned

The logistics of Farm Stand Wayfinding Signage were challenging and time consuming.

Most successful and fruitful components of our project: building the brand (credit goes to Teresa Vito and Dawn DiPrince), getting billboards in place using the grant, and the courthouse garden. Each garnered far more attention than any other advertising method.

Tracking finance and economic gain from a single crop is difficult to almost impossible.

Proliferation of the brand at farms requires very specific instructions – i.e. "place the signs in your fields, like this…"

Entrepreneurial farmers were the ones that can execute a brand best, and will run with it. Rules for use of the brand are needed in place to give these farmers guidance.

Most farmers are very reluctant to rock the boat. The entrepreneurial farmers make them nervous, but they follow their lead (begrudgingly).

The number of willing partners and cooperating agencies that wanted to participate, for no individual gain, was a big surprise. Folks volunteering time, resources and enthusiasm really began once the brand visual was released.

Advice to other similar communities: reach out to your creative artists early, and bring them into the fold from the beginning. A single consultant can't do it all, so plan to involve both a branding/marketing expert, as well as an artist. Our brand is successful because we did this.

All the chile growers from Pueblo County have, spurred by this grant, created a growers' association. The Association is our primary partner, whom we have worked with to create the Pueblo Chile brand. Likewise, the Association has assisted us in developing a road signage plan, and they have been consulted on all marketing & outreach opportunities. Likewise, we are working together to collect several thousand petition signatures to enact legislation to establish a Pueblo Chile license plate!

We encountered difficulty executing the wayfinding signage in 2015 and in 2016 due to unanticipated regulatory issues relating to road signage. We finally found the appropriate sign type to implement through the Colorado Department of Transportation's TODS program, which is finally installing signs along US Highway 50 to direct travelers to farm stands.

Difficulty in collecting sales tax data as a performance measure of activity - our budget office has had difficulty calculating numbers for wholesale chile sales. We're not sure if these numbers actually exist, or if the State of Colorado charges sales or excise tax on fresh chile. This is disappointing, as we'd hoped to be able to quantify sales through this statistic.

Problems executing the zip code tracking program at farm stands - after working extensively with farmers, we quickly realized that collecting zip codes at farm stands was a daunting task, and that tablet computers and/or paper data collection aren't terribly feasible in open-air farm stands. We plan to work with farmers over the winter months and find a simpler, effective way to collect data for future use.

Contact Person

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Additional Information

Pueblo Chile License Plate link
Pueblo Chile Brand article, Pueblo Chieftain, September 5, 2015
Pueblo Chile Brand article, Denver Post, August 13, 2015
Pueblo Chile Brand Advertising, Columbine Gallery Blog, November 3, 2016
Pueblo Chile Brand article, BC Democrat Online, August 21, 2016

Appendix A

Pueblo Chile Brand Summary and BrandBrief™	
ASSIGNMENT	Create an identity/logo for the newly formed Pueblo Chile Growers Association
OBJECTIVES	Create the Pueblo Chile brand
STRATEGIES	1. Identify the brand positioning/communication platform 2. Create the brand creative strategy 3. Design the brand identity/logo
BACKGROUND	In Colorado, and to some extent elsewhere, Pueblo is known for its chile peppers. The product has awareness, consumer acceptance and equity as a result of its generational farming/production and promotion through roadside stands, farmers' markets, and the annual Pueblo Chile & Frijoles Festival. Like Rocky Ford Cantaloupe, Palisade Peaches, and Olathe Sweet Corn, Pueblo Chile is a regional specialty that reflects the unique diversity of Colorado's agriculture. The Pueblo Chile Growers Association is a newly formed association of growers who have come together to develop the Pueblo Chile brand. The Association's primary goals are: 1. To be a unified voice for Pueblo County Chile growers 2. Secure and maintain a trademark for the brand 3. Develop markets and promote sales The Growers Association/County Economic Development received a Specialty Crop Block Grant from USDA/CDA to develop Pueblo Chile. The BrandWerks Group has been selected to create the Pueblo Chile brand and its identity.
STRENGTHS/CAPABILITIES	**Growers/Association** • Multi-generational growers • Years of knowledge • Family-owned and –operated • Hardworking • Pride, care • Community. We're a family. We all know each other. • Trust each other. Been "down the road together" • Growers Association defined by geographic area **Pueblo (Agricultural features)** • Hot days; cool nights. Climate conducive to growing high quality chile. • Rocky Mountain water. Water availability. • Ditch water better than (Hatch's) well water (cleaner, with less salt, total dissolved solids) • Produces a chile pepper with thicker wall, more "meat"

	Pueblo (Place)
	• Authentic, real place.
	• Scrappy, blue collar. Roots/heritage in steel and coal.
	• Ethnically diverse, socioeconomic culture *(Italian, Mexican/Latino, Metisto/laborers, "Bojon"/Slavic, etc.)*
	• A **blend** of cultures
	• Neighbors, neighborhood. **Connected** together.
	• Traditional old ways, but changing/evolving to new, **youthful**
	• Misperceptions. Really unknown by outsiders. A **secret place**. A **new discovery**.
	• Independent, **unpredictable ("Got a hot one?")**
	• **Hot/warm** climate
	
	Pueblo Chile
	• Several varieties of chile peppers grown in area. "Pueblo Chile" refers to ANY chile pepper grown in the area.
	• Mirasol (Mira Sol "**sun vista**") is the original "Pueblo Chile" *(Mosco variety/hybrid same species as Mirasol, just more consistent)*.
	• **Mirasol** should be the "face" of the brand. 95% are **green**. Red – "sweetens up".
	• Variance in heat and flavor, just like the independent, unpredictable spirit of Puebloans.
	• **Characteristics:**
	  ○ Color variation, but **green**.
	  ○ Peppers grow and point **upwards**.
	  ○ **Meaty** (meatier, fatter than NM Hatch Chile)
	  ○ Size variation
	  ○ Better, more suitable for roasting
	  ○ Unique aroma. Complexity.
	  ○ Depth of flavors. **Bold.**
	  ○ More "**bite**" on the palate.

OPPORTUNITIES AND MARKETING INITIATIVES	We discussed some **opportunities and development ideas** for Pueblo Chile. Given our allotted time, this was a brief ideation. We recommend that we explore further and that the Association develop a business/marketing plan and budget (and consider how it will execute and manage such a plan).
	
	1. Secure trademark for **Pueblo Chile Growers**. *(Note: Pueblo Chile, registered 2002, is owned by Mira Sol Chile Corp., 1745 North Erie Avenue, Pueblo, CO 81001)*
	2. Secure Web domains for **PuebloChile.org**, **PuebloChileGrowers.com, and PuebloChileGrowers.org**. *(Note: Purchased on May 6, 2015 by Chris Markuson [ownership assigned to _____])*
	3. Develop a food safety program for all growers
	4. Business and marketing plan (and budget)
	5. Create awareness for the brand
	  a. Comprehensive PR program (logo intro, Chile & Frijoles festival, food recipes, travel/tourism, etc.)
	  b. Tie-ins, partner with Chamber of Commerce
	  c. Potential advertising campaign
	  d. Other (TBD)

	6. Label/sticker program like Colorado Proud 7. Co-branding (Pueblo Chile and grower/shipper) on cartons 8. Website, Facebook presence, email blasts (trade, consumer, etc. databases) 9. Agritourism. Tie-ins, partnering with CTO, others. 10. PR/events (e.g., world record bowl of chili, etc.) 11. Markets. Develop new markets/uses for Pueblo Chile a. Value-added products b. Co-brands (e.g., Schlereth's Green Chili... made with Pueblo Chile, or a "Pueblo Burrito/Chipotle, etc.) c. Licensing (name/identity/trademark) d. Hire sales/marketing company to develop the brand
TARGET AUDIENCE	**Demographics**: 1. Consumers: Equally male/female 2. Age: Broad, 25+ (generally) 3. Purchasers: Equal M/F 4. Income: Broad 5. Higher education: Broad 6. Cross-cultural, urban/suburban ***Psychographics***: Traditional food consumers, those who appreciate ethnic, spicy foods. Cultural. Experiential consumers willing to try new foods/taste experiences. ***Purchase behavior/usage*:** Varies, but approximately 90% consumed roasted (local consumption). Use as condiment (burritos, sandwich); served with beer; relish with meals; ingredient in salsa, etc. Some popular local (Pueblo Chile) specialties: • "Slopper" (hot/medium chile sauce on open face hamburger) • "Grinder" (with Italian sausage) • "White Trash" (?) • "Pueblo Popper" • Chile Wrap • Piquin (crushed red pepper garnish, condiment)
BRAND DIFFERENCE	Pueblo grows the best chile peppers
DESIRED PERCEPTIONS	Pueblo Chile is a special experience (or adventure) to discover
DIFFERENTIATORS	Sun/warmth, blend of (colors, flavors, cultures), fresh/"new", uplifting, bold, unpredictable
BRAND DRIVER	Bold and exciting (taste) adventure
BRAND BENEFIT	Come alive with Pueblo (Chile)
BRAND POSITIONING STATEMENT	Pueblo Colorado is a special place. Here in the heart of the Rocky Mountains, life is bold, fresh, and vibrant – defined by our unique growing conditions and blend of cultures, flavors and tastes. Just like our chile peppers. Always meaty and juicy, Pueblo Chile is a complexity of lively sensations that will awaken your tastes and stir your passion for new adventures. Discover Pueblo Chile… *the better pepper.*

Pueblo Chile Growers booth at Colorado State Fair.

Artist Teresa Vito with billboard-size reproduction of her work.

Pueblo Chile banner behind roasting chiles.

Final Report: Serving Colorado Fruit and Vegetable Growers through Educational Outreach, Promotion and Networking
Project Partner: Colorado Fruit and Vegetable Growers Association

Project Summary

Colorado has a diverse and rapidly changing produce industry with over 1,500 fruit and vegetable growers (2012 Census of Agriculture). Initial outreach efforts by Colorado State University Extension and the Colorado Fruit and Vegetable Growers Association (CFVGA) have found that Colorado produce growers are facing an ever-increasing number of challenges. Specifically, the increased cost and complexity of dealing with food safety, labor, water, and a host of other production and marketing-related issues is making it logistically and financially difficult to remain in business. As a result, there is a dire need for outreach and educational opportunities to help producers fully understand and subsequently work through these challenges.

Colorado fruit and vegetable growers of all scales, production practices and marketing channels face increasing business risks and regulatory challenges as well as numerous opportunities. The Colorado Fruit and Vegetable Growers Association has partnered with Colorado State University to better understand these emerging issues. This partnership plans to address these issues by delivering comprehensive outreach materials and activities through print, web-based media, conferences and workshops. The success of this project will be measured not only by the number of outreach products, and number of engaged participants, but also by a thorough evaluation of knowledge gained and new practices adopted by educational program participants.

This project built on a prior SCBG project "Developing a Produce Growers Organization in Colorado" funded in FY11. In that project CFVGA was launched with the following project activities:

1. Formed a Board of Directors and Elected Officers
2. Developed By-Laws and Mission
3. Created Legal Status
4. Developed Web Site and Social Media Site
5. Hired an Administrator
6. Launched Organization and Membership Drive
7. Developed Branding and Marketing Materials

This project complimented those first ground-breaking efforts in organizational development by using the organizational structure to deliver more targeted output to help growers succeed in the produce business with education and promotion.

Project Approach

Conduct assessments - Grower Needs 1: Two online surveys of growers were conducted statewide in January 2015 and October 2015
Conduct assessments - Grower Needs 2:

CFVGA contracted with Corona Insights to survey via 30 minute telephone interview a representative sample of 19 commercial produce growers in four regions of Colorado (five regions attempted).

Conduct assessments - Consumer Needs:
CFVGA joined Colorado State University and Colorado Department of Agriculture to include additional produce related questions on a five-year periodic survey of Colorado consumers.

Conduct Strategic planning:
Two board retreats for strategic planning were hosted in central Colorado November 2015 and November 2016 (pic from 2015).

Develop outreach materials 1:
CFVGA coordinated design and printing of 40,000 "Colorado Produce Calendar" on cardstock, half letter sized monthly harvest availability of 35 Colorado produce items.

We learned to include in a second print "Approximate Availablity" text in the calendar based on feedback from Shamrock Foods. Chefs were demanding product to some of our distributor partners based on the start time in the calendar when the actual harvest season was a bit behind schedule.

Develop outreach materials 2:
CFVGA coordinated design and printing of 400 18" x 24" and 22" x 28" poster versions of the "Colorado Produce Calendar" for posting on produce floors and backrooms of produce retailers.

King Soopers, Safeway, Sprouts, and Wholefoods welcomed this idea. Pictured on produce floor of King Soopers. Our next print run may include specific retailer branding.

Develop outreach materials 3:
CFVGA coordinated design and printing of 1000 presentation pocket folders.

Develop, promote and deliver annual conference: CFVGA did this in February 2015 and February 2016.		LeAnne Skelton from USDA delivers a FSMA talk to over 260 partici-pants Feb 2016.
Develop and promote videos: CFVGA coordinated production and fostered viewership of two buyer facing videos and one consumer facing video.	[Buyer video 1](#) [Buyer video 2](#) [Consumer video](#)	
Develop, promote and deliver educational workshops to produce growers in Colorado: CFVGA did this with Colorado Farm Show "Produce Day" educational sessions January 2016, one "Mock Food Safety Audit" July 2016, , 15 webinars in 2015-2016, and one "Produce Safety Rule Training" Oct 2016.		
Promote Colorado produce at PMA and Colorado Ag Day: done in 2015 and 2016 for both events.	 	PMA 2015 (L-R: Adrian Card, Robert Sakata, Julie Kerr and Reid Fishering). Colorado Ag Day at the Capitol in Denver 2016 featuring a vegetable dish (Robert Sakata far right).

Develop media stories and Facebook posts to promote Colorado Produce and CFVGA: done in 2016.	

Goals and Outcomes Achieved

Assess grower needs

November 7, 2014 the CFVGA Board of Directors held a strategic planning retreat facilitated by a contractor, Brandwerks. BOD attended from four regions of Colorado with nine total in attendance. During this retreat the BOD determined that an online survey was the best use of current resources to gain a deeper understanding of the needs and priorities of commercial fruit and vegetable growers in Colorado. An initial strategic plan/outreach plan was delivered by Brandwerks to the BOD after the retreat. An online survey was conducted by the BOD January 2015 to commercial fruit and vegetable growers in Colorado with 66 total responses statewide.

A second BOD retreat was held November 6, 2015 and facilitated by contractor, Blake Angelo, with eight BOD and the vice chair of the CFVGA food safety committee. A second and enhanced online survey was conducted in October 2015 of produce grower members and non-member to better inform this second BOD retreat and develop a strategic plan for 2016. This survey had 45 respondents. The BOD, with the help of its facilitator, developed a more robust strategic plan/outreach plan.

This second plan was later informed and confirmed in its focus in February 2016 by Corona Insights grower interviews, designed and coordinated by CFVGA. CFVGA worked to develop a representative sample based on scale, production type, and marketing channel from five regions of Colorado. Interviews were based on 20 questions that took about 30 minutes per grower. Output showed key areas of focus for CFVGA in a ranked order: labor availability, food safety compliance, water supply and rights in ag, farm expansion, succession and marketing as part of business development.

In November 2016, the CFVGA BOD reviewed its 2016 strategic plan considering the Corona report plus BOD observations and reaffirmed the plan for use in 2017.

Assess consumer needs

CFVGA joined a long term “Consumer Attitudes” survey effort with partners Colorado State University and Colorado Department of Agriculture, adding eight additional produce specific questions. This allowed CFVGA to accomplish the project goal, amplify reach, and stay within budget compared to a consumer panel.

Performance measure:

Outreach plan developed to meet identified needs of Colorado produce growers and consumers	**Status**
2015 Target: First plan developed after two strategic planning sessions	First solid grower focused plan in grant period developed at November 2015 BOD retreat for 2016
2016 Target: Second plan developed based also on consumer input	Second plan was a review of the first plan with overlay of grower interview info to refine it. Consumer survey data was completed but not yet available from Colorado Department of Agriculture at project final report deadline.

Engage buyers and consumer through print, social media and events

A streamlined approach was taken to have the broadest impact to promote Colorado Fruits and Vegetables to general consumers and wholesale buyers through outreach print materials. CFVGA refined, updated and added to a produce harvest calendar, originally developed by the Colorado Department of Agriculture, with input from growers throughout Colorado. The calendar is on one side of 5.5" x 8.5" card stock pointing interested parties to the CFVGA website for more information on how to source Colorado produce. The other side details the mission of CFVGA. It was designed by Brandwerks. The association printed 20,000 of these for wide distribution to consumer and wholesale buyers in Colorado and at PMA in 2015 and, after distributing all of these, another 20,000 in 2016. The electronic copy can view viewed at http://coloradoproduce.org/colorado-grown/ These were distributed at the following events: Colorado Proud month (statewide twice), 2016 Colorado Farm Show, CFVGA annual conference (twice), Colorado Ag Day at the Capitol (twice), 2016 Shamrock buyers conference, 2016 Colorado Chefs Association annual event, 2016 Sprouts buyers conference, Share Our Strength Cooking Matters 2016, Colorado State Fair 2016, Boulder County Fair 2015-2016.

This same Colorado Produce Calendar was developed into a 22" x 28" poster size format for display in retail stores. Sprouts put 30 in all Colorado stores on the produce floor, Safeway put 130 into the produce backroom of all Colorado stores, WholeFoods put 25 into the produce backroom of all Colorado stores, and King Soopers put 150 on the produce floor of all Colorado stores.

CFVGA developed its first "Colorado Produce Promo" video in 2015 and showed this at PMA 2015 and the CFVGA annual conference in 2016. It can be viewed on the CFVGA YouTube Channel: https://www.youtube.com/channel/UC07PRLa99k0hCSa0JNMO10w.

The second video "Produce Promo Buyers" was more clearly targeted to buyers and released just ahead of PMA 2016 and was shown at PMA with subtitles on a large monitor on the wall behind the CFVGA booth. It can be viewed here: https://youtu.be/HS9rHfXpsl4.

The third video "Producer Promo Consumers" was unique in its grower interview format and was targeted specifically to consumers to tell more of the emotive story of Colorado produce. It

was completed just before the end of the project end date and can be viewed here: https://youtu.be/fF5mKcig_VA.

CFVGA BOD and new ED Contractor developed three media stories about Colorado produce in Q3 and Q4 of 2015 and over 40 Facebook posts in 2015 to promote Colorado produce and CFVGA. https://www.facebook.com/CFVGA/. Currently 615 people like the CFVGA Facebook page (up from 396 November 2015). Nine media stories and 52 Facebook posts were produced in 2016 promoting Colorado produce.

CFVGA BOD and members engaged in the Colorado Proud Pop-Up Picnic in various locations in Colorado in 2015, discussing produce growing with consumers and stimulating interest in Colorado produce. Over 50 consumers were engaged at the Pop-Up Picnics and at the B2B food networking event November 3, 2015 (over 17,000 total at these events).

In 2016 CFVGA participated in the Colorado Proud Month kick-off event early August at History Colorado in downtown Denver, promoting Colorado produce to over 50 consumers (approximately 1,600 attendees).

Additionally, CFVGA participated in Colorado Ag Day at the Capitol in Denver March 15, 2015 and March 16, 2016, showcasing Colorado produce by serving a special vegetable dish prepared by a member of Colorado Chefs Association for lunch to over 500 legislators, staff, other public sector workers, and citizens of Colorado.

Outside of project funding, CFVGA partnered with other single commodity Colorado produce associations to fund radio ads promoting Colorado produce on the Denver Broncos Radio Network, reaching over 80,000 Coloradans per game for 23 pre, regular season and post season games in 2015-2016 (including a Super Bowl ad) and 14 pre and regular season games in the 2016 project period. This ad spot pointed listeners to coloradoproduce.org and to click on the KOA radio logo to learn more about Colorado produce, its health benefits and keys to success with Colorado produce.

Performance measure

Number of buyers and consumer receiving print information, number of views of media stories, Facebook posts and videos, number of consumers engaged via booths at events	**Status**
2015: Print and distribute 400 copies of promotional material, produce one video, engage 50 consumers at booth at each of two events.	Distributed approximately 11,000 copies of Colorado Produce Calendar card size in 2015 to buyers and consumers, produced “Colorado Produce Promo” video with 230 video by YouTube views to date and 341 views by Facebook metrics to date in addition to over 100 views at the views at Produce Marketing Association’s “Fresh Summit” in Atlanta. Three media stories were produced promoting Colorado produce in Q3 and Q4 and over 40

	Facebook post were delivered in 2015 to promote Colorado produce. Over 50 consumers were engaged with Colorado produce promotion at the Colorado Proud month pop-up picnics in August and at the B2B event in November.
2016: Print and distribute 400 copies of promotional materials, produce 12 media stories (2000 views each), and 52 Facebook posts (250 views each), produce two videos (250 views each), engage 50 consumers at booth.	Distributed approximately 11,000 copies of Colorado Produce Calendar card size in 2016 to buyers and consumers, distributed 335 copies of Colorado Produce Calendar poster size in 2016 to retailers (Safeway, King Soopers, Sprouts and WholeFoods), 52 Facebook posts with Facebook metrics reporting 20,641 total views with 430 average views, nine media stories sent on Constant Contact to a list of 317 media outlets in Colorado with an average email open of 93 per emailed media story (assume one gets published then over 2000 reached per media story). One new buyer facing video was produced with over 250 views at Produce Marketing Association's "Fresh Summit" in Orlando. Production delays related to filming seasonal shots, interviews and editing slowed the completion of the consumer facing video until early November, so no viewing metrics to report at the end of the Colorado harvest season. Over 500 consumers were engaged with Colorado produce promotion at Ag Day at the Capitol in March.

Develop and Implement Educational Outreach and Networking Opportunities to increase grower capacity and increase buyer demand for Colorado fruits and vegetables

CFVGA developed, promoted and delivered its first annual conference on February 24, 2015 in Denver, Colorado to 260 attendees. Seventeen buyers (retailers, distributors, school districts and chefs) attended a grower/buyer networking sessions. One notable outcome was the decision by WholeFoods to switch all of their chile peppers in Colorado stores to the newly branded Pueblo chile from the Pueblo, Colorado area.

The 2016 CFVGA second annual conference brought 310 participants and 26 buyers in a grower/buyer networking session. Evaluations of the grower/buyer networking in 2016 showed 100% of growers responding found it valuable and got new leads on buyers. Of the buyers responding, 94% found it valuable and 88% got new leads on growers.

In 2015 CFVGA delivered two food safety webinars: "Good Manufacturing Practices (GMPs) and Hazard Analysis and Critical Control Points (HACCP) programs for produce growers" and "Assuring Water Quality" (this one with an emerging partner Western Growers).

CSU staff assisted in the development of an educational session at the Colorado Farm Show January 26, 2016, for the second annual Colorado Produce Day. Content featured topics including food safety, labor, and production practices. Over 120 participated.

In July 2016 CFVGA partnered with CSU to deliver a "Mock GAPs Audit" in Pueblo to help growers and professionals understand how to prepare for a GAPs audit.

October 2016 CFVGA partnered with CSU and the Produce Safety Alliance to deliver one of the first FSMA "Produce Safety Rule" trainings for growers in Colorado. This was a two-day training. Day one focused on providing the key curriculum to farmers required to comply with the Produce Safety Rule and had a strong grower focus with professionals participating. Day two focused on a training of trainers to create new PSR trainers certified by Produce Safety Alliance. Participants from outside of Colorado joined the day two TOT. Ten new certified trainers were created for Colorado. Evaluation content was controlled by PSA and behavior change questions were not included.

During the 2016 project period, CFVGA delivered 13 live webinars, recorded for later viewing and built around themes including business strategy, protecting workers, irrigation tech, beginning farmers, and media engagement.

Performance measure

Annual conference and workshops attendance number and knowledge gained and 50% show intent to change behavior	**Status**
2015: One annual conference = 130; two workshops 60 attendees total; all show knowledge gained and 50% intend to change behavior	2015 conference = 260. Educational content can be viewed here: https://coloradoproduce.org/news-issues/ Two food safety webinars webinars delivered, total of 40 attending, all showed knowledge gained. Behavior change was not surveyed.
2016: One annual conference = 160; three workshops 80 attendees total; all show knowledge gained and 50% intend to change behavior	2016 conference = 310. Educational content can be viewed here: https://coloradoproduce.org/news-issues/ Three workshops delivered 1. Colorado Produce Day at Colorado Farm Show: 120 participated to hear sessions on food safety, labor and production practices. All showed knowledge gained, intent to change behavior was not surveyed 2. Mock GAPs Audit: 16 participated, all

	showed knowledge gained, 94% showed intent to change behavior 3. Produce Safety Rule training: 37 (16 growers, 21 trainers) participated, a minimum of 67% of growers showed knowledge gained and 73% of trainers trained showed knowledge gained. Thirteen webinars delivered to 70 participants. All participants reported knowledge gained and intent to change behavior.

Beneficiaries

Beneficiaries include Colorado produce growers, Colorado retail buyers, US and international distributors, Colorado school meal providers, Colorado food bank procurement managers, Colorado farm to school program directors, Colorado health and wellness organizations, Colorado public agencies and higher education, and Colorado consumers.

Number of beneficiaries is estimated conservatively at 100,426.

Economic impact is estimated conservatively based on increased grower, distributor and retail sales from grower buyer networking, print, social media and radio promotion at $399,000. ($100,000 + $130,000 + $169,000)

Lessons Learned

Project partners have been integral to planning, promotion and delivery of all CFVGA grant project aspects. Time required for coordination among these partners was underestimated.

CSU is an integral partner with CFVGA. As CFVGA and its working partnerships mature, time appropriated and time required should become more balanced.

Additionally, time required coordinating contractors was also underestimated.

CFVGA is a new organization and as such is growing its financial resources to better fund the ED contractor to manage contractors.

Project activities fell short a few instances with evaluations, particularly with behavior change outcomes. This is in part due to a need for more careful communications among partners with evaluation instruments and expectations.

In project budget allocation, significant dollars were put into travel. Much of those dollars were not utilized and greater impact was found for using them in contractual and other services, specifically on video production, food safety workshops, and online survey of consumers. For

CFVGA planning, we learned to map out project expenses more thoroughly and budget more conservatively for travel.

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Additional Information:

Final Report: Research and Technical/Marketing Support for Colorado's Specialty Crop Producers
Project Partner: Colorado State University

Project Summary

Colorado State University (CSU) provided research, technical support, and extension education programs to Colorado's highly diverse population of specialty crop producers. Through continued support for a Specialty Crops Coordinator, as part of CSU's broader Specialty Crops Program (SCP), growers benefited from research conducted by CSU addressing the needs of specialty and small farm producers. CSU's Specialty Crops Coordinator provided research-based technical advice and guidance in support of growers that had active Grower Research and Education Grants, and broadened the impact of these projects by presenting to a wider audience of growers, educators and consumers.

Colorado's specialty crop producers face unique challenges in terms of crop/cultivar selection for adaptation to a wide variety of environmental and market conditions; resource management, particularly water availability; the need for season extension; etc. There is great opportunity for producers to supplement and/or build upon research conducted by CSU, as well as to have access to technical support and other resources available across CSU's state-wide academic, research and extension networks. To effectively develop and sustain specialty crop enterprises and local food systems, producers require applied, field-oriented research to identify problem solutions.

This project continues to be timely and important because developing local food systems are still gaining momentum across the United States, especially in Colorado.

The overall purpose for the Specialty Crops Coordinator is to conduct and facilitate research in specialty crop production and utilization, including the application of organic methods, especially for organic and small farm producers. The Coordinator's focus is on solving problems with current crops and on the identification and development of new specialty crop opportunities. Primary emphasis is on small scale vegetable crops because of the state's need in this area, and especially because such producers are relatively underserved by current research programs. Research results were delivered to growers through field days, written and electronic communications and farm visits.

The CSU Specialty Crops Coordinator continued to support the remaining Grower Research and Education Grants. As a part of prior year programs, CSU had awarded these grants on a competitive basis for purposes of conducting on-farm production and enterprise feasibility studies, and for the development and implementation of direct marketing and farm-to-market demonstration projects.

This project built on specialty crop research and grant programs that have been part of prior CDA SCBGP applications. More specifically, specialty crop funds allocated to Colorado in 2001 as part of a supplemental agriculture appropriations bill were targeted to a grower grants program in cooperation with CSU. More recently though, cultivar trials, season extension, hops and small fruit projects were included in CDA's SCBGP applications, and CDA's FY08 SCBGP-Farm Bill

application included a project establishing the Specialty Crops Coordinator. The Coordinator position was continued in the FY09-14 SCBGP. In FFY2014 the role of the Specialty Crops Coordinator was temporarily filled by interim coordinator, Dr. Leila Graves, while CSU awaited the arrival of the new Specialty Crops Coordinator, Dr. Mark Uchanski, who started January 2016.

Project Approach:

Analyze results from previous years' research; Post research results and recommendations to CSU Specialty Crop website; Present results at grower conference(s) and meetings; Finalize plans for 2015 research

Results of 2014 tomato and cucumber variety trials were analyzed and a report was written on March 21, 2015. The results have been posted on the new specialty crops website under 'Past Projects'.

Dr. Leila Graves, interim Specialty Crops Coordinator, held a round table discussion on February 25th at the Colorado Fruit and Vegetable Growers Association that discussed results of this research.

2015 High Tunnel Tomato Trial

Planning for 2015 research was finalized by interim staff of the Specialty Crops Program (SCP) at CSU. Research at the CSU Horticulture Field Research Center (HFRC) under the guidance of the interim Specialty Crops Coordinator Dr. Leila Graves and included the following projects all proposed in the 2014 plan:

- High tunnel trial of tomatoes for analysis of Colorado as a production location of organic specialty crop vegetable seeds
- Research and demonstration of cover crops as a means of organically fertilizing the soil while abating weeds
- Organic vegetable breeding research
- Evaluation of different protective coverings to protect against severe climate changes (especially hail)
- Sustain a small Community Supported Agriculture (CSA) enterprise growing specialty crops using a student/intern 'business model'
- Collaboration with CSU's College of Food Science and Human Nutrition focusing on Specialty Crops

The tomato variety trial, a continuation of a trial started in 2014, partnered with Vitalis Seed Company, included three Marmande type tomato entries and two Coeur de Boeuf type tomato entries. It took place in high tunnels located at the Horticulture Research Center (HRC). It concluded that unheated high tunnels provided effective protection from hail, high winds and significant fluctuations in temperature. A taste test held during the September 12, 2014 field day revealed that consumers preferred the appearance and taste of all of the Marmande entries and one of the Coeur de boeuf. Measures taken revealed that the Marmande type tomatoes were higher in general yield and marketable yield both in quantity and weight, though both varieties produced equal numbers of non-marketable fruit. This is helpful information for developing breeding lines suitable to Colorado growers. Data on tomatoes grown in 2015 was completed October 14, 2015. It was analyzed and made available via the SCP website in 2016.

The multi species cover crop study was a continuation of research from 2014. Soil samples taken February 21, 2014 and March 23, 2015 revealed an increase in organic matter and nitrate in soils that were previously cover cropped. The plot that was utilized for the 2014 CSA was under cover crop in 2015, but was to be tested in spring 2016 to investigate the continued impact of multi species cover crops. The results are inconclusive, but will be saved as preliminary data for future studies.

The SCP hosted a trial of winter squash and peppers as part of the Northern Organic Vegetable Improvement Collaboration (NOVIC). This trial collaborated with the SCP and CSU to host an 'On-Farm Plant Breeding Course' free to the public and to CSU students and faculty on September 11 and 12, 2015. Nationally-renowned breeders from Oregon State University, Cornell University, University of Wisconsin, and Organic Seed Alliance came together to teach a free two-day workshop on the basics of plant breeding at the Horticulture Field Research Center. Twenty-seven participants came from Colorado, Wyoming and California, and included farmers, gardeners, agricultural professionals, undergraduate students, graduate students, and university faculty and staff. Outdoor sessions at the HFRC included observing the NOVIC pepper, acorn and delicata squash trials, pollination demonstrations and discussed plant traits unique to organic agriculture.

CSA Farm Stand at CSU
June 2015

Tomatoes, cucumber, melons, corn, kale and lettuce crops were all produced under protective covering in 2015. These crops had on average a 75 percent higher yield than their field-grown counterparts. Hail netting was trialed this year in the open field as a mitigation method for hail, but weather did not permit a proper trial of the material as no hail events were recorded at HFRC in 2015. However, the netting was found to reduce insect damage by 50 percent. The hail netting required extra labor to install and maintain as it was susceptible to collapse under high winds. Developing a better method of installing and managing the netting is recommended. In 2014, the use of thicker plastic (1.5mm) was thought to resist puncture by hail, but it proved more difficult to remove at the end of the season. Thinner plastic (1mm) was used in 2015, it proved sufficient at suppressing

weeds, and was much easier to remove at the end of the season.

The interim specialty crops coordinator continued management of the CSU CSA in 2015. Over 2,000 pounds of excess vegetables were donated to the Larimer County Food Bank. The CSA collaborated with the Larimer Youth Conversation Corp for the month of June 2015, giving volunteers experience with farm-related work. The coordinator also engaged Ag-Ed students from AGED 101 through volunteer hours required by their course instructor.

Students of FSHN 496 course volunteered as part of their requirement to complete their course 'Art and Science of Food Preservation'. This collaboration gave students whose academic focus was on food preservation and preparation extensive hands on experience with growing the produce they process.

Provide Technical Support and management support for funded GREGs; Manage research plan; Conduct Field day

No new grants were awarded in 2015 through CSU as this program was discontinued.

Dr. Leila Graves coordinated and managed the final report submission by the following GREG recipients;

Green Dog Farms - Karl Talbot -$23,850 - Forming a Multifarm CSA Cooperative. Local farms cooperating to increase profit and sustainability.

Sunspot Urban Farm - Rod Adams and Amy Yackel Adams - $10,000 - High tunnel strawberry production in suspended versus in-ground beds: Can a suspended growing system be a profitable addition to the high tunnel?

Osito Orchard - Frank Stonaker, Beth Karberg - $9,999 - Evaluation and demonstration of organic sweet cherry production using precocious dwarfing root stock, the super spindle axe training system and high tunnels.

Interim SCP coordinator, Dr. Leila Graves, communicated due dates, reviewed final reports, and requested final invoices from these farms. No other technical support was given.

Results of these final GREG grants are posted on the specialty crops website:
http://hortla.agsci.colostate.edu/research-programs/specialty-crops/greg/
http://specialtycrops.agsci.colostate.edu/

Goals and Outcomes Achieved

1. **Desired Outcome:** Conduct research and provide information and recommendations for Colorado specialty crop producers.

Performance Measure: Results and recommendations for producers will be communicated through such means as Agricultural Experiment Station Bulletins, Cooperative Extension Fact Sheets, at Field Day events and conferences targeting specialty crop producers, as well as made available on the HLA Specialty Crops Program website.
Goal for 2015: Hold two field days with a total of one hundred attendees, give four research based talks at grower meetings and conferences, produce two print publications providing research-based guidance to growers, and increase website visits by 10%.
Outcome: This goal was partially met. Two back-to-back field days were held in an outdoor classroom format on September 11 and 12, 2015 during which one print publication was handed out covering summary information on field research. Twenty-seven participants came from Colorado, Wyoming and California, and included farmers, gardeners, agricultural professionals, undergraduate students, graduate students, and university faculty and staff. During a round table discussion at the Colorado Fruit and Vegetable Grower's Association conference Dr. Leila Graves discussed field research with growers. From October 30, 2013 to October 30, 2014 the SCP webpage received 2,976 page views. From October 30, 2014 to Oct 20, 2015 the SCP webpage received 3,315 page views, an increase of 11%.

2. **Desired Outcome:** To facilitate the development of emerging specialty crop grower and marketing associations.
   Performance measure: Help organize grower conferences, and assist programs in any other ways needed.
   Goal for 2015: Assist both Rocky Ford Growers Association and statewide Colorado Fruit and Vegetable Growers Association by helping organize grower conferences.
   Outcome: Interim program coordinator Dr. Leila Graves helped coordinate and host a round table discussion of specialty crops research on February 25, 2015 as part of the Colorado Fruit and Vegetable Growers Association's 1st annual conference.

Beneficiaries

The beneficiaries of these research projects and grants are small acreage, socially disadvantaged, and beginning specialty crops growers in Colorado that attended field days and that utilize the information published to the SCP website.

Lessons Learned

Dr. Leila Graves left CSU in October 2015, and Dr. Mark Uchanski arrived in January 2016. Many of the 'Expected Measureable Outcomes' for 2015 proved lofty for the interim coordinator and, while an attempt to achieve each goal was made, time and resources did not allow for completion. These benchmarks were not met in 2015 by Dr. Leila Graves and, with her departure, it is hard to know why she did not meet them.

Contact Person

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Final Report: Enhancing Marketing and Production of the Old Fort Market Garden Incubator Program
Partner Organization: Fort Lewis College, Durango, Colorado

Project Summary

The Old Fort Market Garden Incubator program is an alternative entry point for beginning farmers in southwest Colorado to grow specialty crops. Located near Hesperus, this program is the only active farm incubator program in Colorado and one of 65 operational programs in the United States. The 6.5 acre project offers access to land, irrigation and communal infrastructure for farmers who successfully complete training. Current infrastructure includes irrigation systems, basic processing shed, small equipment and hand tools. After being selected and completing their winter education, six farmers operated on 2¼ acres with the assistance of an in-field mentor in 2013. Our first year was highly successful and produced over 30,000 pounds of vegetables and cut flowers.

From our 2013 production numbers, we are confident that our land, water access, education and mentoring model can produce highly productive beginning farmers. This project proposes to continue these proven programs, address harvest and storage needs, promote food safety and crop planning practices, explore alternative marketing models, and develop a program logo, signage and promotional material. These activities will be monitored by a site coordinator that will serve as a liaison for project team, conduct in-field mentoring and create a cooperative CSA to reduce the amount of stress on our farmers during peak harvest.

Success measures include increasing participation, completing food safety and crop plans, monthly production records, monthly sales records and documenting usage of provided resources such as the cooler, farmer's market supplies and root cellar space.

At the end of the season, three of the incubator farmers were fortunate enough to transition to their own land. While we had a very successful first year, we are still very much in the infantile stages of development. Private donations, SCBG funds and volunteer hours from our project team have contributed to the formation and initial success of the OFMGI program. As we move forward, this project is asking for support for the next phase of the project to continue successful key aspects of our project (curriculum, training, in-field mentoring). This new project will begin to address key marketing issues and expand the promotion of both our program and our farmers who grow only specialty crops.

The program director for the project has been actively involved in the National Incubator Farm Training Initiative (NIFTI) since its inception. This organization based at Tufts University has assisted with developing program documents, provides an online resource of webinars and hosts a yearly field school that brings together farm incubator managers from throughout the country. Having access to these resources has definitely helped make this program successful. This organization recently published a case study of 12 farm incubator programs in the U.S. and their data shows that a majority of them are dedicated to vegetable production (http://nesfp.nutrition.tufts.edu/sites/default/files/resources/farm_incubator_case_studies_-_nifti_v2.pdf).

Since 2014, our new classes of farmers do not have access to their own land. They complete their winter training where they meet every Monday night for nine weeks. Following our in-field work days, they begin working on their plots. Our farmer's plots range from 1/8 acre up to two full acres including returning farmers who often doubled their land size request. Monies generated from access fees were used to increase drip irrigation from 3/16 of an acre up to 1.25 acres, install electricity to site and provide infrastructure for walk-in coolers. Any fees generated from the project will continue to be used for the long term financial investment of the project. Currently, we have not applied to any other federal or state grant agency for funding related to the OFMGI.

From our production and mentoring records, we are confident that our land, water access, education and mentoring model produce highly productive beginning farmers. This model was developed with a 2011 SCBGP that provided shared tools, curriculum materials, education honorariums, basic signage and an in-field mentor. Our project continued these proven programs and enhanced infrastructure needed for marketing specialty crops. We addressed storage and handling needs, promoted good food safety practices, explored alternative marketing models, and developed a program logo, signage and promotional material. These activities were monitored by a marketing coordinator that served as a liaison between the project team and the incubators. This coordinator created a cooperative CSA to reduce the amount of stress on our farmers during peak harvest when they needed assistance with marketing efforts.

Success measures include increasing participation, food safety plans, crop plans, monthly production records, monthly sales records, CSA usage of produce, and documenting usage of provided resources such as the cooler, farmer's market supplies and root cellar space.

The Old Fort Market Garden Incubator program has explored revenue streams that will make this project viable in the long term. Because we do not have any land or rental payments, monies are needed for continuing the educational programming, providing mentorship and maintaining/upgrading infrastructure. Access fees continue to be reinvested into the project. We offered our class series to outside growers that provided a continuing education opportunity and CSA memberships could assist with marketing funding.

Project Approach: Activities

Meet with key personnel to update curriculum and set dates for training

2015: The project team has worked together since 2011 shaping the incubator program and we were all excited to continue to the next phase of development for this program. We modified the training schedule slightly in 2015 to give the students a couple of two week breaks since we felt that there was too much information to absorb during the continuous training.

We discussed infrastructure updates and decided to extend the drip irrigation another half-acre and purchase a second electric pump to power the lower half of the upper field.

Unfortunately, Gabe Eggers decided to move to Washington to pursue a new career so we had to replace his growing expertise, educational contribution and mentorship. Additionally, Katrina Busick who we planned on hiring as the site coordinator moved to Hawaii to pursue on-farm therapeutic work. Fortunately, Elicia Whittlesey joined the Old Fort staff in April, 2015 and

served as the marketing coordinator and we were able to partner with the CO Building Farmer program to fund an apprentice who assisted with site maintenance and worked side by side with many of the farmers.

2016: For 2016, the project team decided to add an additional session on succession planting that would be taught by Elicia Whittlesey, give four-year farmers from Fields to Plate Produce the opportunity to teach crop culture and open up the training to non-incubator farmers. Because Elicia is in charge of marketing produce for the Old Fort Market Gardens, it was important to share good practices for succession planting. The Fields to Plate Farmers have been mentoring younger farmers for a couple of years so we wanted to include them in our winter education. As our program has garnered more press, we have had requests from farmers in the area that have access to their own land but would like to have the market garden education. We contacted five farmers who had reached out to us and two of them joined the education series at a cost of $150.

Develop logo and promotional strategy

2015: We began logo development by having a brain storming session at one of our February education meetings. They came up with great ideas for the graphic artists. It included mountains, elevation, and a "seal" look. The graphic artist gave us several ideas to review and each time the incubator farmers gave their input. Because of this collaborative process, there was definitely a sense of ownership on the design. We decided on the name of "Old Fort Market Gardens" to make it more concise and encompassing. Later in the process, Fort Lewis College graphic artists modified the logo include its name so it could be an officially approved logo.

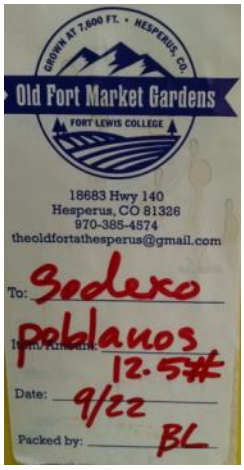
Insulated bags were ordered with the logo on them for the CSA and for farmers to use at Markets. Peel stickers were also ordered for the farmers to place on bags, boxes, crates, tables and vehicles.

Additionally, we ordered 50,000 Twist ties that were ½" by 18" long so it could be cut to various shorter lengths. They were used to wrap various sizes of bunches as well as close plastic bags.

The combination of these items has given the program a lot of attention this summer.

2016: Our CSA grew so much that we ordered an additional 100 bags with the updated logo on it. We also ordered labels for crates and boxes that meet the new Food Safety Modernization Act (FSMA) labeling requirements.

We distributed polo shirts with the Market Gardens logo on them to all the incubator farmers at our first winter training session. Later in the season, we provided the marketing managers with jackets that had the logo on them as well.



Obtain curriculum for participants

2015: We provided the Teaching Organic Farming and Gardening and Teaching Direct Marketing and Small Farm Viability from Center for Agroecology and Sustainable Food System for each participant. We require the farmers to utilize University of Minnesota's Ag Plan website (https://www.agplan.umn.edu/) to develop their business plans. They were able to make project team members reviewers so we can make comments and check on progress. The students receive a copy of the PowerPoints and handouts developed by the Project Team for each of the winter training sessions. They also received a copy of Market Farming Success. We also ordered a sample copy of Wholesale Success from www.familyfarmed.org. The farmers reviewed the publication and decided that it would be a great resource. Unfortunately, it was out of print in 2015.

We continued to have a resource library at the Old Fort containing all of the Growing for Market newsletters as well as more than 20 books recommended by winter workshop teachers that farmers can borrow.

2016: In addition to the previously used educational materials, we provided each participant with a copy of Market Farming Success. The monthly Growing for Market newsletters were forwarded to each of the incubator farmers and hard copies were kept in the office.

Coordinate winter training for growing seasons

2015: We prepared the following schedule for the 2015 educational series. As mentioned previously, we decided to have a series of three classes and then take a two week break before repeating the schedule. In addition to the Project Team delivering content, we also teamed with Dr. Dawn Thilmany from CSU again to deliver introductory business planning information. She delivered her initial presentation using Google Hangouts but was able to come to Durango in March and meet with each of our farmers individually to follow up on their progress.

All classes were held from 6-9 pm at the LaPlata County Fairgrounds. We changed the weekly format to include 30 minutes of updates and Business Planning reports including business name development, mission statement reviews and SWOT analyses. Additionally, the lecture segment was shortened to allow for at least an hour of hands-on activities during each session. Examples of activities include crop sign-up sheets, assembling irrigation drip systems, maintaining irrigation filters, soil milk shakes and ribboning, logo brainstorming, and a glo-germ exercise.

Date	**2015 Topics**
Jan 26	Welcome to the Program; Incubator Logistics; Q & A Potluck beginning at 6 pm
Feb 2	Crop Culture/Crop Planning - Gabe Eggers
Feb 9	Business Plan Development - Dawn Thilmany- CSU

	Crop Planning con't
Feb 16	No Class - Presidents Day
Feb 23	No Class
March 2	Seeds and Transplants/Marketing - Gabe and Mike Nolan
March 9	Soils/Soil Fertility/Cover Crops - Darrin Parmenter
March 16	Irrigation Basics/ Weeds & Pests - Mike/Darrin
March 23	No Class
March 30	No Class
April 6	Recordkeeping/Season Extension Options - Beth
April 13	Post Harvest Handling/Food Safety-Mike/Beth
April 20	Final Business Plan Presentations
April 26	All-day workshops at incubator site
May 10	All-day workshop at incubator site

June/July/Aug/Sept: Monthly in-field meetings (2 hours)

Additional Educational Opportunities

Jan 30-31	Western Slope Soil Health Conference - Delta, CO

http://deltacountyliving.com/western-slope-soil-health-conference-2014/

Feb 20-21	Organic Farming Conference- ABQ, NM

http://www.farmtotablenm.org/programs/new-mexico-organic-farming-conference/

Feb 27-28	Food Retreat sponsored by Growing Partners
March 10	Specialty Crop Symposium at Lewis-Ariolla Community Center
March 14	USDA Grant Writing Workshop - LaPlata County Fairgrounds; 12-4 pm
March 15	Individual meetings with Dawn Thilmany

2016: An outline for classes was developed and distributed to participants. We invited our two outside class participants to arrive at 6:30 so that we could spend time on incubator business prior to class beginning. Additionally, 4th year participants (Fields to Plate Produce) were invited to deliver the Crop Culture discussion. We did not include as many hands on activities as we had in the past and they will need to be included next year. Because our CSA program has grown, we spent more time explaining to the farmers how the wholesale purchase of produce would occur in 2016.

Also, our Farmers in Training will be included in all of the training next year. They were not selected until April, 2016 so they only attended a few of the sessions.

Date:	**2016 Topics**
Jan 18	Welcome to the Program; Incubator Logistics; Q & A Panel Potluck beginning at 6 pm
Jan 25	Crop Culture - Fields to Plate Produce; Beginning Crop Planning - Mike Nolan
Feb 1	Business Plan Development - Dawn Thilmany - CSU
Feb 8	No Class
Feb 15	No Class- Presidents Day
Feb 22	Soils/Soil Fertility/Cover Crops - Darrin Parmenter/Ron Godin
Feb 29	Seeds and Transplants/Marketing (CSA) - Elicia Whittlesey

March 7	Season Extension Options
March 14	No Class
March 21	No Class
March 28	Succession Planting/ Recordkeeping - Elicia/ Beth
April 4	Post Harvest Handling/Food Safety - Beth
April 11	Irrigation Basics/ Weeds & Pests - Mike/Darrin
April 18	No Class
April 25	Final Business Plan Presentations
April 30	All-day workshops at incubator site
May 14	All-day workshop at incubator site

June/July/Aug/Sept: Monthly in-field meetings (2 hours)

Additional Educational Opportunities

Jan 22-23	Food and Farm Forum- Montrose, CO http://www.foodfarmforum.org/
Feb 17	Colorado Fruit and Vegetable Growers Association meeting - Denver, CO
Feb 19-20	Organic Farming Conference - ABQ, NM http://www.farmtotablenm.org/programs/new-mexico-organic-farming-conference/
Feb 27	High Tunnel Workshop - Cortez Middle School
Feb/March	Individual Consultations available through WRME grant for Quickbooks, Crop Planning, Logo Development, CSA Planning
March 10	Specialty Crop Symposium at McGee Park-Farmington, NM
March 12	What's Hop'n in 4-Corners – Hops Symposium - FLC
April 16	Food Retreat sponsored by Growing Partners

Install monitoring devices in root cellar

Upgrading the root cellar has been instrumental in the continued success of our program. We installed min/max thermometers with humidity readings to monitor these readings. During the fall when the root cellar is full of produce, temperature and humidity is monitored daily. The fan is used to bring in cool air at night to help the produce cool down.

In 2015, Fort Lewis College paid to have electricity reconnected to the building so that it would have lights and electrical outlets. Because of this upgrade, we were able to re-connect the fan system and place it on a timer.

Because of some persistent rodents, we lined two of the bays with hardware cloth and installed doors in 2015. It was very effective so we lined two more bays in 2016 and added more shelving to get the pumpkins and winter squash off of the ground.

Obtain food safety materials and supplies

The most important purchase we made was hand washing stations for the field and wash stations. The portable systems provide 17 gallons of potable water, soap and paper towels for approximately 270 hand washings. They also collect grey water so that it can be drained appropriately when the tanks are refilled.

We also purchased Rubbermaid totes for incubators to use as harvest crates and exposure to the elements when transferred from field to harvest shed. Since our harvest shed is not located in the field, all harvested produce must be transported.

Harvest shed improvements included moving the stainless steel washing machine into the shed to provide greens producers a way to more quickly wash and spin product. Two spray tables were constructed along with two tables with removable screens. Also we installed a PVC system around the shed that provided several water outlets to alleviate hoses on the ground in the shed. While we'd like to have additional pressure, overall, it worked very well. All of these items allowed us to divide the harvest shed into two sections- one for those who needed to spray off root vegetables and one for less dirty produce like greens and peppers.

In the root cellar, we purchased metal shelving for storing pumpkins and winter squash. In addition to utilizing vertical space, the shelves also got all of these items off the ground. Additionally, we lined two of the bays with hardware cloth to prevent rodent damage to the tempting beets, carrots and delicata squash that we are storing. A live trap was set to catch a few fat squirrels and large mouse traps were also set to prevent any other large rodents from eating stored produce.

Advertise and organize cooperative CSA

2015: A recruitment brochure was developed in February, 2015 to advertise the Old Fort CSA. We also worked with Fort Lewis College to create a MarketPlace page that would allow customers to pay for the CSA online and sign the agreement.

Old Fort Marketplace: www.tinyurl.com/oldfortmarketplace was used for both the Summer and Fall CSA signup.

Since this was a pilot program we were hoping for ten initial members. We had selected three drop off locations (Old Fort, Campus Farm Stand and Southwest Conservation Corp office) and decided we would run the CSA from June 25 to October 8. The charge would be $225 for a half share (two people) and $450 (four people). We had 6 half-shares signed up by the first of June so we were happy with the initial interest. FLC hired a new garden manager in May, 2015 that

had experience with running a CSA and wanted to grow the program so she put together some sample CSA bags. By the end of the season, we had 15 members. Our goal for 2016 is to have 25-30 members.

Also, because of our unusually long growing season and the interest in fermentation techniques by one of our farmers, a Fall CSA was offered as well. It was a six week program available for $75 and we had nine people take advantage of it.

Elicia Whittlesey, Education Garden Manager and Incubator Marketing Coordinator was responsible for the assembly, delivery and member communication of the weekly CSA. Her creativity and experience was instrumental in its success. We had one person who signed up for the Fall CSA just to keep receiving her emails!

We used Small Farm Central (www.smallfarmcentral.com) to track weekly distributions. Since we have an internal system to take payments (Marketplace), we didn't use that option in the Member Assembler program. However, we did use the reports that summarized the amount of produce that was placed in the bags each week and overall.

2016: The CSA brochure was updated in January, 2016. Weekly share amounts were increased from $15 to $20 and we included both a regular 16 week CSA and a 10 week high season CSA option. Here are a few excerpts from the brochure:

WHAT IS A CSA?

CSAs, or Community Supported Agriculture shares, create agriculture-supported communities! You provide capital at the beginning of the season; we share the bounty of the season's produce. We also welcome your input on future crop plans.

WHAT'S UNIQUE ABOUT THE OLD FORT CSA?

This CSA includes produce from four sources:

- The **Education Garden**, where Fort Lewis College interns learn farming practices for college credit.
- The **incubator farms**, where beginning farmers of all ages get access to land, water, and support.
- The **4-H Giving Back Garden**, a youth project that grows food and distributes it to local families in need.
- **Local farmers** with good practices growing specialty items that we'd like to share with you.

Support farming education & beginning farmers.
Invest in the Old Fort Market Gardens CSA!

- **Full Season Share**, from June 22st to October 5th, $320

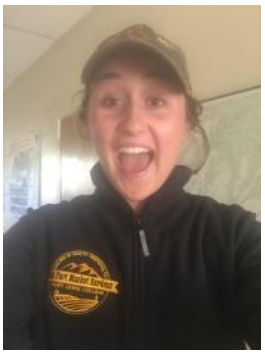
- **High Season Share**, from August 3nd to October 5th, $200

The Fine Print: one full payment due by 4/6/16, or two half payments, the second due 6/15/16**.** Full season is 16 weeks, high season 10 weeks. One share provides vegetables for about 2 adults. Prices include a weekly email with farm news & recipes and one insulated bag.

WHO GROWS MY FOOD?

- In the Education Garden, **Fort Lewis College staff and students** grow vegetables & coordinate the CSA.
- **The 4H Giving Back Garden** contributes produce & coordinates donations to local families.
- Incubator farmers grow food for the CSA, from carrots to kale. This year's farms include **Fields to Plate Produce**, **Wren & Raven Farm**, **High Pine Produce, and Woods Family Farm.**
- We partner with lower-elevation growers to provide tomatoes, dry-farmed corn, and pinto beans.

For Summer 2016, we had 30 full season members ($320) and 9 high season members ($200). Summary data at the end of the season showed that full season members received approximately $344.15 worth of produce for an average of $21.51 per week. High season participants received $220.56 in produce for an average of $22.06 per week. Elicia calculated that they received around 50 different vegetables during the season. Each week she put together bags that were beautiful and then she composed the most amazing emails describing the produce and how to use it. One of our fall subscribers indicated that she signed up just to keep reading the emails. Our Fall program offered a monthly delivery utilizing stored produce and value added items. We sold 20 memberships for $160 that will provide four boxes of produce from October through January.



The cooperative CSA model has worked very well for us because we can utilize smaller amounts of produce and allows farmers to try out new crops. The farmers are provided with a price list showing what we will pay them for their product. It allows them to make crop plans based on this income.

Because of the increased production and marketing tasks associated with a bigger CSA and the FIT program, we hired Danielle Duni as the assistant garden manager. She was an incubator farmer in 2015 but spent a semester in Montana taking agriculture classes and was unable to apply for the 2016 growing season. Her duties included tasks associated with production and harvesting for the CSA, four farmer's markets and restaurant accounts. She attended evening farmer's markets during the summer and assisted with processing Sodexo orders for the Fall after school began.

Assist incubators with developing food safety plans

2015: During winter training we provided the farmers with food safety training using GAP standards. They were also provided with checklists and templates for food safety plans. Since the Old Fort provides harvest shed, cooler and root cellar space, applicants must adhere to the food safety oriented guidelines provided for each of these spaces.

With these guidelines provided, incubator farmers need to develop food safety plans primarily focused on field management of water and post-harvest handling practices.

2016: As with all incubator programs, food safety plan development and implementation continues to be an issue. We provided farmers with the outstanding book, "Wholesale Success" to assist with guidelines on how to process and store crops. While we include food safety practices in our site guidelines, they are very challenging to enforce because of how busy staff is during the summer.

Assist incubator with developing crop plans

2015: We had seven returning farmers and one new one so crop planning was a little easier. We began with an interactive activity where we placed all of the crop families on large poster paper and had the farmers sign up. It was a very visual activity for everyone and led to some great discussion about missing pieces. This was especially important since we were planning on offering a collaborative CSA and needed variety. As the educational classes progressed, I brought the papers back and put them on the wall for farmers to review and make changes on. By the time we got ready to plant, we had a balanced crop plan for the CSA.
In the three years that we've been asking farmers for crop plans, 2015 was the closest to what actually was planted. However, we still overproduced certain vegetables (green beans, mixed greens) and not enough of others (spinach).

2016: We only had four returning farmers so the crop planning process was different. The two new farmers had a very specific crop plan (greens, melon and corn) so there was not a need to divide the popular crops among different farmers. Additionally, the three Farmer in Training participants were given a crop plan by the Marketing Coordinator that filled in the gaps. With the larger CSA and the probability that Sodexo was going to purchase more product, it was essential.

Host OFMG cooperative meeting to review marketing strategy

2015: At our May work day, the farmers met with Project Director and Marketing Coordinator (Elicia) to discuss how the purchase of produce for CSA, Old Fort Farm Stand, existing restaurant accounts and Sodexo (campus dining at Fort Lewis College).
It was determined that the Old Fort would post a wholesale price list that would be used to purchase produce from individual farmers. On Mondays of each week, they could respond to Elicia via email or personal communication what items they would have available for the week. Farmers were not required to sell product through the Old Fort but all were given the opportunity. Once knowing availability, Elicia would contact our primary restaurant accounts, determine what items we needed for the farm stand as well as Sodexo. By Wednesday at the latest farmers were told what we would purchase for the week and how it should be packaged. Shelves in the cooler represented our various outlets and farmers would place the produce on the appropriate shelf. Farmers submitted invoices and they were paid monthly. In fiscal year 16, the Old Fort purchased approximately $8,567 worth of produce from the farmers.

2016: We once again provided our farmers with a wholesale produce list along with a schedule of order and delivery dates. The Old Fort moved their farm stand to Wednesday afternoons and added a weekly Tuesday night market in Farmington and a monthly market in Cortez.

Additionally, once school started Sodexo began purchasing a lot of produce. They have set up a standing order to purchase 290# of potatoes per week, 150# carrots bi-weekly, 50# of beets bi-weekly, 50# of delicate squash weekly along with other produce we might have available this winter (cabbage, greens and herbs). Below is a table comparing this year's sales and purchased produce to last year on a calendar basis (Jan-Dec).

Type of Market	Calendar Year: 2015	Calendar YTD: 11/12/2016
Farmer's Markets	$7,440	$11,280
CSA subscriptions	$3,335	$14,201
Sodexo (produce only)	$3,676	$9,982
Total Produce Sales (includes markets, CSA and wholesale)	$22,399	$33,900
Total Produce Purchases	$ 6,668	$11,706

Distribute promotional material to incubators

2015: Promotional materials were distributed to incubators as they became available. The peel-off stickers were placed on bags, twist-em ties were used to bunch produce, tables and tents were used at local markets. Once the season is over, we plan to order shirts and hats this Fall with the new logo.

2016: Polo shirts were distributed to all staff and farm incubators during the winter training. They were worn at special events including markets, open house and tours. We also distributed crate and box labels to producers that were providing produce for restaurant and Sodexo.
As a method for promoting the individual farmers and the program, these one paragraph descriptions were developed and distributed:

Fields to Plate Produce (Max Fields and James Plate): Established 2013

Fields to Plate Produce is an up and coming force in the farming world. Based high in the Southern San Juan Mountains we use morph our crop plan and marketing according to our environment. Utilizing root and cole crops in addition to cold storage root cellaring we can stretch our seasonal range to six months. Maintaining organic practices and an attentive care for the soil is at the core of our business. We believe that organic farming can feed us all and we are constantly striving to achieve local food security in our community and surrounding regions. Fields to Plate is ever progressing and it is our hope to always expand and grow.

4-H Giving Back Garden (Greg Felsen): Established 2014

The La Plata County 4-H Giving Back Garden is excited to produce fresh, healthy, local vegetables for our community in 2015. Our garden plot acts as both an educational and production agriculture site. We will continue to focus on growing food for the USDA Commodity Food Distribution "Produce Bounty" program as well as for local community outreach organizations. In 2015, we will also further our efforts to engage youth in our community through hands-on garden projects that teach healthy living skills.

Unaccompanied Farmer (Brian Willemin): Established 2014

Unaccompanied Farmer is the area's premier fresh produce freedom fighter. Shade-grown greens for the salads we eat, as well as a variety of veggies raised with care at the Old Fort in Hesperus, CO.

Van Sickle Farms (Aaron Van Sickle): Established 2014

Van Sickle Farms takes a fairly simple approach to growing and selling food. While relying on time tested cultivation methods, we are still able to merge into a more progressive organic practice. Our climate offers us a 6-8 month growing period. By either fermenting or otherwise preserving food, we are able to extend the life of fresh foods, and sometimes even increase their nutritional value- naturally. Growing with excellent water and land resources out at the Old Fort Hesperus research center has enabled us to approach our local food issues by using minimal inputs and labor, all the while growing varieties of particular endemic, and nutritional value.

Wild Soul Farms (Danielle Duni): Established 2015

Wild Soul Farms provides top quality local vegetables at a fair price. Our food is grown in a manner that treats the land with care. We share education, food and love from 7600 feet in southwest Colorado. To grow vegetables and herbs to be sold locally at a profit based on fair market prices. To gain experience and learn about farming practices to further my career in agriculture and food production/marketing as part of the Old Fort Incubator Project.

High Pine Produce (Max Kirks): Established 2016

High Pine Produce believes in adding to a vibrant food system in the Four Corners while embracing local landscapes and heritages. It is our goal to provide consistently fresh leafy greens using appropriate technologies and organic farming practices. Experience the highest quality produce grown at high elevation with a touch of youthful spirit.

Alkali Gulch Farm (Candice Wood): Established 2016

As sixth generation farmers in the High Mountain Desert near Durango, CO, we produce flavorful, high-quality dryland pinto beans, wheat, sweet corn and melons. We are committed to our land, family, community and customers. To maintain the ecological capital of our soils, we use traditional farming practices including crop rotation and seed saving. We use traditional ecological knowledge of our area to produce culturally rich vegetables with the unique taste of our lands.

Farmer in Training Program: Established 2016.

Farmers-in-training (FIT) work two-three days per week, both in the Education Garden learning farming skills and co-managing a ¼ acre plot with other FITs. Crops in the ¼ acre plot may include onions, winter squash, zucchini, snap peas, green beans, potatoes, carrots, beets, kale and broccoli. FITs will also care for a small perennial plot, which may include raspberries, thyme,

lavender, garlic, and flowers. Experience in the education garden and FIT plot will range from harvesting greens to fixing drip irrigation, from planting peppers to packing CSA bags. In addition to winter educational classes, monthly informal classes will be offered during work hours, including pump maintenance, harvesting and food safety, direct seeding, and other topics with hands-on components. Learning farming skills that will support them in the future, FITs will be able to plan and run irrigation, select varieties, manage weeds, and harvest, process and market many different crops.

Program Graduates:
Mountain Roots Produce (2013): Mike Nolan
Laughing Wolf Farm (2013): Leeann Hill
Terra Nova Gardens (2013): Chris Brussat
Linger Flower Co (2014): Emily Lloyd and Audrey Preston
Axe Handle Farms (2014): Betzi Sherman
Odd Bird Farms (2014): Julia Hastings-Black
Unaccompanied Farmers (2015): Brian Willimen
Van Sickle Farms (2015): Aaron Van Sickle
Wild Soul Farm (2015): Danielle Duni

Obtain and install cooler supplies

2015: Additional shelving was placed in the cold storage building and thermometers and long term temperature monitoring devices were placed in both the walk-in cooler and the cold storage. A skid of wax boxes were purchased for the farmers to use in making their deliveries. We encouraged them to place plastic liners in the boxes as well. Plastic liners are available for purchase in the office in 25 or 100 count quantities.

The Old Fort received a grant from the Fort Lewis College Foundation to purchase food grade crates and baskets that could be used to store produce as well as make deliveries. They were very well received by our customers as well. When making deliveries to Sodexo, they could just put the crates in their walk in coolers to make deliveries go faster.

2016: Some of the wax boxes were used as CSA boxes for both the farm incubator's CSA and the Old Fort Market Garden Fall CSA. Customers returned their box each week to get a new one. We found that because the boxes were not recyclable, they were more apt to return them. We also partnered with District 9R to split a pallet of additional food grade crates. They are much more affordable when you order them in large quantities. The orders going to Sodexo have increased almost four fold so they may have 25-30 of the crates in their coolers so we needed more.

We converted a 12 x 20 dry, cold storage room to a cooler space

by adding an 24,000 BTU and a cool bot (www.storeitcold.com). We set the temperature at 45 degrees to allow for better storage of potatoes, squash and peppers. These items were taking up a lot of room in our regular cooler (39 degrees) and it was much too cold for them. We tried to store them in the root cellar but it was too warm. This space will allow us keep more produce at the appropriate temperatures.

Develop agenda for Spring work days

2015: Work days were planned for Saturday, April 25 and May 9 from 9 am until 3 pm. We planned to set up drip irrigation on April 25 since it had been so warm and then attend to more business items on May 9.

Items were purchased to build additional pressure regulators so that each 1/8 acre plot would have its own controls. Additionally, a second electric pump was purchased to service the lower ½ acre and black poly was obtained to set up the new system.

2016: Work days were planned for Saturday, April 30 and May 14 from 9 am until 3 pm with a potluck lunch on both days. In addition to building additional pressure regulators, we purchased additional black poly to extend the drip system to the lower fields.

Host work days

2015: On April 25, we had six incubators along with two members of the project team who worked on setting up the new irrigation system. In previous year, the project team had set up the systems and then trained the farmers. This year by having the farmers install the new system, it required a lot less mentoring throughout the system. The farmers built new pressure regulator, installed new pump, filter and main line for lower half acre.

On May 9 we had a snow storm and couldn't do any outside activities. We met for a couple of hours on cooperative issued and our plans for cooperative marketing. Elicia had been working with on the wholesale price list and was able to share a draft with them.

2016: On April 30 we began a cold day in the shop building pressure regulators. All of the farmers and the FITs were in attendance. With our expansion of the drip system we needed to build another six regulators. All of the materials were purchased and the farmers worked together to build them. Afterward, we moved all of the filters, main lines and headers to the field. Because our plots are various lengths, it takes a while to get them all laid out. Our next task was to take soil samples from each of the plots so we can begin individual monitoring. Our last morning task was to walk the irrigation ditch so that everyone understood where the water came from. After a group lunch, farmers worked in their individual plots.

By our second work day on May 14, all of the beds were shaped and planting had begun. We worked together to flush and test the drip irrigation system while the farmers began laying out drip tubing. We reviewed the use of impact sprinklers since they would be used to water the cover crop on the fallow plot.

Mentor incubators

2015: Max Fields and James Plate who are third year incubators and co-owners of Fields to Plate Produce provided 93 hours of mentorship to their fellow incubators. We have learned that beginning farmers appreciate the in-field mentoring and having another farmer provide it encourages cooperation.

2016: Max and James provided 68 hours of mentorship to other incubator farmers. Because three of the new farmers were FITs and mentored by Elicia, this number was reduced.

Explore alternative markets

2015: In addition to the collaborative CSA, the incubators were organized by Elicia, the marketing coordinator, to attend the Farmington, NM Farmer's market on Saturdays from August 1st until the first week of October. At our July 28 open house, Bonnie Hopkins, who assists with the market and is the San Juan County, NM agriculture agent suggested that we attend. Farmington is approximately 2500' lower than Hesperus and considerably warmers so it is very challenging for them to grow cool season crops such as greens. After hearing about how much excess mixed greens we had the last week in July, she suggested we try it out. Over the course of ten weeks, three different farmers went to the Saturday market. The Old Fort provided the transportation and paid the $10 booth fee. They utilized the tables and pop up tent from the incubator program. Sales from this market were $4,449 including $1,075 for Van Sickle Farms, $788 for Wild Soul Farms and $521 for Unaccompanied Farmer. The remaining amount was for Old Fort produce. We believe that with some additional crop planning, this could be a good market for the beginning farmers.

A second market that was expanded by Elicia was the Sodexo campus dining services. The Old Fort gardens (including incubator farmers) are allowed to sell produce to Sodexo under the campus garden clause. In 2014, Fort Lewis College signed on to the Real Food Challenge to try and source 20% of their food purchases from local, organic, fair trade, humane or ecologically sound by 2020. Purchasing product from the Old Fort can help contribute to this endeavor but there were definitely challenges to working with a large corporate company.

2016: Product was marketed at a total of four farmer's markets along with the CSA, restaurants, Country Store and Sodexo accounts. New markets included the Farmington Tuesday evening market, Cortez monthly market, Country Store retail establishment at the Old Fort and a large increase in Sodexo purchases. Because there were so many different markets, the Old Fort placed orders with farmers for produce that could be used in more than one of our markets. It eliminated the different price structures for wholesale versus retail sales and placed the burden of selling all of it away from the farmer. Feedback from new farmers indicated that they were

willing to sell their produce for less if they had a weekly order and only had to put it on a shelf in the cooler.

Once the Farmington and Cortez markets began, we began entering sales by market. Four Cortez markets yielded $1,198.50 while the 16 Farmington markets totaled $5,203 and the Country Store has sold $463 in produce. Sodexo produce sales have increased from $3,676 (Calendar Year) to $9,982 (YTD).

Give access to farmer's market supplies to first year incubators

We purchased tables, pop-up tents and banners for all of the farmers to use during the season. They were used at Farmer's Market in Durango, Mancos and Farmington. The items were kept in the office and farmers checked them out as needed. In 2016, we purchased another scale, extra batteries, recyclable bags for farm stands and made a large group purchase of produce bags.

Collect monthly production records

An electronic spreadsheet was provided to each farmer to record production records by month. They were asked to provide at least the product and weight but could also include market outlet. Each farmers used different methods to collect the records in the field. Some used printed copies of the spreadsheet, others used invoice records and load sheets for farmers markets.

Production totals for incubator farmers by year:

Farm	2015 Acreage	2015 Production (pounds)	2016 Acreage	2016 Production (pounds)
Fields to Plate Produce	1.75	26,990	2.25	25,000
Giving Back Garden: 4-H	.125	2,174	.125	1,500
Van Sickle Farms	.1875	2,841	NA	NA
The Unaccompanied Farmer	.1875	703	NA	NA
Wild Soul Farms	.0625	924	NA	NA
Alkali Gulch	NA	NA	.0625	500
High Pine Produce	NA	NA	.25	2,097
Farmer in Training	NA	NA	.25	3,062
Totals:	2.3125 acres	33,632	2.9375 acres	32,159
Average Pounds/acre		14,543		10,948

Farmers submitted their production numbers and an Access database was used to calculate final production values per farmer, per acre and per crop. Weights per farmer may vary due to the type of crops that are grown. For example, in 2015 The Unaccompanied Farmers grew primarily greens (lettuce, arugula, spinach) which are higher value crops verses others that grow root crops.

Farm	**Primary Crops (by weight)**
Fields to Plate Produce	Beets, Carrots, Potatoes, Onions
Giving Back Garden	Pumpkins, Potatoes, Greens, Beans
Van Sickle Farms	Cabbage, Beans, Radishes
The Unaccompanied Farmer	Mixed greens, Arugula, Spinach
Wild Soul Farms	Snap Peas, Peppers, Greens
Alkali Gulch	Melons
High Pine Produce	Salad mix, Head lettuce, Kale, Kohlrabi
Farmer in Training	Winter squash, Potatoes, Carrots

Collect monthly sales records

During the summer season, farmers record production numbers and their markets. They utilize both hand records and a provided spreadsheet to compile these records. For those selling root vegetables, farmers provided sales records for the off-season sales associated with utilizing the root cellar and walk-in coolers. Those farmers that reapply to the program a are ask to provide a profit/loss for the year.

Coordinate incubator space in coolers and root cellar

2015: Farmers began using the walk in cooler in July and the root cellar in mid-September. They also have access to a cold storage space that allows them to store peppers, onions and other vegetables that do better in a 50 degree environment. Farmers are charged $25/month to use the coolers and $50/bay/month to use the root cellar. Up until November 15, the cooler had been used for 17 incubator-month and the root cellar had been used for seven incubator-months.

It would be very challenging for this program to produce the amount of summer produce we do without these coolers. With the new food safety upgrades, the spaces are cleaner, more organized and definitely better utilized.

2016: We had product in the root cellar until March and stored onion starts and seed potatoes in April and May so the root cellar was definitely used a lot. The first fall crops went into the cellar in August and by mid-October it had approximately 40,000 pounds of potatoes (30,000 from regional farmers), 7,000 pounds of beets, 8,000 pounds of carrots, 2,000 pounds of onions, 1000 pounds of winter squash and a couple hundred pumpkins.

We had the use of two coolers that were held at different temperatures. The smaller cooler was set at 39 degrees and was very full on Thursdays and Fridays as farmers harvested for Saturday markets. With the scheduled restaurant and Sodexo deliveries that were made by Old Fort Market Garden marketing on Friday as well, we were outgrowing the 10 x 10 cooler space. We had a second dry cooler space (12 x 20) that was converted to a second cooler in August by adding a cool bot unit. It was set at 45 degrees and was soon full of peppers, potatoes, squash and pinto beans.

Since, November, 2015, the cooler was used for 37 incubator-month and the root cellar had been used for 35 incubator-months.

Host Field Day

2015: For the first two years of the program, we hosted an independent field day to promote the incubator program. However, in 2015, we decided to host an Open House to showcase all of the projects at the Old Fort Open House. We advertised the site wide event and had five different stops available for participants during the 1 pm to 6 pm event. We had over 50 people register at the different stops and many of the farmers were in attendance to visit with those that were interested. In addition to the Open House, we have hosted several tours during the growing season. These tours included a large group of Western Sustainable Agriculture Research and Education (WSARE) Professional Development Program participants, San Juan College Horticulture students, Colorado agriculture extension agents and other community groups.

2016: Our field day was during the Old Fort Open House on July 28, 2016. In addition to offering tours at the different projects, we had the grand opening for our Country Store and offered a concession stand that featured Old Fort Products including hamburgers, grilled vegetables and an amazing salad featuring produce from many different farmers. We had over 100 people attend and estimated that 75% of them were new.

Distribute incubator applications and select 2016 incubator applicants

2015: New applications were made available in mid-November for 2016. It was emailed to a list serve of potential incubators, posted on Facebook and placed on our website (www.tinyurl.com/OFIncubator)

2016: For the 2016 growing season five farmers (three businesses) were selected to return and four new farmers (three businesses) were accepted into the program. Along with two local growers who were selected to participate in the program, nine farmers began the training in late January. By mid-March, one of the businesses (two farmers) decided that they wouldn't be able to complete the season. Because we had already sold almost 30 CSA memberships, we brainstormed ideas on how to meet the produce demand with the farms we had. It was decided that we would pilot test a Farmer in Training program (FIT) where Elicia would develop the crop plan, FLC would purchase the supplies, the FITs would be paid minimum wage (plus benefits) for up to 64 hours a month and FLC would market all of the produce. By the end of the season, the FITs had been paid for 767.5 hours ($7557.84) and their produce had been valued at $7,599.50. While these program costs did not include staff time or supplies, we believe it was a

good pilot year. Next year, we'll include the FIT in the winter training and that should help with some of the issues we had this year.

Project Approach: Significant Contributions and Role of Project Partners

Beth LaShell, Coordinator, Old Fort at Hesperus - As project director, I was responsible for maintaining the application process, coordinating educational programming, supervising the marketing coordinator and resolving conflict. I continue to be active in the National Incubator Farm Training Initiative (NIFTI) by participating in their webinars, attending the yearly field school and currently serve as the Southwest regional convener. This initiative (http://nesfp.nutrition.tufts.edu/resources/nta.html provides technical assistance and networking opportunities for managers of similar programs throughout the U.S.

Additionally, I serve as the trustee for the Old Fort Market Garden Cooperative by completing legal requirements such as registering with the state and filing income tax.

I meet individually with each incubator several times during the year to finalize crop plans, procure production records and receive input on how the program is going.

Gabe Eggers, Garden Manager at Twin Buttes Gardens - Assisted with incubator selection and delivered educational materials during winter 2015 classes. Gabe moved to Washington in March, 2015 and was unable to continue to work with the project.

Mike Nolan, Mountain Roots Produce - Assisted with incubator selection, developed and delivered educational materials, initial field setup, assisted with hands-on work days and upgrading irrigation system. Mike was an active project team member and was available if farmers had questions on irrigation systems, weed management, equipment operations, post-harvest handling and product marketing.

Darrin Parmenter, LaPlata County Horticulture Agent - Assisted with incubator selection, developed and delivered educational materials for winter classes, advertised and promoted via his Colorado Master Gardener and Backyard Food Production participants. He has also assisted producers with disease identification and management.

Elicia Whittlesey, Old Fort Education Garden Manager – Assisted with marketing coordination for the collaborative CSA as well as wholesale distribution of product to several new outlets. She communicated with both farmers and buyers to plan, harvest and deliver food to four farmer's markets and numerous restaurants. During the winter Elicia delivered educational materials on marketing and succession planting. In 2016, she was instrumental in developing and supervising the Farmer in Training program.

Goals and Outcomes Achieved

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase number of new beginning farmers at OFMGI	The number of new farmers who begin season	4	1	5	4 in '15 4 in '16

In 2015, we only had one new farmer in the program but in 2016, we had two new farmers and three Farmer in Training participants. We believe that the FIT program will increase the number of applicants to our program.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase number of successful beginning farmers at Old Fort Market Garden Incubator	The number of farmers who begin season	8	8	9	11 in '15 15 in '16

While we only had one new farmers, we had 7 returning farmers in 2015. This included a couple of the farmers adding a partner to assist with their plot. In 2016, we had four returning farmers, two new ones and three Farmers in Training. We believe that the FIT program will help us increase the number of successful farmers.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To provide appropriate curriculum and hands-on trainings to all incubators	Record attendance at winter sessions and spring trainings	95%	95%	75%	100% in '15 100% in '16

2015: We had good attendance at our winter training and the participants appreciated the hands-on learning aspect to each of the sessions. Our local 4-H agent also made sure that one of his leaders that would be working with the program was also in attendance.
2016: Our overall attendance went down because our Farmers in Training were not selected until mid-March so they were unable to attend the first half of our sessions. However, we did offer the course to two local land owners who have their own market garden businesses.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the number of farmers who create a Food Safety Plan	Submission of food safety plan	33%	75%	75%	100% in ‘15 100% in ‘16

With the shared land and infrastructure, it is more challenging for the farmers to create an individualized food safety plan. We provide the farmers with GAP guidelines that need to be followed in the field and in post-harvest handling.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the number of farmers who complete crop plans	Submission of crop plan	0%	100%	100%	100% in ‘15 100% in ‘16

All farmers completed their crop plans.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the number of marketing channels for beginning farmers	Submission of monthly production records	3	8	11	5 in ‘15 6 in ‘16

Marketing channels in 2015 included Old Fort Farm Stand, Old Fort CSA, Sodexo, Farmington Farmer’s Market and seven restaurants/wholesale outlets (Kennebec, The Box, Carvers, Blue Lake Ranch, Raider Ridge Cafe and Durango Natural Foods) coordinated by Marketing coordinator. In 2016, we added Farmington Tuesday Farmer’s Market and a monthly Cortez Farmers Market during the summer and Sodexo increased their produce purchases beginning in August.

Individual farmers had additional wholesale and retail outlets (Yardbird Eatery, Seasons, Cyprus, EarthGirls, Nature’s Oasis, Juice Bar, El Moro, Four Seasons Winter Market, Mancos Market, and District 9R Schools) as well as a multi-farm CSA run by two of our producers

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the amount of produce marketed in off season (Nov-Feb)	Submission of monthly sales records	0%	20%	20%	5% in ‘15 10% in ‘16

On November 15, 2015, there was approximately 16,400 pounds of product in the root cellar that was marketed in Fall 2015/Winter 2016. Most of the product belonged to Fields to Plate Produce as they are more established farmers and grow a lot of root crops. The Giving Back Garden stored pumpkins, winter squash and potatoes during October. Produce was marketed until March, 2016 from the 2015 growing season amounting to a 20% increase. Sales figures show that approximately $30,000 of sales occurred between November and March

On November 15, 2016, there is over 45,000 pounds of product in the root cellar that will be marketed in Fall'16/Winter '17. It includes 35,000 pounds of potatoes, 7,000 pounds of beets, 8,000 pounds of carrots, 2,000 pounds of onions, 1000 pounds of winter squash and a couple hundred pumpkins. Farmers that used the root cellar include Fields to Plate Produce (beets, carrots, potatoes), High Pine Produce (18,200 pounds of potatoes from regional farming partner), Alkali Gulch (pumpkins), FITs (acorn, delicata, blue hubbard, pumpkins, onions and potatoes), Education Gardens (onions and winter squash) and Mountain Roots Produce- former incubator (16,000# potatoes). We are just beginning our off season but with the amount of produce we have stored in the cellar, I would anticipate an additional 20% increase in off-season sales.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the visibility of Old Fort Market Garden Incubator	Host one open house/year	1	1	1	1 in '15 1 in '16
To increase the visibility of Old Fort Market Garden Incubator	Develop and distribute promotional material to incubators	0	8 farmers received promotional materials	9 farmers received materials	10 in '15 15 in '16

Attendance for the open house was nearly 100 in 2016 with about 75% of them new people. We featured Old Fort product in the country store and the concession stand that was held during the open house.

We have definitely created a brand identify for the Old Fort Market Gardens. The combination of the shirts, bags, stickers, signs and produce labels has put our name in front of a lot of people the last two years.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To increase the utilization of marketing enhancements	Record number of incubator: months using the root cellar	0	7 incubator -months as of 11/1/15	35 incubator months as of 11/1/16	6 in '15 12 in '16
To increase the utilization of marketing enhancements	Record number of incubator: months using coolers	0	17 incubator months as of 11/1/15	37 incubator months as of 11/1/16	20 in '15 30 in '16

In 2016, eight different farmers used the root cellar for at least two months while one group utilized it for seven months. Cooler use also increased to six months out of the year with every farmer using it at least three months. With the addition of the larger cooler and its higher temperature (45 degrees), it was able to store potatoes, peppers, tomatoes, beans and other products that won't last in a colder cooler or warmer root cellar.

Desired Outcome	Performance Measure	Benchmark	Actual-2015	Actual-2016	Target
To develop pilot cooperative CSA	Record amount of produce marketed through CSA	0	1080#	5,972#	500# in '15 1000# in '16

Using the Member Assembler program we are able to total the weights of the produce that was supplied between July 1 and November 19 to both our Summer CSA and the Fall-Season Extension CSA. Customers received on average six pounds of produce in various forms (pounds, bunches, each) including value added item such as pickles and sauerkraut in the Fall, 2015. For 2016, we had 40 members who subscribed to the regular (16 weeks) or high season (10 weeks) CSA between June and early October. Additionally, we had 20 members who signed up for a monthly delivery in October, November, December, and January where they each received approximately 20 pounds of produce each of these months.

Figure 1: Fields to Plate Produce is 2nd in the first annual HawkTank competition in Spring, 2016

Beneficiaries

This project has definitely benefitted our beginning farmers by providing access to pertinent education, equipment and in-field mentoring that is critical to the success of their fledgling businesses. With the marketing assistance and access to storage facilities, they have enhanced their ability to market product during and after the growing season. At 7,600 feet we can grow

a lot of root crops but often encounter a saturated market at harvest. By upgrading the Old Fort's 1,500 square foot root cellar with temperature and humidity monitors, automated fans, bay dividers, storage shelves and rodent proofing, we've been able to store crops into April. This storage option alone has allowed our producers to diversify their income and command a higher price once other growers are sold out of product. The availability of two walk-in coolers allow our participants the ability to higher quality product to their customers for a longer period of time and a higher premium. We made basic farmer's market supplies (tents, tables, scales, boxes) available to incubators and encouraged them to attend markets when we are selling their produce. The cooperative CSA has been highly successful and utilized nearly 6,000 pounds of produce in 2016 alone.

The promotional materials developed over the past two years has allowed our program to grow in name recognition. Additionally, it is used to meet food safety requirements by identifying our produce using twist ties, market signage and labels.

The designation of a marketing coordinator has allowed the beginning farmers to concentrate on growing product. It has also been an excellent promotional tool since more people are seeing our logo and produce. Elicia has done a remarkable job with not only the CSA but also by adding additional market opportunities. We have also learned that it is much more than a five hour a week job to coordinate and market all of the produce!

Since our program began in 2013, we have had a total of 27 individuals who completed the winter education series. Of those 19 participants successfully completed the field season representing 15 independent businesses. Eleven of those participants have graduated from the program and 72.7% of them are still involved in farming.

The economic impact of producing nearly 70,000 pounds of product in the last two years alone is astounding. Even at $2/pound, that is a significant contribution to the local food economy in Southwest Colorado. It is difficult to quantify the number of people who have been affected by consuming this bounty.

In addition to training farmers, we are creating businesses and respect for a trade that seemed to be growing out of favor. Small scale farming is hard work and very challenging to make a livable wage at. However, you can't deny the passion for producing food that our beginning farmers have shown us and the community. This Old Fort Market Garden Incubator program will continue to provide an opportunity for participants to farm with a safety net that allows them to explore the profession in a supportive and cooperative environment.

Lessons Learned

During this second phase of the incubator farm development here at Hesperus, we made some big strides in marketing and promotion while still maintaining the integrity of the program. Our project team had some major changes since 2014 but we were fortunate to bring on even stronger individuals with a passion for this program. We continue to learn lessons every day from both an administrative and participant perspective.

As the project director, I have been sharing our model with other programs in the state and region. It is very challenging to convince them that they need to get so many different systems and infrastructure in place before accepting farmers. Our continued involvement with NIFTI has allowed us to learn from others across the country as well as promote regional programs.

From a manager standpoint, here are some observations and lessons learned:

- After infrastructure development, marketing support and program promotion should be the next priority
    - You can not underestimate the impact of positive promotion
    - With the addition of the marketing manager, we have doubled the produce that is marketed under the Old Fort Market Garden logo
- Incubator farmers can become very dependent on the services and facilities provided
    - Ensure they understand the value they are receiving in the program
    - Be transparent on how much upgrades cost
    - Don't feel bad about protecting your investment (soil, equipment, name)
        - Farmers still break things and most are unable to perform maintenance
    - Enacting food safety guidelines is challenging
    - Assist farmers with transition to new land but don't put yourself or your program in the middle of a lease arrangement
- It is very challenging to fiscally staff a small program
    - Utilize more experienced farmers in the program as mentors
    - Spend staffing money on marketing and promotion rather than micro-management
    - Farmers need to learn to work cooperatively

Some observations about and from our participants:

- Not all beginning farmers come to us with enough experience to start their own business
    - 2016- Piloted a Farmer in Training program that was very successful. Two of the three participants applied in 2017
- They appreciate help with marketing once the season gets intense
    - They may not be interested at the beginning of the season
- There is a lot of information presented during winter trainings
    - Need more hands-on activities to help them remember
- Work days and monthly meetings should be mandatory
    - Summer meetings are very challenging to schedule
- Most of them live at least 20 minutes away and want to live on the property
    - Very difficult to be their mentor and their landlord so most programs do not allow this
- Once the first couple of harvests are finished, they calm down considerably
- The end of the season is a very stressful time, especially if they are growing late season crops.

As we finish our fourth year, we continue to have amazing support from the community and local farmers. We are fortunate that they do not see the incubator farm program as a direct competitor which has resulted in building some great relationships. In addition to promotion,

the bags and labels have helped us become more compliant with food safety regulations. We will continue to work toward developing a solid food safety plan.

Contact Person

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Additional Information

Information continues to be uploaded to the Old Fort at Hesperus website (http://www.fortlewis.edu/oldfort/CurrentProjects/MarketGardenIncubator.aspx)
Edible San Juan, a regional magazine highlighting local food activities: Fall, 2012 (page 5)
http://issuu.com/sunnyboypublications/docs/fall_2012

Durango Inside TV: July, 2014
http://www.youtube.com/v/7jIa0qnKxUI?version=3&start=594&end=738&autoplay=0&hl=en_US&rel=0

August, 2015: Rogers Mesa Feasibility Study- Farm Incubator
http://www.deltacounty.com/DocumentCenter/View/9067

September, 2015: Old Fort Farm Stand
http://www.4cornerstv.com/episodes_by_tag/durango/old-fort-farm-stand

October 2015: The Independent (FLC Newspaper)- Old Fort Farm- Our gateway into student grown produce
https://www.theindyonline.com/Community/ArtMID/17651/ArticleID/1147510.aspx

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http://www.governorsagforum.com/speaker-biographies1.html

March 2016: Old Fort lives on as regional learning center
https://www.fortlewis.edu/news/FullStory/ArtMID/23759/ArticleID/1148126/Old-Fort-lives-on-as-regional-learning-center.aspx

KSJD- Big Fat Farm Show, April 2016 with Candice Wood on Incubator program
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Durango TV: Follow your food
https://www.facebook.com/durangotv/videos/10153662579876143/

A day in the life of Fields to Plate Produce: September 2016
https://www.youtube.com/watch?v=jfjpY97vuoc

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https://www.youtube.com/watch?v=UyVx1oQQNkk&t=22s

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http://www.durangoherald.com/article/20121109/NEWS01/121109507/0/SEARCH/Wanted:-New-farmers-to-work-on-fertile-land

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October, 2013: http://www.durangoherald.com/assets/pdf/DU14229897.pdf

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http://www.durangoherald.com/article/20140715/NEWS01/140719742/0/SEARCH/Farm-incubator-open-house-set-for-this-month

July 28, 2014:
http://www.durangoherald.com/article/20140728/NEWS01/140729592/0/SEARCH/Open-house-for-those-interested-in-growing-marketing-crops

April 2, 2014: Gardening with kids
http://www.durangoherald.com/article/20140402/COLUMNISTS05/140409909/0/SEARCH/Gardening-with-kids

August 9, 2014: Ag Tour promotes local growers
http://www.durangoherald.com/article/20140809/NEWS01/140809567/0/SEARCH/Ag-tour-promotes-local-growers

August 27, 2014: Rooting for a farm business
http://www.durangoherald.com/article/20140827/NEWS01/140829570/0/FRONTPAGE/Rooting-for-a-farm-business

September, 2014: Harvest riches at Giving Back Garden
https://durangoherald.com/articles/78998-4-h-x2019-ers-harvest-riches-at-giving-back-garden

November, 2014: Class offered for farmers in training
https://durangoherald.com/articles/82542-class-offered-for-farmers-in-training

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https://durangoherald.com/articles/88639-extend-your-growing-season

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https://durangoherald.com/articles/88998-giving-back-garden-highlights-power-of-local-food

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https://durangoherald.com/articles/96436-produce-bounty-at-4-h-harvest-fest

February, 2016: Young Farmers in LaPlata county face expensive, dry future
https://durangoherald.com/articles/101695-young-farmers-in-la-plata-county-face-expensive-dry-future

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https://durangoherald.com/articles/101325-always-in-season

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http://www.farmtotablenm.org/wp-content/uploads/2013/01/2014-Organic-Conference-program-FINAL-lo.pdf

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https://durangoherald.com/articles/103733-hawk-tank-entrepreneurs-innovation-central-to-boosting-southwest-colorado-x2019-s-economy

May, 2016: Giving Back Garden
https://durangoherald.com/articles/105067-4-h-grows-bountiful-garden-strong-character

June, 2016: Durango to Denver Exchange visits Giving Back Garden
https://durangoherald.com/articles/106107-4-h-adventure-unites-rural-urban-young-people

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https://durangoherald.com/articles/109411-la-plata-county-4-h-members-succeed-at-colorado-state-fair

October 11, 2016: Reliable Roots
https://durangoherald.com/articles/110540-reliable-roots

November 22, 2016: 2017 Applications:
https://durangoherald.com/articles/116571-applications-available-for-2017-growing-season

Pagosa Springs Community Development Corporation:
http://pagosaspringscdc.org/hesperus-old-fort-market-garden-incubator-program/

Facebook Pages:
Old Fort at Hesperus https://www.facebook.com/oldfortathesperus/
Recruitment Event Page: https://www.facebook.com/events/357212231288895/
Fields to Plate Produce: https://www.facebook.com/fieldstoplateproduce
Linger Flower: https://www.facebook.com/LingerFlowerCo
Mountain Roots Produce: https://www.facebook.com/pages/Mountain-Roots-Produce-LLC/248116841888109

Laughing Wolf Farm: https://www.facebook.com/laughingwolffarm
High Pine Produce: https://www.facebook.com/HighPineProduce/
LaPlata County 4-H: https://www.facebook.com/La-Plata-County-4-H-335611536629842/

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http://www.bizapedia.com/co/OLD-FORT-MARKET-GARDEN-COOPERATIVE.html

Local Harvest Bio page:
http://www.localharvest.org/the-old-fort-at-hesperus-M63572

San Juan RC &D Annual Report (fiscal agent for cooperative):
http://sanjuanrcd.org/blog/wp-content/uploads/annual-report-4-page.pdf

Westwood One:
http://blogs.westword.com/cafesociety/2014/08/colorado_proud_lunch_highlights_state_agriculture_including_fields_to_plate_beets.php

Denver Post:

August, 2014: Colorado Proud Lunch- the beets rock
http://m.bizjournals.com/denver/blog/earth_to_power/2014/08/colorado-proud-luncheon-showcases-the-state-of.html?r=full

August, 2016: Farmers use new tools to teach public about Agriculture industry
http://www.denverpost.com/2016/08/29/colorado-farmers-use-new-tools-teach-public-about-agriculture-industry/

Final Report: International Contractor and International Support for Colorado Companies at PMA 2016
Partner Organization: Not applicable. This project was implemented by the Colorado Department of Agriculture.

Project Summary

The Colorado Department of Agriculture (CDA) hired a Mexican contractor to recruit buyers from Mexico to visit our companies and bring in an international element to the Produce Marketing Association's (PMA) Fresh Summit Expo held in Orlando, Florida, October 14-16, 2016. CDA targeted Mexico because it remains Colorado's largest export market for produce.

As part of the larger Colorado presence at PMA, the international aspect of the show created contacts with international buyers for the Colorado companies who participated in the Colorado Pavilion.

Project Approach

The PMA international initiative was to locate and contact the top produce importers and retailers in Mexico to determine their interest in U.S. produce and inform them of Colorado's offerings and bring them to visit the Colorado Pavilion. CDA worked with CDA contractor located in Mexico to identify buyers and draw them into the Colorado Pavilion.

Prior to the PMA show, the CDA contractor contacted approximately 250 Mexican produce buyers and invited them to participate in arranged meetings and visit the Colorado Pavilion at the PMA trade show. Of the buyers contacted and confirmed that they were attending the show in Orlando, Florida a total of 11 were interested in pre-scheduling meetings with Colorado companies at the Colorado Pavilion. A few buyers committed to stopping by the booth without committing to a scheduled time. CDA worked with companies participating in the pavilion to inform them about the opportunities of meeting with Mexico buyers during the show.

During the trade show, the CDA contractor was onsite to assist in pre-arranged meeting times, translation and calling all Mexican buyers who had previously confirmed. In addition to buyers contacted prior to the show, the contractor found more buyers from Mexico at the show and brought them to the Colorado booth to meet with Colorado companies. A total of 40 meetings took place at the Colorado Pavilion over the two days.

Following the event, CDA and the CDA contractor continued to work with both buyers and producers to help with communications and other requests and increase sales to Mexico.

Goals and Outcome Achieved

Goal	Performance Measure	Benchmark 2015	Target 2016	Actual 2016
Create contacts with international buyers with Colorado Pavilion	Number of buyer/seller meetings	177	185	40

exhibitors				
Percent of companies/organizations who sell wholesale reporting an increase in existing business or believe they will develop new international business as a result of participating in PMA*	Post event exhibitor survey	70%	75%	50%

* Some PMA exhibitors such as the Colorado Potato Administrative Committee and the Fruit and Vegetable Growers Association do not sell wholesale but make referrals and provide information on the Colorado industry to buyers.

We are unsure why there is such a great divergence in benchmark and actual numbers for contacts. We believe that meetings were counted and compiled differently in 2015. Organizers and participants were satisfied with the number of meetings.

We did not meet our goal for companies who expect to increase sales; however, not all companies participated in the survey despite repeated reminders.

Beneficiaries

This exhibit directly benefited the six companies who attended the show as well as the three associations that represent Colorado's produce industry. Stakeholders who support and benefit from this project consist of specialty crop organizations that represent multiple farms such as Colorado Potato Administrative Committee, Rocky Ford Growers Association, the Colorado Fruit and Vegetable Growers Association and Colorado Proud.

Lessons Learned

Mexican produce buyers are interested in expanding their produce portfolios by working with US companies and in particular finding new product in Colorado.

Mexican buyers are impaired by current high exchange rates making Colorado appealing due to the geographic logistical advantage.

Spanish promotional materials for the companies would be a good idea for future shows.

Colorado continues to be impaired by restricted access to the interior of Mexico for fresh potatoes, limiting the amount able to export.

Comments from contractor and Mexico buyers:
- When is the border going to be open for potatoes?
- Current onion prices and volumes available
- Not interested in organic products
- Interested in learning about fruits and vegetables offered in Colorado
- Not acquainted with logistics from Colorado

Colorado participants greatly appreciated the availability of translation services from our contractor.

Contact Person

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Final Report: Promoting Colorado Produce Using the Colorado Proud Logo
Partner Organization: Not applicable. The Colorado Department of Agriculture managed this project.

Project Summary:

The Colorado Department of Agriculture (CDA) promoted Colorado fruits and vegetables in summer 2015, utilizing the Colorado Proud logo, through two public relations efforts. Colorado Proud developed the "Choose Colorado" Pop-Up Picnics and Produce Challenge public relations campaigns to educate consumers across the state about Colorado specialty crops and encouraged them to "ReFresh With Local Produce." *Colorado Proud* builds on current "buy local" trends, supports local market systems, and positions the Colorado specialty crops industry to expand distribution channels and increase sales.

The purpose of this project was to continue to educate consumers, retailers and restaurants about the wide range and availability of Colorado specialty crops. This year's project complemented previous years' work by strengthening the Colorado Proud message as it pertains to produce. Our project goal was to increase the consumer's connection to Colorado produce labeled with the Colorado Proud logo.

Project Approach:

Since its inception by the Colorado Department of Agriculture in 1999, Colorado Proud has served as the state's primary program to promote food and agricultural products that are grown, raised or processed in Colorado. The program is a great fit with the Colorado consumer's desire to buy local produce. Surveys, as recently as September 2015, have found that more than 90 percent of Colorado consumers would be more likely to buy food that was produced in Colorado than outside of the state.

Colorado produce growers Amy Kunugi (potatoes, vegetables) and Michael and Ronda Hirakata (melons) join the Colorado Proud team at a Pop-Up Picnic event at the Dave Matthews Band Concert.

Specialty Crop Block Grant funds helped to implement two new public relations campaigns in the summer of 2015 aimed at encouraging consumers to "Choose Colorado" and emphasizing Colorado's fresh fruits and vegetables. SCBGP funds were only used to promote specialty crops.

The total SCBGP project budget was $141,441.92 ($41.92 unspent) with matching funds (cash and in-kind) for the project totaling $56,956.88.

Colorado Proud contracted with Philosophy Communication in Denver to develop a public relations campaign to promote Colorado produce to residents across the state. The original proposed campaign theme was "Eat Colorado Produce." However, after extensive discussion and analysis,

the team decided to keep the "Choose Colorado" theme from 2014's successful efforts and add the tagline "ReFresh with Local Produce." These campaign themes proved very effective, especially with social media messaging.

Although Colorado Proud promotes all food and agricultural products that are grown, raised or processed in Colorado, the focus of the 2015 public relations campaign was solely on promoting Colorado produce. Costs associated with promoting non-specialty crop products were covered by cash and in-kind contributions. Specialty Crop Block Grant Program funds were used to solely enhance the competitiveness of specialty crops.

Pop-Up Picnics

The Pop-Up Picnic event series was a summer long community-to-community public relations campaign to celebrate specialty crops grown in Colorado and educate consumers about the benefits of buying and eating local produce. The picnics recognized consumers' on-the-go summer lifestyles, and offered a new way to experience the picnic utilizing local produce.

More than 4,000 produce samples were provided during 20 Pop-Up Picnic events.

The Picnics began on May 16, 2015, and ran through September 5, 2015, taking place at 20 festivals, farmers' markets, grocery stores and concerts. Colorado Proud partnered with Safeway, Thorntonfest, South Pearl Farmers' Market, Aurora KidSpree, Broomfield Farmers' Market, Grand Junction Farmers' Market, May Farms, Fiddler's Green Amphitheater, City Park Jazz, Bands on the Bricks, Highland Square Farmers' Market, History Colorado, Boulder Farmers' Market, Palisade Peach Festival and Colorado State University Agriculture Day to educate consumers about locally grown produce, the importance of buying local produce and its impact on the state's economy.

At several picnic events, Colorado produce growers were available to answer questions and educate the public about picking and preparing fruits and vegetables. Farmer engagement (and free produce samples) was the most popular feature at the picnics.

Pop-Up Picnics Fun Facts:

- The Pop-Up Picnic campaign directly reached more than 16,000 Coloradans and indirectly reached more than 3,546,000 people.
- Secured 72 media placements about the Pop-Up Picnics and Colorado produce, with an estimated media value of $282,634.00.
- Media reached an estimated 33,074,274 viewers/readers.
- Secured 78 calendar listings announcing the Pop-Up Picnic events, with an estimated media value of $20,927.89 and reaching an estimated 359,865 viewers/readers.

- Social media organically reached an estimated 30,112 viewers and reached a total estimated 130,921 viewers.
- The Colorado Proud Facebook page increased by 270 likes between May and August.

Produce Challenge entries were creative, with this Colorado flag made from Colorado produce by Jessica Fischer.

Produce Challenge

The Choose Colorado Produce Challenge was an online photo contest to showcase and celebrate specialty crops grown in Colorado and educate consumers about the benefits of buying and eating local produce. Consumers were tasked with completing Colorado produce-based challenges and subsequently uploading photos of completed challenges on the Choose Colorado Blog, www.choosecoloradoblog.com. Some of the contest challenges included finding Colorado produce at grocery stores and farmers' markets, cooking a farm-to-fork meal using fresh produce and visiting produce farms across the state. Two winners were selected—one for completing the most challenges and one for acquiring the most public votes on submitted challenge photos.

The Produce Challenge began on August 1, 2015, the state's birthday, and ran through the month of August in conjunction with Colorado Proud Month. Colorado Proud partnered with Safeway to educate consumers about locally grown produce, the importance of buying local and its impact on the state's economy.

Produce Challenge Fun Facts:

- The Produce Challenge directly reached more than 1,000 Coloradans and indirectly reached more than 220,312 state residents.
- Participation via Choose Colorado Blog:
  - 57 Entries
  - 823 Votes
- Secured 43 media placements about the Produce Challenge, with an estimated media value of $132,000.00.
- Media reached an estimated 21,556,068 viewers.

Goals and Outcomes Achieved

Combined, the Pop-Up Picnics and Produce Challenge directly reached an estimated 17,000 Coloradans and indirectly reached an estimated 3,766,312 people. The campaign secured 115 media placements, with an estimated media value of $436,028.00. Media reached nearly 55 million viewers/readers.

Desired Outcome	Performance Measure	Benchmark	Target	Actual
To increase the consumer's connection of Colorado produce and Colorado Proud.	Percent of consumers reporting desire to purchase Colorado produce with the Colorado Proud logo.	66%	75%	66%

Beneficiaries

The Pop-Up Picnic events and Produce Challenge benefited the more than 200 Colorado Proud members that are specialty crop producers and the nearly 400 restaurant, retailer, school and farmers' market members selling Colorado specialty crops. (No SCBGP dollars were used to promote non-SCBGP products.) Produce associations, and their members, such as the Rocky Ford Growers Association, Colorado Fruit & Vegetable Growers Association and Colorado Potato Administrative Committee also benefited from this project. Overall, the program benefited all Colorado produce growers as consumers were encouraged to buy Colorado produce wherever they shopped and dined.

Lessons Learned

Although the numeric goal was not achieved (statistically, with margin of error, remaining flat from the 2014 result of 71%), this project was an absolute success. The media attention received for both components of the campaign and the direct and indirect communication with consumers were overwhelmingly positive. In addition, overall awareness of the Colorado Proud logo by Colorado consumers remains strong at 86%. The 2015 public relations campaigns effectively educated Colorado consumers about selecting, buying and preparing local produce.

Survey results did lead us to look at the semantics of survey questions. We currently ask "Do you purchase more Colorado produce if it's labeled with the Colorado Proud logo?" Our goal with this question is to not determine if consumers purchase "more" quantity of produce, but rather if they are "more likely" to select produce with the Colorado Proud logo. We may slightly adjust this question in future surveys to make it clearer to consumers.

Although the Produce Challenge received great media attention, consumer participation in the contest was disappointingly low. Our goal was to have 100 entries, but the actual entries totaled 57. Despite heavy promotion of the activity and outstanding media attention, consumer engagement was limited. The rules our state agency requires contestants to abide by may be a barrier to entry. We have found that contests, in general, are not as effective as other public relations efforts.

Contact Person

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Additional Information

- Pop-Up Picnics Recap Video

2015 CHOOSE COLORADO CAMPAIGN REPORT

115
TOTAL MEDIA PLACEMENTS
+ 78 CALENDAR LISTINGS

54,990,207
ESTIMATED TOTAL MEDIA REACH

$436,028
ESTIMATED TOTAL MEDIA VALUE

GOALS
- EDUCATE COLORADANS ABOUT LOCALLY-GROWN SPECIALTY CROPS

SOCIAL MEDIA

ORGANIC REACH: 30,112

TOTAL REACH: 130,921

PRODUCE CHALLENGE

57 ENTRIES

823 VOTES

20 POP-UP PICNIC EVENTS

4,000 SAMPLES EATEN

5,750 MATERIALS DISTRIBUTED

2,200 MILES DRIVEN

CONSUMERS REACHED

DIRECT: 17,000

INDIRECT: 3,766,312

POP-UP PICNICS TOOK PLACE IN AURORA, BOULDER, BROOMFIELD, BYERS, DENVER, FORT COLLINS, FRISCO, GRAND JUNCTION, GREENWOOD VILLAGE, PALISADE, THORNTON

Final Report: Colorado Pavilion at the 2015 Fresh Summit Expo
Partner Organization: Not applicable. This project was implemented by the Colorado Department of Agriculture.

Project Summary

The Colorado Department of Agriculture (CDA) partnered with 13 produce associations, companies, growers and handlers in Colorado to exhibit at the Produce Marketing Association's (PMA) Fresh Summit Expo held in Atlanta, Georgia, October 22-24, 2015. The Colorado Pavilion at PMA, which is the largest produce expo in the United States, increased exposure and sales potential of specialty crops for companies throughout Colorado. The CDA helped 13 Colorado companies or associations to gain a national and international buying audience through attendance at the Fresh Summit Expo, thus increasing awareness of Colorado as a reliable supplier of fruits, nuts and vegetables.

Project Purpose

Formed in 2008, the Colorado Pavilion began with only two associations and three growers. The 2015 Colorado Pavilion had 13 growers and/or associations of cantaloupe, potatoes, seed potatoes, sweet corn, dry beans and pulses, onions, mushrooms, chiles, packaged nuts and specialty crop juices. The CDA Pavilion covered 16 booth spaces, with three booth spaces being reserved for the CDA and "new to market" exhibitors who hadn't attended PMA before and who were given the chance to be a part of the Pavilion with a mini-booth at no cost.

Past exhibitors have recognized that continuous participation in this show is critical to maintaining and expanding their market share in the produce sector. Continual participation as an exhibitor is imperative, as the show's location rotates to different regions of the United States, thus providing opportunities to reach new buyers on and off the show floor. Several exhibitors remarked that this was the best PMA for making connections with buyers they had attended in recent years.

This project built on a previously funded SCBGP project. The CDA has partnered with Colorado companies for the Colorado Pavilion since 2008, and has requested SCBGP funding for many years. For 2015, CDA continued to promote Colorado specialty crops by focusing on Colorado as the "theme" for the booth. Surveys of attending exhibitors indicated that the exhibitors preferred that the CDA create a pavilion that not only reflects each exhibitor's style and business, but also promoted Colorado with a centralized theme" The project focused not only on sales and increased customer base, but a positive experience rating from the exhibitors that cooperate with the CDA in the 2015 year.

This project not only shapes the success (sales) of previous PMAs funded through the SCBGP, but it helps Colorado specialty crop growers and shippers to stay competitive, which becomes more difficult in an economy where the cost of doing business is increasing and there are more competitors fighting to capture future dollars.

Project Activities

Develop theme/concept for the trade show, incorporating any new design and/or promotional elements. Establish budgets and coordinate with the trade show organizer to finalize exhibit space needs and location. Work for the 2015 show began in the 4th quarter of 2014, as the Marketing Specialist reviewed the surveys and discussed with CDA staff the success of the Pavilion concept. This pavilion concept continued to be well-received, and it was decided to use it again the following year. The pavilion was also a significant cost to the project, so using it for another year would allow cost savings. This decision was factored into the budget for 2015. The Marketing Specialist participated in site selection prior to the 2014 PMA Expo to choose the booth space for the 2015 Pavilion.

Begin recruitment of producers for exhibiting at the trade show and begin work with contractor to build out display. Promote show to obtain "New to Show" scholarship recipient. Design and promotional plans will be finalized. Marketing Specialist Glenda Mostek and International Marketing Specialist John Addison used industry contacts (email and phone lists) to market participation and promoted the PMA Fresh Summit Expo at specialty crop conventions and meetings, and with personal contacts. CDA hosted a "new to market" booth that hosted 3 businesses that had not displayed at PMA before, specifically recruiting new-to-PMA specialty crop businesses. All of the businesses that were interested in participating were able to obtain booth space.

The Marketing Specialist worked with design contractor BrandWerks and GES (the show contractor who supplies the materials for the Pavilion and constructs the Pavilion) to develop a structure for those spaces that would unite the Colorado Pavilion while economizing by using previously printed graphics for the booth where possible. Marketing specialist coordinated all

companies' and associations' information being entered into show directory, and a postcard-sized handout promoting Colorado's specialty crops was developed and printed.

Work with PMA coordinators and exhibitors to ensure all details are handled for CO Pavilion and maintain positive relationship with both parties. CDA Marketing Specialist coordinated with all exhibitors to ensure that they were able to register, obtain badges for their personnel and order the needed booth furniture. CDA worked with GES (show facilitator for PMA) to ensure that the Pavilion would be constructed in a timely manner and would be ready to go for the show.

By September 2015, the CDA confirmed all exhibitors which included: Colorado Potato Administrative Committee, Colorado Certified Potato Growers Association, Aspen Produce, Mountain Valley Produce, Rocky Ford Growers Association, Bing Beverage, Olathe Sweet Corn, Colorado Fruit and Vegetable Growers Association (new), Canon Potato (new), Jack's Beans (new), Rocky Mountain Foods (new), Colorado Mushroom Farm (new), and Pueblo Chile Growers Association (new) and kept them up to date on PMA show deadlines, badge information, etc.. Each of these exhibitors maintained their own exhibit space during the show, are dedicated Colorado companies that participate actively to meet PMA deadlines, purchase and coordinate shipping and travel plans, and aid in customer service to attendees at the show.

Utilizing an in country contractor in Mexico, communicate with key Mexican produce importers to understand Colorado's produce industry and visit the Colorado Pavilion at the 2015 PMA Fresh summit.

Finalize all show logistics and shipping of product and materials. Supervise trade show set up, conduct briefing for exhibitors, and attend to exhibitor needs during the show. Oversee the breakdown of the display and any return shipments. CDA staff coordinated final preparations with the exhibit company GES, shipped brochures and other materials. CDA staff Glenda Mostek and John Addison arrived early and supervised the show set up and assisted Colorado exhibitors in set up as they could, including trouble shooting furniture arrivals and booth materials. CDA staff met with exhibitors before the show opened to brief them and cover logistics, and checked in periodically with exhibitors during the show to see if they had any needs. CDA staff were present for the tear down of exhibits and coordinated return shipments on items that were not used.

Conduct follow-up survey of exhibitors, discuss plan for next year's PMA and develop final report.

In November 2015, each Exhibitor was sent a survey from Survey Monkey (an online survey company), where they were asked questions about the level of customer service provided by the CDA, how well they liked the design of the Pavilion, number of new and current contacts made and if there was an increase in qualified buyers made during the Expo. As the response rate in the past has been low, the Marketing Coordinator spoke to each exhibitor personally to emphasize the importance of this survey to the project. This year, ten exhibitors responded to the survey, compared to seven last year.

Goals and Outcomes Achieved

Goal	Performance Measure	Benchmark	Target 2015	Actual 2015
To increase the variety of private companies participating in the Pavilion.	The number of private companies and their staff participation as determined from Expo evaluation	6	7	9

The target was six private companies participating in this year's pavilion. Nine private companies participated, including five new participants.

Goal	Performance Measure	Benchmark	Target 2015	Actual 2015
To increase satisfaction of exhibitors participating in the CO Pavilion	Post event exhibitor survey to show good or great rating about CDA's customer satisfaction	70%	Increase by 5%	90%

Exhibitors reported a 90 percent "excellent" experience interacting with CDA staff during the PMA Summit.

The survey also asked exhibitors if they expected an increase in existing business or believe they will develop new business as a result of participating in PMA, which was judged as a better measure of success of the project than the satisfaction with their interaction with CDA (and is a goal in for the 2016 PMA project).

- Sixty percent of the exhibitors responding stated that they either had already generated new business or expected to generate new business.

The survey also asked how exhibitors would rate the effectiveness of the Expo as a venue for creating brand awareness for their company or product.

- Ninety percent of exhibitors responded that PMA Fresh Summit was either very effective or somewhat effective at creating brand awareness.

Exhibitors were asked about the effectiveness of the Expo at enhancing business opportunities with existing customers.

- Eighty percent of exhibitors responded that PMA Fresh Summit was either very effective or somewhat effective at enhancing business opportunities with existing customers.

Respondents were asked about the effectiveness of the Expo for creating new business prospects for their company.

- Ninety percent of exhibitors responded that PMA Fresh Summit was very effective or somewhat effective for creating new business prospects.

Goal	Performance Measure	Benchmark	Target 2015	Actual 2015
Number of new contacts	Post event exhibitor survey	2013-20	25	78+

Goal	Performance Measure	Benchmark	Target 2015	Actual 2015
Number of contacts with current customers	Post event exhibitor survey	2013-70	75	77+

Goal	Performance Measure	Benchmark	Target 2015	Actual 2015
Create contacts with international buyers with Colorado Pavilion exhibitors	Number of buyer/seller meetings	2013-76	80	177

The Colorado Department of Agriculture (CDA) hired G&G Gestoria en Comercio Exterior S.C., who is CDA's contractor located in Mexico, to organize meetings between Mexican produce importers and Colorado producers during the PMA Fresh Summit. G&G contacted more than 150 Mexican companies in order to identify who was travelling to Atlanta, Georgia for the PMA Fresh Summit. A total of 17 meetings were effectively conducted with pre-scheduled contacts, plus 35 new meetings and introductions during the show.

G&G Gestoria was able to bring 52 Mexico companies to the Colorado pavilion. G&G facilitated 150 meetings were conducted between these Mexico companies and Colorado companies. G&G Gestoria recorded a contact list of the Mexico companies that met with Colorado companies.

Beneficiaries

The Colorado Pavilion targeted two core groups who focus on Colorado specialty crops: the produce commodity associations and the individual produce shippers/growers. This year, three potato operations, one dried fruit and nut distributer, four associations (potato, fruit and vegetable and chile), one corn grower, one juice producer, one dry bean producer, one mushroom farm, and one cantaloupe association/grower benefited directly from the CDA Pavilion project. Economic benefits of this activity included the garnering of new international and domestic customers, as well as reconnecting with existing customers. These participating companies report

making contact with existing and new buyers this year and many exhibitors mentioned that their current customers expect their attendance at the show, and see it as a necessary business interaction.

Two new associations and four new private companies participated in the pavilion this year.

Also, although the direct beneficiaries are the exhibitors, the presence of the Colorado Pavilion does benefit Colorado Produce companies and the Specialty Crop industry as a whole. With the over 20,000 attendees walking past and through the Pavilion, looking up at the massive 16 feet Colorado scenery and producer photos, it brought attention to the Colorado producers as whole and increased interest within the produce industry.

Lessons Learned

Exhibitors were slow to sign up for the Pavilion this year, which led to delays in logistics and design. Atlanta did not appear to be as attractive a location as Anaheim for Colorado exhibitors. We will take this into consideration when booking space in the future. It seems that Atlanta and New Orleans Fresh Summits attract less exhibitors, while Anaheim and Orlando events attract more.

The goal for participant satisfaction was exceeded, communication and customer satisfaction will continue to be a focus year to ensure that needs are met during the conference, and that all participants will have an excellent experience. The Marketing Specialist has now been through an entire cycle of planning and execution and has a much better idea of logistics and timelines centering around the event.

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Additional Information


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Final Report: Compiling and Cataloging Four Decades of Research to Revise the CO Grape Growers Guide
Partner Organization: Colorado Wine Industry Development Board (CWIDB)

Project Summary

This project compiled, digitized and catalogued research documents and results pertaining to growing grapes in Colorado beginning with the original 'Grape and Wine Production in the Four Corners Region' (University of Arizona, Agricultural Experiment Station, Technical Bulletin 39, April 1980) through Colorado State University's (CSU) Grape Grower Survey for the 2013 harvest. A volume of research materials on growing grapes in Colorado existed, but because of staff turnover, the passage of time and the lack of digital records from the first half of this period, the research was scattered, uncatalogued and difficult to find, let alone access.

Surveys of the Colorado wine industry identified a need to consolidate information for grape growers into one easily accessible location so they could get procedural questions answered when the State Viticulturist or other staff is not available. The final output of this project is an on-line resource library of information from 40 years of Colorado viticultural research, and a newly revised and greatly expanded digital version of the Colorado Grape Growers Guide and related publications.

Project Approach

This project compiled research documents, results and reports from CWIDB archives and files, Western Colorado Research Center (WCRC), Museum of Western Colorado archives, Rick Hammon personal files, etc.

- Scanned and digitized all documents
- Catalogued research information and contents of documents
- Posted content on www.coloradowine.com and http://aes-wcrc.agsci.colostate.edu/
- Finalized and published the revised and expanded Colorado Grape Growers Guide
- This project focused solely on grapes and the Colorado wine industry.

Significant contributions and role of project partners:

The Colorado Wine Industry Development Board staff, primarily Doug Caskey, executive director:

- Offered guidance and direction for the project.
- Worked with the CWIDB's marketing contractor/web developer to create the mechanism for hosting the research document catalogue.

Colorado State University faculty, Dr. Horst Caspari, State Viticulturist in the Department of Horticulture and Landscape Architecture:

- Offered guidance and direction for the student researcher compiling the documents.
- Administered the grant funding of the student's research.

Colorado State University Masters student, Jonathan Sautter

- Compiled documents in the files and archives of the CWIDB as well as CSU Western Colorado Research Center at Orchard Mesa.
- Searched for additional documents at the Museum of the West, Grand Junction and among grape growers on the Western Slope of Colorado.
- Scanned and catalogued all documents for input into the historical document catalogue on the new Trade Resources page of coloradowine.com.
- Compiled documents pertained to viticultural research and those focusing on enology and winemaking were not included.

Goals and Outcomes Achieved

Mr. Sautter identified 278 documents for inclusion in the document catalogue. Included documents date from 1980 through 2014, with one addition from 1934.

Mr. Sautter completed a supplement for the Colorado Grape Growers Guide on "Grapevine Cold Hardiness."

The CWIDB contracted with its web developer to create a searchable document catalogue into which the compiled and digitized documents from Mr. Sautter could be catalogued, searched and stored.

Due to delays in Mr. Sautter's academic process and programming the revised Trade Resources page of coloradowine.com, the project was delayed beyond the intended completion date of 2016. Mr. Sautter's document catalogue was uploaded by June 2017; however, the Trade Resources page was not made live until early October 2017. The searchable document catalogue will be demonstrated and discussed during the Colorado wine industry's conference and trade show, VinCO, January 15-18, 2018. The original proposal intended that presentation to be made at VinCO 2017, although the compilation was not completed at that time. This means that the early delays in compiling the documents have pushed some of the measurements of the impact of this historical research library beyond the timeline of the grant.

As the table below shows, use of the Historical Research Document Library was nearly non-existent. Only 7 unique visitors clicked on that link in the period from October 11, 2017, when the final report for the grant was filed, and April 29, 2018. We had hoped that we would have seen well over 100 visits for several dozen unique visitors as a result of the collecting and posting of the Historical Research Document Library.

That said, the percentage of visitors to the Trade Resources page of coloradowine.com (Trade Resources unique visitors/total website unique visitors) went from less than 2% between July 10, 2017 and October 10, 2017, to more than 5% between October 11, 2017 and May 1, 2018. Even if visitors to coloradowine.com were not using the Historical Research Document Library, there has been an increase in the percentage of people visiting the Trade Resources page for other reasons. Perhaps this project did not provide the information and resources that the Colorado wine and grape industry is looking for, but it does seem to coincide with an increase in the use of the Trade Resources page as a source of information. It may have brought the Trade Resources section to the attention of the industry.

Goal	Performance Measure	Benchmark	Target		2017 Outcome
			2015	2016	
To revise and publish an expanded Colorado Grape Growers Guide	This is an output in itself, but will be the central deliverable of this project: is the guide downloaded and used by growers	No benchmark as the Guide is outdated, has not been promoted recently and is not on a monitored link	N/A, as the Guide will not be finished and posted until 2016	200 downloads, hard copies or CD versions	Although the revision to the CO Grape Growers Guide is currently on-line, it has not been promoted in time for measurement under this project. (See following paragraph regarding visits to web page) Only 7 unique visitors clicked on that link in the period from October 11, 2017, when the final report for the grant was filed, and April 29, 2018.
To provide easy access to research information for Colorado Grape Growers	Visits to the web page containing accumulated research information	No benchmark available given the changes in web site platforms and content for both coloradowine.com and WCRS	500 visits	750 visits	
Increased industry satisfaction with research information dissemination	Industry survey	No specific question addressed this topic in 2014, but we can compare 2014 anecdotal comments about wanting a better web site, source of information or FAQ page to results of a specific question in the 2015 study	Minimum 75% positive response to a survey question specifically about access to information	Minimum 90% positive response to a survey question specifically about access to information	As there was no document library or other updated resources for the industry to review until October 2017, there was no time to issue a survey.

Announcement of catalogue and centralized location of research results and information	Industry seminar: the best time and place to announce this will be during the wine industry conference, VinCO, normally held in January every year. The CWIDB and CSU will work with CAVE, the trade association to schedule a stand-alone seminar before Fall 2016 to release this information and will repeat that seminar during VinCO 2017, which falls outside the scope of this project	Attendance at VinCO is normally over 150 with seminars similar to this release of information drawing maybe 75 or more. A stand-alone seminar outside VinCO typically draws 25-40	VinCO 2016: Preliminary announcement attendance 40	VinCO 2017: Final announcement attendance 80	The announcement and overview of the new resources will be made during VinCO, Jan. 17, 2018 The CWIDB will be starting a series of monthly conference calls with grape growers in February 2018. The new resources and historical research document library will be a part of those calls' agendas as well

Although the delays in the first part of the project pushed much of the measurement of the impact of the deliverables out of the project time period, we can show anecdotal evidence of the industry's interest in the information. The first email announcement of the new Historical Research Document Library to the industry showed a significant bump in unique visits to the Trade Resources page on coloradowine.com.

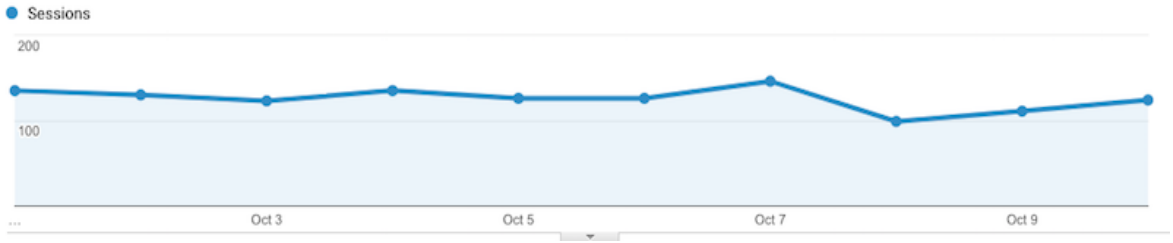
As the graphs and data of website traffic below indicate, the percentage of unique visitors to coloradowine.com between July 10 and October 10, 2017 that went to the Trade Resources page was 1.95% (304/15,604). That percentage jumped to 6.96% for the period of Oct. 1-10, 2017 (73/1049) during which the new Trade Resources page was announced to the industry through an email sent out on October 6. Precise numbers are not available for October 6 alone, but approximately 56% of coloradowine.com unique visitors went to the Trade Resources (about 70 out of 125). This is certainly not conclusive proof that Colorado grape growers will use this new resource, but it does show there is interest in viewing it.

July 10, 2017 - October 10, 2017

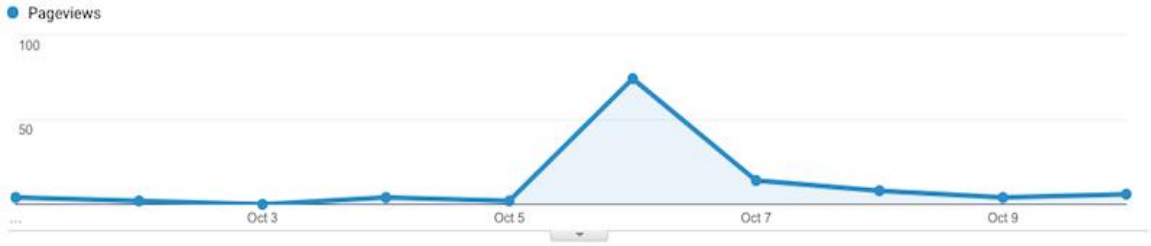
- **Total site visits:** 19,123 (15,604 unique visitors)
- **Trade Resources visits:** 396 (304 unique visitors)
- **Device (all visits):** 52% mobile / 37% desktop / 11% tablet

October 1, 2017 - October 10, 2017

- **Total site visits: 1,255 (1,049 unique visitors)**



- **Trade Resources visits: 118 (73 unique visitors)**



The implications of this project are dynamic and wide-ranging. The online database will serve as a permanent on-demand educational resource for the Colorado wine industry, and function as a central location for all grape growing information – past, present and future. The database also represents a complete list of all current and finished research and will serve to direct future research and activities; including, but not limited to, revising the Colorado's Grape Grower's Guide.

Beneficiaries

The nearly 200 commercial growers of winegrapes in Colorado now have access to the research and historical documents from the activities funded by the Colorado Wine Industry Development Board since 1990, as well as to some reports from before the CWIDB's creation.

This project solely benefited specialty crops.

Lessons Learned

The limitations of this project are related to the discovery of material, the accuracy of the database, limitations of technology and associated resources available to host the online database and the exclusion of material not considered pertinent.

As previously mentioned in this report, the concern for undiscovered, unrecovered or lost materials due to the passage of time, staff turnover, illness and various unforeseen circumstances has led to an unknown amount of material being excluded from this project. Efforts should be taken to continuously seek new and potential materials for the database.

The accuracy of the database, specifically, the application of tag words, dates, titles and descriptions will dictate the functionality of the database. Issues and mistakes relating to the accuracy of information will severely limit the usefulness of the database and ultimately the success of it being adopted for use by the industry. All information, past, present and future should be carefully examined and verified for accuracy before inclusion in the database.

Limitations of technology and the associated resources available to host the online database must also be considered. There are two circumstances in particular that limit the performance of the database. First, an expanded character-count for descriptions. In most cases, descriptions were repetitive and non-informative due to the limited character count. Second, a search function that allows users to search for and find specific tag words within the text, would improve functionality and the end-user experience.

The materials included in the database are limited to information on growing grapevines in Colorado. However, there were numerous documents discovered but excluded that contained information on the history, marketing, sales, and promotion of the Colorado wine industry, as well as material pertaining to wine making and enology.

In retrospect, increasing the budget request to cover much more extensive programming and digitalization of the documents would have made the final catalogue much more usable. Had the budget included the resources for character recognition to convert old printed documents to text as well as the time and manpower to edit the converted text, the catalogue would be searchable with more detail and refinement. That said, the intention of the project was to compile as much of the research done on grape growing in Colorado over past 40 years or so into one location. That has been successfully achieved. To create a more complex search mechanism would most likely have been overkill and would have provided a functionality that few would ever use.

Additionally, employing a graduate student to do this work supported the education of someone who may go on to advance the success of the Colorado grape industry; however, the delays in that student's academic progress significantly delayed the work on this project such that much of the follow-up and measurement of the impact the compiled research documents will have on our industry were pushed beyond the deadline for reporting. Again, in retrospect, hiring a dedicated researcher to locate these documents could have avoided the delays caused by a student's academic issues.

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Additional information

Historical Research Document Library

Colorado Grape Growers Guide, 1998

Colorado Grape Growers Guide, Cold-Hardy Addendum 2017

Sautter Master's Presentation PowerPoint (See Appendix)

Final Report: Development of a Molecular Marker for Quick Identification of *Cytospora leucostoma*
Partner Organization: Colorado State University

Project Summary

Over the last one hundred years, western Colorado has developed an exceptional peach production industry, with peaches known for premium market qualities such as flavor, size, color, and texture. In western Colorado, peach production totals over the last ten years have ranged from 12,000 to 17,000 tons with estimated values of 28 to 35 million dollars. Colorado ranked 6th in the U.S. in peach production in 2016 according to USDA NASS, and accounted for $27 million in cash receipts.

Peach production in the west is threatened by environmental stresses, such as decreasing water supplies, low winter temperatures, spring frosts, alkaline soils, and pest problems like persistent Cytospora canker disease, which lead to major reductions in productivity, profitability, and orchard longevity. Cytospora canker, caused in peaches by the fungal pathogen *Cytospora leucostoma*, has been hindering peach production for over 30 years. The current extent and severity of the disease throughout Colorado has reached a level that is making peach orchards economically unviable. It can account for at least 20 percent production loss annually. Results from a recent survey found that every orchard surveyed throughout the Grand Valley, North Fork of the Gunnison River region and Olathe was infected by Cytospora. On average, seventy-five percent of trees were infected in orchards surveyed; however, many orchards were 100% infected, especially those at the typical age of peak production. Previous research examining the modes of dissemination suggest *C. leucostoma* is spread via rainsplash. However, survey results showed that tree infections were randomly scattered throughout orchards. These results suggest that inoculum may be spread via wind or insects. Understanding the epidemiology of the pathogen is vital for developing control methods.

Previous funding by the USDA Specialty Crop Block Grant Program through the Colorado Department of Agriculture developed chemical treatments for Cytospora canker. Several conventional and organic chemicals were identified that can be used as preventative for Cytospora and act as wound and canker covers to prevent new infections.

The objective of this project was to develop of a molecular marker for rapid and sensitive detection of *C. leucostoma.* This molecular marker will then be used in future studies to understand the epidemiological cycle of Cytospora canker by better assessing mechanisms of dissemination. To develop best management practices, it is necessary to determine ways in which the pathogen is spread from tree to tree. Currently there is difficulty in assessing aerial and insect collected samples for *C. leucostoma*; morphological visualization of asexual spores is difficult and plating environmental samples yields contamination because *C. leucostoma* is a slow grower. Our long-term goal is to provide peach growers in western Colorado disease

management information and solutions for controlling Cytospora canker. Development of this molecular marker would allow accurate, rapid, and sensitive detection of the pathogen which is vital to understanding the epidemiological cycle of Cytospora canker in peaches.

Project Approach

Multiple Cytospora species have been observed and collected from peach orchards in western Colorado. Previous work completed in the Stewart lab showed that *Cytospora leucostoma* was the most virulent species to peach. Therefore, to develop a molecular marker that only identified pathogenic *C. leucostoma*, previously sequenced genomes of four *Cytospora leucostoma* isolates and one *Cytospora parasitica* isolate (originally collected from a peach orchard in western Colorado in 2015) were assembled and compared to design primers and probes for a Droplet Digital PCR assays (ddPCR).

Identical regions (100 percent genetic similarity) in the four *C. leucostoma* genomes were identified using the NUCmer alignment script of the MUMmer software package. Those regions were then compared to the genome assembly of *C. parasitica*. Only regions with less than 90 percent similarity were kept for additional analyses. Each region was then manually examined to eliminate those with highly repetitive sequences. The new set of regions (without repetitive sequences) was compared again to the *C. parasitica* genome using the nucleotide BLAST program in the NCBI+ suite. Only those sequences with no hit or less than 80 percent identity were kept (called from now on "*C. leucostoma* exclusive sequences"). From these *C. leucostoma* exclusive sequences, primers and probes for ddPCR were designed, following guidelines by BioRad (Planning Droplet DigitalTM PCR Experiments), using both the Primer3Plus and the PrimerQuest Tool web applications. Primers were designed and tested using the primer specifications found in Table 1.

Table 1. Specificities for primer design and assays

Reaction conditions	
Monovalen Salt (Na^+) Concentration	50 mM
Primer DNA Concentration	50 nM
Divalent Salt (Mg^{++}) Concentration	3.8 mM
Probe DNA Concentration	50 nM
dNTP Concentration	0.8 mM
Primers details	
Tm	Min: 54ºC, Opt: 55ºC, Max: 56ºC
GC Content	Min: 50%, Opt: 55%, Max: 60%
Size	Min: 13 nt, Opt: 20 nt, Max: 27 nt

Probe details	
Tm	Min: 59ºC, Opt: 60ºC, Max: 61ºC
GC Content	Min: 50%, Opt: 55%, Max: 60%
Size	Min: 13 nt, Opt: 20 nt, Max: 27 nt
Amplicon details	
Size	Min: 75 nt, Opt: 85 nt, Max: 100 nt

A total of 15 primer sets were designed for preliminary tests by amplification through traditional PCR using DNA extracted from *C. leucostoma* and *C. parasitica* isolates. The two most promising primers were selected based on the observed levels of amplification of *C. leucostoma*, but no amplification of *C. parasicita*. These selected primers were then tested on a larger set of samples of *C. leucostoma* and *C. parasitica* to ensure specificity only to *C. leucostoma* and amplification of a genetically diverse population of *C. leucostoma*. When primers met this rigid selection criteria, a SYBR green modified probe was designed to sit within the amplified product of the primer sets. These primers and probes were first tested in a Real-Time qRT-PCR assay, and when successful, then tested within the ddPCR assay. The final primers/probe selected for further use are found in Figure 1. As seen in Figure 1, the molecular region within *C. leucostoma* and *C. parasitica* vary about several basepair sites. The primers and probe were designed to anneal to basepair sites unique to *C. leucostoma*.

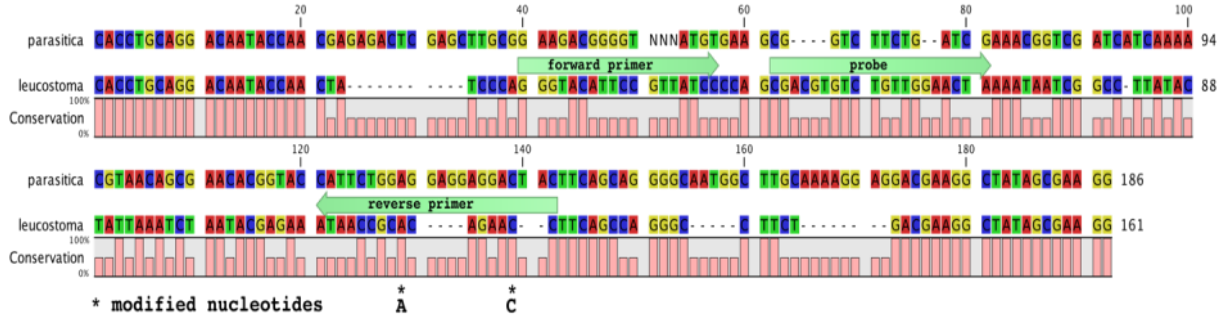

Figure 1. Primer and probe placement along genomic DNA comparing *C. parasitica* (top) and *Cytospora leucostoma* (bottom) for use in Droplet Digital PCR assay. The "Conservation" row highlights base pair sites that differ between *C. parasitica* and *C. leucostoma*. The green arrows highlight genetic region each primer and probe amplify in *C. leucostoma*. The * represents nucleotides designed for better annealing in the reverse primers that differ from the *C. leucostoma* sequence. The primers and probe are specific to *C. leucostoma*.

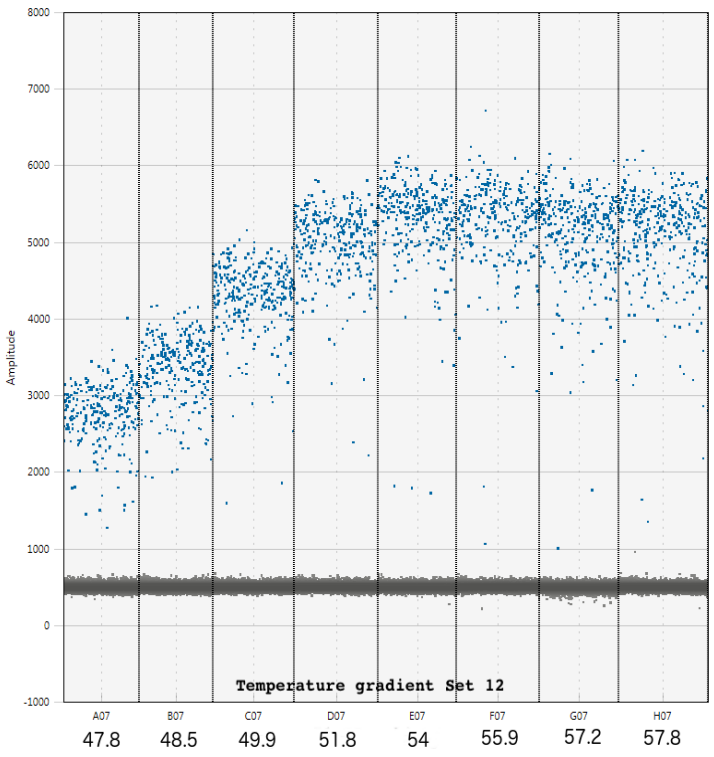

Figure 2. This figures shows that the optimal temperature for the developed primer/probe is 52C. The x-axis shows temperature and the y-axis shows fluorescence amplitude. Each blue dot is positive amplification of *C. leucostoma*. At 52 C, there is a maximum of positive hits with high amplitude.

The first step to determine accuracy of the ddPCR assay was to determine the optimal temperature for ddPCR amplification using the ddPCR primer/probe set from Figure 1. From these runs, we found that 52° C, was the most optimal temperature for ddPCR amplification because there was a large number of positive amplifications that had high fluorescence amplitude (Figure 2). To further test *C. leucostoma* specificity, this primer/probe set was then also tested against additional Cytospora. The additional samples included several more isolates of *C. parasitica*, one isolate of C. *paraleucostoma*, and one isolate of *C. cinctum*. *Cytospora paraleucostoma* and *C. cinctum* are closely related to *C. leucostoma* and are thought to be peach pathogens, however, a survey by Stewart et al. in 2015 did not find these species within Colorado peach orchards. Lack of specificity against these species will help identify if these two species are transported into Colorado. If found and causing disease, a lack of amplification by the marker will suggest isolation and molecular species identification is warranted. As shown by Figure 3, the primer/probe set is species specific to *C. leucostoma*, as few positive droplets are found with *C. paraleucostoma*, *C. cinctum*, and *C. parasitica* and these profiles were similar to the negative control.

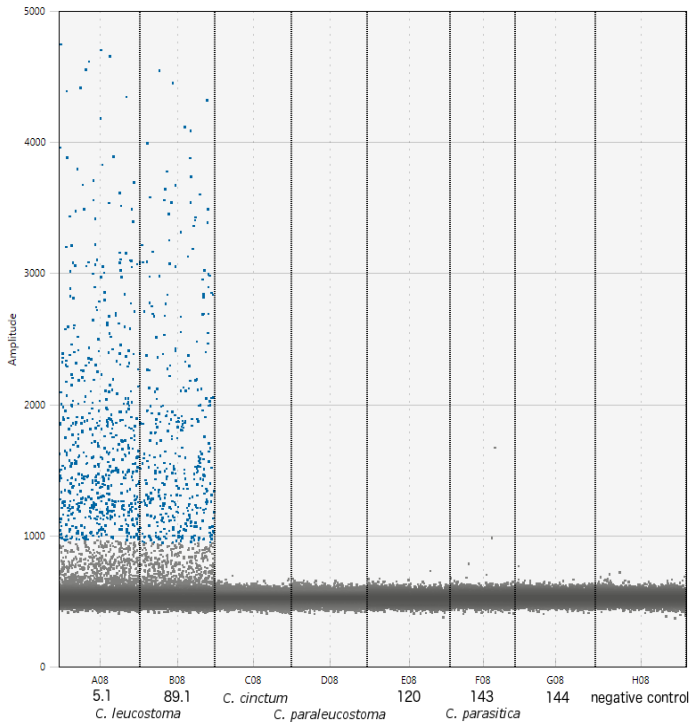

Figure 3. The x-axis shows temperature and the y-axis shows fluorescence amplitude. Each blue dot is positive amplification of *C. leucostoma*. This figures shows that a large number of positive droplets were observed for *C. leucostoma* isolates 5.1 and 89.1, but few droplets were observed for *C. cinctum*, *C. paraleucostoma* and *C. parasitica*, which also share similarity to the negative control droplet profile.

Goals and Outcomes Achieved

The goal for this project was to develop a genetic marker to quickly and accurately identify *Cytospora leucostoma*. As described above, we were successful in developing a molecular marker, and tested this marker on several closely related species found within orchards. We are confident that our marker is specific to *C. leucostoma*.

Our long term goal for our research is to understand the epidemiology of Cytospora canker for the development of best management practices. The next steps in this process, which have yet to be completed, are to determine how sensitive the marker is (how much DNA is needed to show identification) and how well this marker works on samples collected from the field. We suspect, based on disease topography, that insects or wind may be involved in spore dissemination. Therefore, our marker must be able to detect a few spores carried on insects and spores collected on glass slides through wind movement. Our next steps are to test DNA quantities sequentially to determine the DNA among threshold and to then artificially inoculate a glass slide with known amounts of spores, to ensure the marker works on environmental samples.

Current results of this marker projects and information on future projects that will utilize this molecular marker were presented by Dr. Stewart to Colorado peach growers during the 2018 Annual Western Colorado Horticultural Society Conference and Trade Show in Grand Junction, Colorado.

Beneficiaries

Results from this SCBGP project benefit the 300 peach growers within western Colorado.

Benefits of this Cytospora research are not limited to Colorado or the surrounding western region. Peaches growers from other states including Georgia, South Carolina, Arkansas, Michigan, Pennsylvania are now dealing with higher incidence and severity levels of Cytospora canker. However, symptoms of infection can look like bacterial infections. This molecular marker could be utilized by extension agents from these states to determine if *Cytospora leucostoma* is present in orchards. Further, Cytospora species infect a variety of stone fruit specialty crops grown in multiple regions throughout the United States, including peaches, nectarines, sweet cherries, apricots, prunes and plums. This project could be a model for the development of molecular markers for additional Cytospora species.

This project solely benefited specialty crops.

Lessons Learned

Digital droplet PCR is a relatively new technique that enables faster, more precise results at a lower cost compared to other methodologies. However, we had some issues with primer/probe development using the new technique. There were several probes that worked in traditional PCR and in the Real-Time qRT-PCR assay. When we then ran this primer/probe set on the ddPCR, we found non-specific amplification in *C. parasitica*, and had to redesign our primers/probe. After several trials, we finally found one primer set that worked, but because this method allows for very accurate identification it is really sensitive nonspecific binding.

The post-doctoral researcher assigned to the project from the Stewart Laboratory at Colorado State University collaborated with a Research Associate from a USDA ARS laboratory with extensive experience with ddPCR. This collaboration lead to a successful project, which likely would not have been completed as quickly without his guidance. I would recommend that researchers wanting to develop a ddPCR assay collaborate with others that have done this process before.

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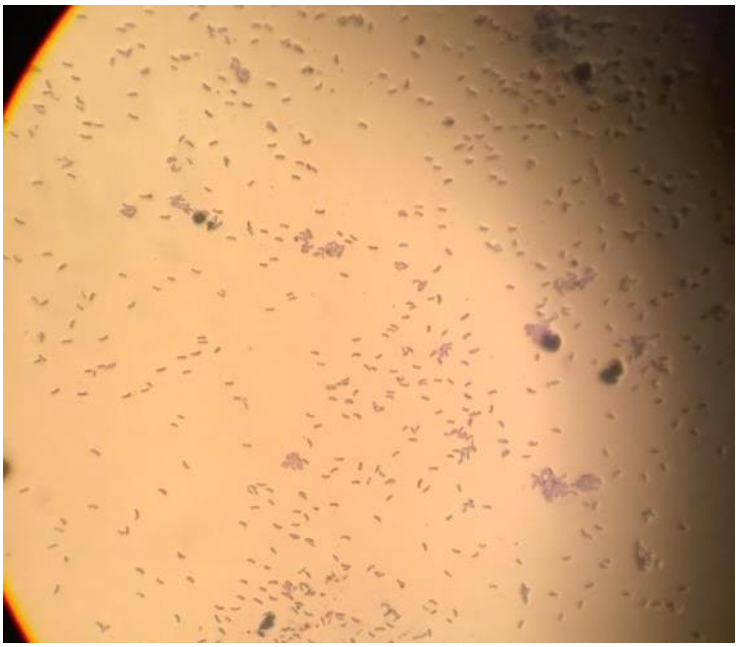
Additional Information

Cytospora cankers associated with pruning wounds and on the main stem of the trees.

A symptom of canker damage is gummosis. Usually copious amounts are produced by the tree in response to the canker.



Conidia (asexual spores of Cytospora). Note the nondescript morphology of the spores. This makes it difficult to identify spores in insect and wind field collections.

Final Report: Promotion of Colorado Potatoes in the Mexican Market
Partner Organization: Colorado Potato Administrative Committee (CPAC)

Project Summary

Market access for U.S. potatoes into Mexico has historically been limited by politics. In 2003 the United States and Mexico signed a trade agreement that would allow U.S. potatoes access to the Mexican market in exchange for access to the U.S. for Mexican avocados. This agreement allowed for phased entry of U.S. potatoes over a three year period. For the first year exports were to be limited to a 26 kilometer area adjacent to the U.S. – Mexico border region. The second year U.S. potatoes would be allowed access to the northern states of Mexico, and the third year the entire country of Mexico would be open to U.S. potato exports.

From the very beginning the government of Mexico did not honor their agreement, citing phytosanitary reasons as the cause, and continued to limit the export of U.S. potatoes to the 26 km border zone. After a decade of negotiation between the two countries a new agreement was signed in May of 2014 which would allow U.S. potatoes access to the entire country of Mexico. In this environment CPAC applied for and received this grant with the intent to grow the export of Colorado potatoes into Mexico. However, politics continued to present major hurdles to our goals. Although the Mexican market was fully open to U.S. potatoes in June of 2014 for three weeks, it was then closed as a result of legal action taken by Mexican potato growers against the Mexican government. It remains closed today with the exception of the 26 km. border zone. The legal battles and political negotiations continue today while the Mexican avocado industry exports over 1.5 billion dollars of avocados into the U.S. annually.

Because of politics, the ability to increase potato exports from Colorado to Mexico has been severely hindered. CPAC was still able to use approximately half of the grant funds very productively, and continue to work with Mexican contacts and retailers within Mexico to fully open the market.

Project Approach

The goal of the project was simply to increase Colorado potato exports to Mexico by providing support to Colorado potato shippers and growers. There were three key objectives:

- Hiring a local Mexican consultant to assist in the efforts.
- Work with this consultant to gather information on Mexican potato consumption and the Mexican consumer.
- Taking and sharing the information that was gathered to develop relationships with Mexican potato importers and retailers. Using this new relationship, we would partner with them in creating a plan to promote Colorado potatoes in Mexico.

We successfully found and hired a consultant, Nora Gonzales of G&G Gestoria En Comercio Exterior, from Guadalajara, Mexico, with the assistance of the Colorado Department of Agriculture. Nora continues to work with us and has been a valuable source of information and intelligence for our committee. She has been a crucial part of re-designing this project as needed when political barriers kept the export opportunity limited. She has provided us with great contacts for the reverse trade missions we have participated in the last four years, and has scheduled visits from scores of produce buyers at the ANTAD trade show over the last three years. Regardless if we ever successfully open Mexico for potato exports, Nora has been a great asset to our export business in the border region.

Goals and Outcomes Achieved

When it became evident that most of Mexico would not be opened up for potato sales from the U.S., we worked with the Colorado Department of Agriculture Specialty Crop Program Manager to refine our goals and extend our project beyond the original ending date. We have listed both our original goals and our revised goals for 2017 below.

Original Goals	Performance Measure	Benchmark	Target	
			2015	2016
Create a contact database for retail, food service, and wholesale contacts in Mexico markets.	Number of contacts in the database.	0	200	300
Survey retailers for support needed	Number of retailers surveyed	0	12	18
Consumer market study	Key consumer categories	0	1	
Publish consumer market study for shippers	Consumer market report delivered to shippers	0	1	
In- bound trade mission	New contacts on mission	0	10	12
Out-bound trade mission	New contacts purchasing	0	60	60
Develop POP, POS promotion material	Types developed	0	5	7
Generate more export sales	Increase the number of shipments to Mexico.	1,797	2,156	2,371

Revised Goals for 2017	Performance Measure	Benchmark	Target	Actual
			2017	2017
Provide retailers with promotional material and support if access granted	POS and POP types developed	0	5	No increase in access in 2017
Out-bound trade mission to ANTAD	New contacts purchasing (limited to border area)	2	3	3
Support CDA trade mission to border region	Participation in CDA trade mission	0	3	CDA did not host a trade mission to border area
Generate more Export sales	Increase the number of Shipments to Mexico	2,519	2,600	2,294

One of our primary goals was developing a contact database for retail, food service and wholesale contacts in the Mexican market for our shippers. This goal was achieved in 2015 and has been put to use by our shippers in trying to sell more potatoes into the border region of Mexico and to build relationships with these contacts. We have educated our Mexican contacts about Colorado Potatoes and the reasons behind the lack of trade, hoping to enlist their help in getting the entire market open.

Nora Gonzales was able to complete a comprehensive analysis of the Mexican market in August of 2015. It was distributed to all Colorado potato shippers either doing business in Mexico or interested in doing business there. The study includes information on each segment of the Mexican market, information on how Mexican consumers view potatoes, and their preferences regarding potatoes.

Twenty-one retail chains in Mexico were surveyed to determine how Colorado potato shippers can support their promotion efforts in Mexico. This has been an on-going conversation with each reverse trade mission over the last four years and at the ANTAD show for three years.

Fourteen potato growers and shippers attended the ANTAD trade from 2015-2017. At the show they have made valuable contacts with potential retail customers and reinforced relationships with existing customers.

Since 2014, 35 potential produce buyers have traveled to Colorado during potato harvest to see the region, experience potato harvest, view the product and processes in person, and meet with industry shippers and growers. Every year we stress the steps taken to provide potential Mexican customers with the very best quality potatoes. We have painstakingly shown them what our growers do from seed to table to meet and exceed the high quality standards that the

Mexican government requires in order to export potatoes. These trade missions have consistently helped our shippers develop new customers for Colorado potatoes.

Although not in our original goals, we redirected some funding to create a Spanish version of our website. Because of the limited market access to Mexico due to the political situation, we realized early on that we needed to carefully evaluate how we should redirect funds to have an impact with our Mexican customers. Based on feedback we received from Mexican participants in our trade missions, Mexican importers, and advice from Nora Gonzales, we worked to create a Spanish version of our website. We have received numerous positive comments regarding this site and its usefulness: https://www.papasdecolorado.com/.

Our potato exports to Mexico initially increased in 2014-15 but have decreased the last two seasons. The fact that market access has not increased is the direct cause of this but not the only factor. Potato prices in Mexico have been lower than normal the last two years resulting in less profit in exporting to Mexico, therefore our shippers have reacted accordingly. Our potato shippers have actually increased their share of U.S. potato exports to Mexico over the last three years. The most recent trade statistics available from the Potatoes USA trade statistics database indicate that Colorado shipped 49.7% of the total potato exports to Mexico over the last year, which is a 5.2% increase compared to Colorado's share of the Mexican export market in 2014-15. Overall exports to Mexico were down 6.7% last year with Colorado shipments decreasing 9.1% in 2016-17.

History of Colorado Potato Export Shipments to Mexico

Year	Shipments	Lbs. Exported
2012-13	1,795	76,931,000
2013-14	2,480	106,452,405
2014-15	2,935	126,904,720
2015-16	2,519	109,021,455
2016-17	2,294	98,769.375

Beneficiaries

Potato growers and shippers have benefitted from this project through the creation of additional market channels for Colorado potatoes into Mexico. It is estimated that nearly 25% of the 165 potato growers in the San Luis Valley export part of their crop to Mexico now, with 12 of the 17 russet potato shippers exporting at some level. In 2017 nearly 7.5% of our total crop was exported to Mexico. Although volume has decreased recently our shippers are doing business

with more customers than prior to this project as a result of the contacts this project has helped to create.

This project solely benefited specialty crops.

Lessons Learned

We have learned that political trade barriers are a very difficult issue to overcome. We have worked with the National Potato Council, APHIS, USDA, Potatoes USA, and the Colorado Department of Agriculture to find a solution for solving the trade issue with Mexico and will continue to do so. We have been successful in elevating this issue to very highest political channels in both countries' governments. The knowledge we have about the Mexican potato market and the new contacts we have created within Mexico can only help to serve us well when and if the Mexican market situation changes. Without the leverage of this funding we would not have been able to learn and do what we have done to enhance our ability to export potatoes to Mexico.

We have been able to acquire a valuable consultant in Nora Gonzales. Jere Metz, a Farm Fresh shipper, reported to me that Nora is a great asset to our industry and she has impressed him with her great organizational skill when he has traveled to ANTAD. We will be able to benefit from this relationship in the future.

Although we did not have the opportunity to meet all of our goals due to the political situation I believe the project was useful. We were diligent in how we spent the funds, careful not to use them when there was not the opportunity to clearly benefit, and are grateful for the award.

Contact Person

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Additional Information:

Photos: Trade Mission 2016

Final Report: Viticultural Consultation for Colorado Wine Grape Growers
Project Partner: Colorado Wine Industry Development Board

Project Summary

Mr. Warren Winiarski, who was one of the founding inspirations for the Colorado wine industry in the very early 1970s and who went on to win the 1976 Judgement of Paris with his Stag's Leap SLV Cabernet Sauvignon from Napa Valley, visited Colorado vineyards in the summer of 2016 and over Memorial Day 2017. He recommended that, just as Napa Valley had turned its focus to improving vineyard practices and grape quality after Napa had received international recognition in the Judgement of Paris and elsewhere, Colorado look toward improving our vineyard practices and grape quality.

The purpose of this project was to offer additional assistance, support and resources to Colorado grape growers by hiring an outside viticulture consultant to offer seminars and one-on-one consultations in order to complement the resources and outreach already offered by Colorado State University and its State Viticulturist.

Following the recommendation from Mr. Winiarski, the Colorado Wine Industry Development Board (CWIDB) sought to expand the resources and educational opportunities available to Colorado grape growers by bringing in Dr. Imed Dami, Viticulture Extension Agent and faculty at The Ohio State University, using SCBG grant funds.

Colorado grape growers experienced severe crop loss due to cold injury in the 2010, 2011, 2014 and 2015 vintages. Those repeated losses prompted greater interest in cold mitigation and recovery techniques as well as in the planting of cold-tolerant hybrid grape varieties. Dr. Dami brought extensive experience in both cold injury recovery as well as best vineyard practices with hybrid varieties from his Ohio experience, as the Ohio grape industry has had much more extensive cold damage in recent vintages than Colorado.

Additionally, in 2016 the CWIDB adopted a strategic plan that called for improving the quality of Colorado wine and grapes from more than one angle, specifically by providing "tools to enable growers/wineries to prosper in a high desert environment" and to "grow the right fruit in the right place." Bringing in an outside viticulture consultant fulfilled these goals.

Project Approach

Dr. Dami made three separate trips to Colorado, each trip including a seminar for grape growers as well individual consultations, as follows:

Performance Activities – Trip 1:

Date of trip: March 28 to April 1, 2017.
Date and time of seminar: March 29, 9:00am - 2pm.
Location: Western Colorado Community College campus, Grand Junction.

Presentation title: "Mitigating Cold Damage of Grapevines" (See Additional Information).
Number of consultations (6): four in Grand Valley AVA; one in West Elks AVA. Dr. Dami also visited the CSU research vineyard at the Western Colorado Research Center—Orchard Mesa in Grand Junction, CO.

Performance Activities – Trip 2:

Date of trip: April 25 to April 28, 2017.
Date and time of seminar: April 26, 2 pm - 5pm.
Location: Colorado State University, Fort Collins.
Presentation title: "Mitigating Cold Damage of Grapevines" (See Additional Information).
Number of consultations (6): two in Front Range; four in Four Corners Area.

Performance Activities – Trip 3:

Date of trip: August 9 to 12, 2017.
Date and time of seminar: August 11, 1 pm - 5pm.
Location: Western Colorado Community College campus, Grand Junction.
Seminar theme: "Best Viticulture Practices for Premium Wines from Healthy Vines".
Presentations (see Additional Information):
Vine Balance & Crop load
Irrigation Management
Managing Hybrids vs. *Vinifera*
Vine Nutrition
Number of consultations (2): one in Grand Valley AVA. Dami also visited the CSU research vineyard to be informed of current viticulture research projects.

During the third trip, Dami organized a half-day seminar and presented topics that he deemed important for grape growers based on his earlier vineyard visits in April and May 2017 and issues shared by growers during those visits. Dami coordinated presentations with Dr. Horst Caspari, Colorado State University (CSU) State Viticulturist, to compliment CSU outreach program and to provide consistent viticultural information and avoid redundancy.

Project Partners:

CWIDB staff worked with Dr. Dami to schedule his visits, reserve venues for the seminars, announce the opportunity for individual consultations to the Colorado industry, and handled logistics for the visits and events.

Goals and Outcomes Achieved

As noted above, the Viticulture Consultant made three trips to Colorado for the purpose of meeting with Colorado grape growers one-on-one or in seminars. Participation in each event is as follows:

Total one-on-one consultations: 15 growers in the Grand Valley and West Elks AVAs, Four Corners area, Front Range including the CSU experimental vineyards in Grand Junction and Fort Collins.
Proposal target: 15 consultations.

Attendance at seminars: Approximately 30 people. Two seminars were held in Grand Junction and one on the Fort Collins campus of Colorado State University. Only a few students attended the latter. There is no history of seminars of this type being held in Fort Collins, so Front Range growers are not accustomed to attending such events.
Proposal target: 40 attendees.

The outcomes of the project, 3 visits to Colorado by the consultant, 15 individual consultations and 3 seminars with about 30 attendees, are detailed above and on pages 1-2 of the consultant's report attached at the end of this document.

The Colorado wine industry is undertaking several new programs either directly or indirectly inspired by the consultant's visits and recommendations (see pages 4-8 of Dr. Dami's report in Additional Information).

Monthly conference calls for grape growers with a guest expert to talk about one or a group of subjects pertinent and timely to Colorado growers. The first such call is scheduled for Monday, February 5, 2018 with Mark Chen, director of the Oregon Wine Research Institute at Oregon State University, to talk about "wine growing vs. grape growing." These calls will continue on a monthly or semi-monthly basis, depending on interest and demand. The goal is that through regular discussion, even if by phone and not always in person, growers will begin to establish better networking and communication on their own, as well as to be exposed to new information and practices from outside experts. In both aspects, we hope to improve stakeholder engagement as well as the dissemination of information.

The CWIDB is working with the Colorado Association for Viticulture and Enology (CAVE), the private trade association representing the Colorado wine and grape industry, on partnering with Colorado State University to create a part-time Viticulture Extension Specialist position. If this effort comes to fruition, the position would be an additional resource for viticulture information, training and education for Colorado grape growers, a strong recommendation by Dr. Dami and Mr. Winiarski, both.

GIS mapping to determine the best cultivars suited to existing vineyard areas and to identify possible new locations for grapes. This project is underway in the Four Corners region under the direction of CSU State Climatologist Nolan Doeskin. The CWIDB will look at ways to expand this project to other areas.

Beneficiaries

The beneficiaries of this project are the 153 Colorado grape growers, especially those who committed $100 and their time to meet privately with Dr. Dami and those who attended the seminars. The benefits will spread beyond that relatively small group as word of improved yields, more consistent cold-hardiness and greater quality spreads to other growers.

Higher and more consistent yields in the vineyard will increase growers' revenues from larger crops, while improved quality will allow growers to seek higher prices for their grapes from winemakers.

This project focused exclusively on Colorado grape growers and solely benefited specialty crops.

Lessons Learned

Dr. Dami offers several recommendations beyond the new programs listed above, including capitalizing on the uniqueness of Colorado's high-altitude, dry-climate *terroir* for marketing purposes as well as to provide a guide for where to look for regions and industries that could offer lessons and suggestions for Colorado. He also outlines steps to improve the communication of research outcomes and extension information to growers. All of these suggestions will be incorporated into CWIDB discussions for updating our marketing and viticulture outreach.

As noted above, the seminar Dr. Dami offered on CSU's Fort Collins campus was a first for Colorado grape growers. Most viticulture seminars happen on the Western Slope or during VinCO, the wine industry's conference and trade show in Grand Junction. State Viticulturist, Dr. Horst Caspari, has offered many hands-on workshops in Front Range vineyards, but an in-person seminar was a first, and was not attended by any commercial growers, only CSU students. While making sure that students have access to viticulture informational resources is important, the CWIDB needs to find a better location or work to establish a tradition of Front Range viticulture seminars, perhaps webinars, that will involve growers on the eastern side of the Continental Divide in the statewide networking and conversation about how to improve Colorado grapes.

Another takeaway from this project is whether charging growers $100 for Dr. Dami's individual consultation, a service that would normally cost about $300 per visit plus the travel costs for the consultant, actually discouraged participation. The consultation services that Dr. Dami offered were a great value, but Colorado's small-scale grape growers can't always see the value if the price is just too high regardless of value. The fee for service level has already become part of the discussion as the CWIDB and CAVE look at how to set up and fund the proposed part-time Viticulture Extension Specialist.

We feel this was a very successful project, even though outcomes came close to but did not surpass our targets. The information made available to Colorado grape growers is extensive and very timely in view of the increased planting of cold-tolerant hybrid varieties in recent years and given the industry's push to improve quality, consistency and value. Dr. Dami's final report has

been posted to the Educational Resources: Viticultural Resources section of coloradowine.com's Trade Resources webpage. And we will promote the information in that report throughout the coming year.

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Additional Information

Dr. Dami's report with recommendations and observations plus the presentations from his three seminars available here: http://coloradowine.com/wp-content/uploads/2017/11/Colorado-Viticulture-Consulting_Final-Report_Dami.pdf

Final Report: Promoting Colorado Proud Produce through Television Advertising
Partner Organization: Not applicable. This project was implemented by the Colorado Department of Agriculture

Project Summary

The Colorado Department of Agriculture (CDA) educated consumers about Colorado grown produce (specifically chilies and potatoes) through television advertising in the Denver metro market. Television ads encouraged consumers to buy produce labeled with the Colorado Proud logo. Colorado Proud builds on current "buy local" trends, supports local market systems, and positions the Colorado specialty crops industry to expand distribution channels and increase sales.

The purpose of this project was to continue to educate consumers, retailers and restaurants about the wide range and availability of Colorado specialty crops. This year's project complemented previous years' work by strengthening the Colorado Proud message as it pertains to Colorado grown potatoes and chilies. Our project goal was to increase the consumer's connection to Colorado produce labeled with the Colorado Proud logo.

Project Approach

Since its inception by the Colorado Department of Agriculture in 1999, Colorado Proud has served as the state's primary program to promote food and agricultural products that are grown, raised or processed in Colorado. The program is a great fit with the Colorado consumer's desire to buy local produce. Surveys, as recently as September 2017, have found that more than 90 percent of Colorado consumers would be more likely to buy food that was produced in Colorado than outside of the state.

Colorado Proud contracted with CBS4-KCNCTV in Denver to produce television ads promoting Colorado potatoes and chilies. The station aired 243 television ads that specifically promoted Colorado grown potatoes and Pueblo, Colorado chilies, August 14-September 10, 2017.

The total SCBGP project budget was $27,500 with matching funds (in-kind) for the project totaling $30,000.

Goals and Outcomes Achieved

The television ads reached 71.5% of households 5.9 times for a total of 6.9 million impressions and 23.2% of adults 25-54 5.4 times for a total of 1.9 million impressions. Digital components including pre-roll video, banner ads, homepage and news takeovers and in-article video delivered an additional 318,740 impressions.

The campaign was expected to run 201 ads resulting in 6.4 million impressions. With in-kind support from the station, 243 ads were aired and the number of impressions exceeded expectations.

Desired Outcome	Performance Measure	Benchmark	Target	Actual
Increase the number of people purchasing Colorado produce labeled with the Colorado Proud logo.	Percent of consumers more likely to purchase Colorado produce labeled with the Colorado Proud logo.	66%	70%	65%

Beneficiaries

The more than 200 Colorado Proud member businesses that are specialty crop producers benefited from the program. In addition, specialty crops organizations such as the Colorado Potato Administrative Committee, Pueblo Chile Growers Association, Colorado Fruit & Vegetable Growers Association, and their grower members, directly benefited from the project.

This project solely benefited specialty crops.

Lessons Learned

Specialty Crops funding provided an opportunity for Colorado Proud to specifically promote two of Colorado's well-known produce items. Although the numeric goal was not achieved, this project was still considered a success. The 2017 overall budget for the Colorado Proud program was significantly lower than previous years (which meant less TV advertising overall), which could explain why the performance measure was lower than expected.

Contact Person

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Additional Information

- Pueblo Chilies TV Ad
- Colorado Potatoes TV Ad

Final Report: Outbound Trade Mission to the Dominican Republic
Partner Organization: Not applicable. This project was implemented by the Colorado Department of Agriculture

Project Summary

The Colorado Department of Agriculture (CDA) has recognized the need to help specialty crops around the state diversify their markets and increase sales both domestically and internationally. Recently, with low market prices in the U.S., it has become a priority for producers to pursue new markets.

In recent years, the Dominican Republic (DR) has become one of Colorado's largest export markets in the Caribbean for a variety of products. The DR passed Mexico for the largest export market for Colorado dry beans. Seed potato and fresh potato exports are becoming steadier compared to the rest of the region and Potatoes USA has increased their efforts to expand and better trade with the DR.

The goal for this mission is to meet with retailers, wholesalers and distributors in the DR and to increase trade opportunities for Colorado specialty crop producers such as dry beans, seed potatoes and fresh potatoes.

Project Approach

Starting in April of 2017, CDA researched and identified potential markets for Colorado specialty crops from around the state. The Caribbean has long been a focus of the producers and also has great potential for growth. CDA chose the Dominican Republic based on current sales, potential success, top imported products, products the DR is looking for and contacts we have in the area.

CDA reached out and found many specialty crop companies interested in exploring or expanding sales into the Dominican Republic. Basic products such as beans, potatoes, seed potatoes and other produce were target commodities.

With help from a contractor, retailers, wholesalers and distributors were contacted in order to gauge interest and find out which commodities would be most successful. CDA had popular response from the Dominican Republic community looking to take on new products. Fresh potatoes, seed potatoes and dry beans were chosen to participate.

In July 2017 a group of fresh potato, seed potato and dry bean producers traveled to Santo Domingo, Dominican Republic to meet with a variety of retailers, wholesalers and distributors. Commodity specific one-on-one meetings were set up over the course of three days.

Upon return, the group was surveyed on their experience and potential of doing business in the Dominican Republic. Initial response was positive and the group thought it was extremely beneficial to participate in the outbound trade mission. Reports and contacts of the mission will

be shared with commodity groups in Colorado to help additional potato and dry bean dealers learn about doing business in the Dominican Republic.

CDA and the contractor will continue efforts to increase business with the Dominican Republic. Follow-up is one of the most important aspects to a trade mission. CDA will assist companies when necessary for the next few months and years. CDA will also keep in contact with the contacts made in the Dominican Republic in order to keep increasing business and sales to this market. Continuous contact and relationship building is important for success in this market.

Goals and Outcomes Achieved

CDA did extensive research to identify a market in the Caribbean with potential for Colorado specialty crops. After finding positive results and possibilities for market expansion, CDA organized an outbound trade mission including companies from across the state of Colorado.

The goal was to meet with a variety of retailers, wholesaler and distributors in the Dominican Republic and increase the amount of contacts in this region. All Colorado specialty crops that participated in this outbound mission were able to increase their knowledge of the market and meet new contacts.

As a result of this mission five out of six companies report that they will increase sales and business in the Dominican Republic. One company thought it might be difficult to get fresh potatoes into the market due to a local production and established imports from Germany. CDA will continue to assist the companies wherever it is necessary. Sales into the market have the potential to continue for the coming years.

CDA's long term goal is to have Colorado companies doing steady business in the Dominican Republic over the next few years and getting additional companies and commodities involved in the market.

The Dominican Republic is a top market for Colorado dry beans. Due to high demand for dry beans and quality of the meetings with new customers, one dry bean company decided to open an office in Santo Domingo. Immediate response from this mission suggests up to 200 containers of dry beans a year from this company will be sold to the DR.

A total of 39 meetings were set up for the Colorado specialty crop producers over the three day mission. All participants were consistently busy and satisfied with the opportunities they were presented with.

Goal	Performance Measure	Benchmark	Target 2017	Actual 2017
To increase the number of buyers contacts for specialty crop producers in Colorado	Number of buyers met during trade mission	0	15	39
Assist Colorado specialty crop producers with increased sales to Dominican Republic	Number of companies who indicate immediate or potential sales as a result of participating in this mission	0	6	4

Beneficiaries

150 agriculture affiliates are beneficiaries of this outbound trade mission. The Colorado Potato Administrative Committee (CPAC), Colorado Seed Potato Growers Association (CCPGA) and Colorado Dry Bean Administrative Committee (CDBAC) supported this mission. This project directly benefitted the specialty crop producers of Colorado. Four specialty crop companies directly benefitted from attending the trade mission, these four companies represent additional growers around the state. CPAC, CDBAC and CCPGA will receive a full synopsis of the trip and an overview of the mission (see Additional Information). Upon request, any producers interested in exploring the Dominican Republic can access market information of this mission.

As a direct result of this outbound trade mission to the Dominican Republic the Colorado dry bean company has since opened an office in the country to better import dry beans. To date they sent $100,000 worth of dry beans and exports continue to grow for them.

This project solely benefited specialty crops.

Lessons Learned

One Colorado participant had to drop out of the mission at the last minute due to personal reasons.

The Dominican Republic is a Caribbean island where relationship building is an important part to doing successful business. Now that Colorado has been to visit them, they are interested in coming to Colorado to reciprocate. Most buyers are interested in forming partnerships and trust when doing business.

The seed potato growers in the Dominican Republic are interested in new varieties of potatoes that might be able to lower their disease and pest rates in the current varieties. Currently they import all of their seed from Germany each year. Colorado is closer and can offer superior varieties they would be interested in testing.

The climate in the Dominican Republic is hot and humid, making it difficult for the local market to grow dry beans. Currently they import almost all of their supply. This is why the Dominican Republic is now a larger market than Mexico for Colorado dry beans.

Supermarkets and retailers are interested in new varieties of fresh potatoes. Currently, they purchase local supply mostly a yellow variety and import from Idaho, USA. Colorado fresh potato producers are able to send new potato varieties and compliment the current production.

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Additional Information:

Synopsis of Trip and Overview: Dominican Republic Trip Report – Outbound Mission July 9-13, 2017

Why target Dominican Republic (DR) for an outbound trade mission?
The DR was zeroed in on for a variety of factors.

- CAFTA the Central American Free Trade Agreement.
- Need to expand our influence & trade in this zone, beyond Mexico
- Area of trade interest and opportunity for Colorado
- Good logistics and transportation
- Good service support and intelligence
- Already a good bean market for Colorado
- Largest meat importer in the Caribbean of U.S. Beef.

DR Snapshot

- Location: Caribbean between Puerto Rico & Cuba.
- Island is 2/3 DR & 1/3 Haiti. Area of DR 18,792 SQ miles
- Population: Appx 10.5 Million
- GDP $68.10 billion
- GDP per capita $10,060
- Economy: Driver is tourism, followed by mining, sugar and textiles

Mission Participants

- Ruby J Farms – Dry Beans (Pinto beans)
- Zapata Seed – Produce (Potato seed)
- Farm Fresh – Produce (Fresh potatoes)
- Skyline Potato – Produce (Fresh potatoes)

Pre-Mission
Although this mission was built and executed in less than eight weeks, we did have very good help in putting the mission together and we were able to feed all the intel and leads to Nora our CDA contractor, who then arranged and set up all the meetings.

Intelligence
Myra Carvajal: The FAS rep for the Caribbean who lives in the DR was outstanding
Marco Albaran: Wusata contractor, who corroborated some of the Intel.
Amy Burdette: U.S Potatoes, who helped in sourcing potato leads.
Fradbelin Escarraman: Contractor to North Carolina for DR who pitched in.

Execution
We were only three days on the ground, but thanks to Nora we had many appointments set up for each company, so we employed a Starburst with each sector splitting off for separate meetings and venues. At times we would meet up and rendezvous for initial group meetings at the major retailers, before breaking off again.

The meetings themselves were very productive and we hit nearly all the major players in each sector - be they distributors or the bigger retailers. We did manage to squeeze in a Port visit, to scope out the very impressive and high speed port, as well as to converse with a freight forwarder as to logistics.

Prospects by Sector

Fresh potatoes - Prospects are low. DR grows its own potatoes, but just one variety the "Granola." Retailers are looking for something different to sell and are interested in bringing in other varieties. We did see some Idaho Burbank's on display, at one of the supermarkets, but the quality of these was not good. For sure there is business to be had, but to start it will be LCL appx 3 -4 Pallets to start from the main retailers who have expressed interest. There is potential to start and grow this market and it can be grown to quite a significant size, but will take some patience to develop and the willingness to send LCL shipments to start.

Seed potatoes - Prospects are fair. Growers and companies are looking for other varieties to grow. Demand is good and already we have had an e-mail requesting a trial and a visit to Colorado next year. Zapata seed has an eye on two varieties that could lend themselves well to the local climate. One of the challenges will be that some of the growers prefer single drop, rather than cut.

Dry beans: Prospects are good. There is big demand and much interest for dry bean particularly Pintos that are bright and maintain color. This is a perfect situation for Colorado, who is one of only a few states to produce these and in the quality required. Ruby J has already been busy accepting PO's. Initial feedback during the mission from Ruby J was the possibility of 200 containers per year. This projection may be, in my view overoptimistic and Ruby J has already re-worked that estimate I believe to be at around 100 containers. The limiting and migating factor is being able to get enough access to quota. The quota will be gone in 2020 when the

CAFTA comes into full effect, which makes Ruby J's decision to open an office in the DR as a result of this mission probably a very smart play.
Interest in other Sectors:
Sector – Beverage. There is interest in beer and Coors is already over there to some degree. There is room for Colorado to take advantage and grow here, in this sector.
Sector – Value-added. Opportunity, but not so much for high end. A low end U.S company that is selling in the DR is viewed as a high end product in many cases when it hits the grocery shelves. Growth potential for good priced value added and niche market for mid end priced products.

Recommendations
1) We should maintain momentum established in the Dominican Republic as we now have established a good footprint. Many of the retailers and distributors were very glad to see us. We had the right product and came at the right time. Many of the companies with whom we met, expressed gratitude in us travelling to see them and also that this was the first time they had been visited.
2) If at all possible we should do the Miami Food and Beverage show as this show serves this area of operations. CDA has done a reconnaissance and deemed the show to be of interest.
3) While maintaining momentum in Mexico and now the DR, we need to be looking over the horizon at the next target in this area. We need to start planning and initial thoughts are leaning toward Columbia at this time.

Final Report: Managing Potato Soil Health Through Cropping System Diversity for Increased Economic Gain in Colorado.
Partner Organization: Colorado Potato Administrative Committee

Project Summary

A constraint limiting Colorado potato yield and quality is an increasing level of soil-borne plant pathogens. A major concern in potato production is the sustainability of farming systems that use crop rotations susceptible to the same pests and pathogens as potato. As the inoculum loads increase, this can lead to the build-up of plant pests and pathogens, which can result in a decline of potato crop yield and quality. Crop rotation options in the San Luis Valley are limited because of the high altitude (7,600 ft. in base elevation) of the region, and the resulting economic considerations of the crops suitable for production at high altitude. Continuous cropping of a susceptible host, or alternate susceptible hosts, can result in the build-up of specific plant pathogens, resulting in a decline of crop yield and quality. Studies in potato cropping systems have shown that the rotation frequency and host range of the crops in the rotation influence potato soil-borne disease incidence and severity. Effective control of soil-borne plant pathogens (plant parasitic nematodes, fungi, phytopathic bacteria) is a serious challenge to potato growers in the San Luis Valley.

The most common local farming practice is a two-year potato-barley rotation. Data from these short rotations supports that fungal and nematode pathogens increase under this cropping system and indicators of soil health (organic matter and microbial diversity) remain low.

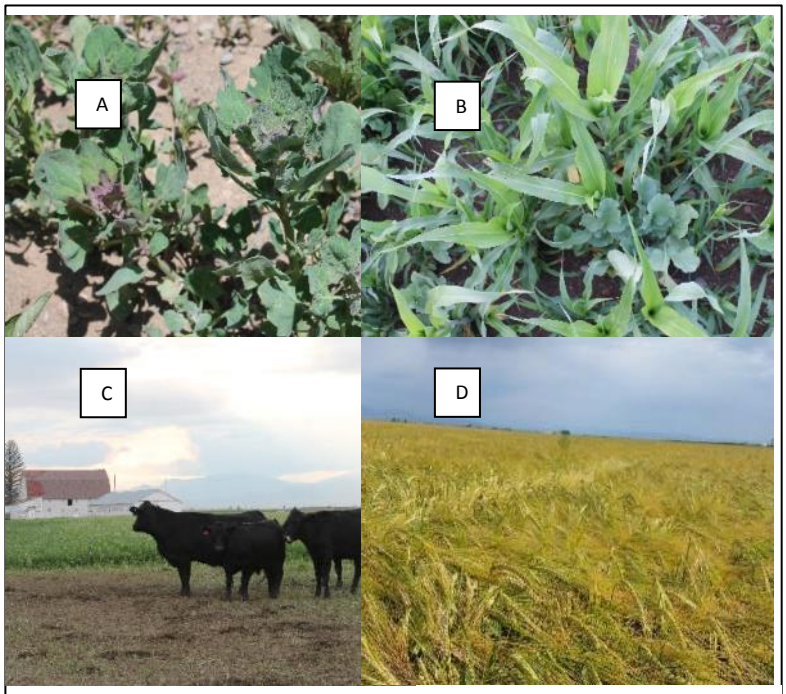

Fig. 1. Representative images for sites that included quinoa (A), grazed cover crop sites (B, C) and on-farm tests sites in barely rotation (D). Cattle are moved every few days with un-grazed sections of the “grazed cover crops” in the background of panel C.

For this project, we tested the effects of grazed cover crops and quinoa rotations on potato yield and quality to determine differences in nematode and microbial populations, and soil fertility in comparison to existing experiments on 2-year rotation (barley-potato) and 3-year rotations (barley, cover crop polyculture, potato). These data will be a baseline to understanding factors that contribute to potato disease severity and pressure, soil fertility and quality, and potential economic impact under different cropping systems.

The long-term goal of this project and a related, continuing SCBGP project, is to understand how these cropping system factors interact and provide best management soil health practices for Colorado potato growers to build soil fertility and reduce disease loss caused by soil-borne pathogens. The project is not a continuation of previous Specialty Crop Block Grant Funding; however, it builds on the existing SCBGP funding. This addition characterizes how cropping diversity within the potato system influences soil health and is different from the current study on crop rotation length.

Project Approach

During the granting period, we sampled and analyzed soil samples from fields that were quinoa and grazed livestock fields in 2016 and were able to compare them to on-farm test sites established this spring (Fig. 1). Soil cores taken at each site were split into upper (0-15 cm) and lower (15-30 cm) sections. Each section was homogenized and subsampled for DNA extraction, nematode isolation, and soil fertility characterization. After sampling, microbial DNA was extracted and amplified with 16S and ITS primers to identify bacterial and fungal species present in the samples. Nematodes were separated from soil samples using Baermann funnels and nematode counts were taken. Soil samples were sent for soil fertility analysis.

Potato Yield and Quality

In 2017, potatoes were grown in all 2016 quinoa and grazed livestock sites. We evaluated the effect of preceding summer crop on the performance of the succeeding potato crop. Potatoes were sampled to determine tuber yield and quality. Yield data indicate that potato tuber yield responds to the preceding summer crop and the site of production (Fig. 2). There was significant variation in total yield (ANOVA, $p < 0.0213$) and marketable size tuber (>4 oz.) (ANOVA, $p < 0.0139$) yield. This is largely driven by low yields at quinoa site 2. For both total and marketable yields, quinoa site 2 had a 25% reduction compared to the average of all other sites. When livestock preceded Russet Nugget, yields were similar to Canela Russet on Livestock and quinoa site 2 for all yield classes. There was no difference in premium size (>10 oz.) tuber yield with proceeding summer crop or potato type.

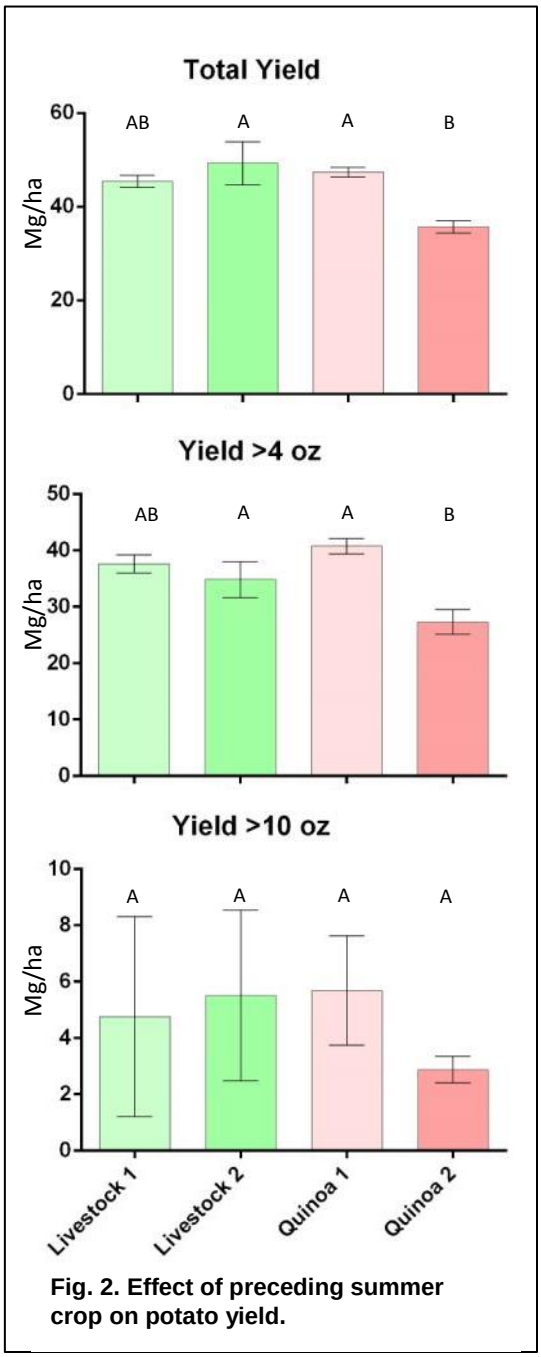

Fig. 2. Effect of preceding summer crop on potato yield.

Interestingly, the preceding summer crop did not impact tuber quality. No internal or external defects were observed in any of the potatoes harvest.

Soil Fertility

Soil samples from two depths (upper (0-15 cm) and lower (15-30 cm)) were characterized for 42 different soil fertility parameters with a Haney Test. This test is a dual extraction procedure that gives an overall assessment of soil health and can be used to track changes in soil health based on management decisions. The Haney Test examines total organic carbon and total organic nitrogen to determine a C: N ratio which can be used to make general cover crop recommendations. Also, the weak acid extraction portion of the Haney Test represents some available plant nutrients. Additionally, this test also includes the ***Solvita CO_2 Burst*** *Test* to look at microbial activity and potentially mineralizable nitrogen.

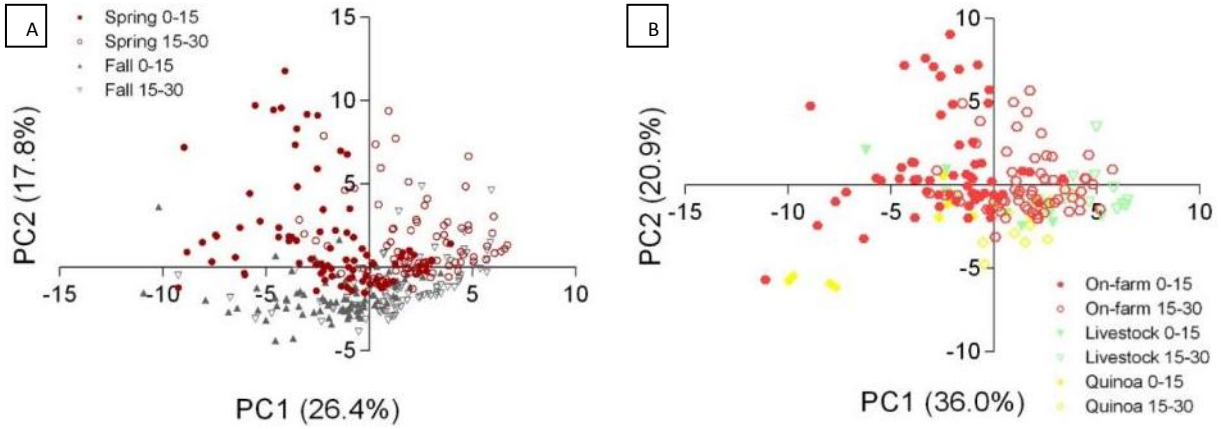

Fig. 3. Scores plot from PCA of soil fertility parameters. The full model combines all traits, crops, locations, seasons and depths (A) and the spring model includes all traits, crops, locations and depths only in the spring timepoint only.

Principal component analysis (PCA) was conducted on these soil fertility parameters and characterized significant variation in soil health traits (Fig. 3). Seven principal components explained 81.8% of the variation for the full model (all traits, crops, locations, seasons and depths). The first two principle components (PCs) are depicted in Figure 3A. The full PCA plot (Figure 3A) indicates that there was variation between Spring and Fall seasons (i.e. top vs. bottom of the figure) and depth (i.e. right vs. left separation). Much of the variation is explained by the nitrogen status of On-farm site 3 in the spring (data not shown). Additionally, the analysis of the Spring data revealed separation of the samples by crop and depth (Figure 3B). Further, the Spring data PCA shows that variation among samples was largely attributed to a reduction in 1) total and inorganic phosphors, 2) available aluminum, iron, and zinc, 3) and nutrient value of On-farm site 3 (data not shown).

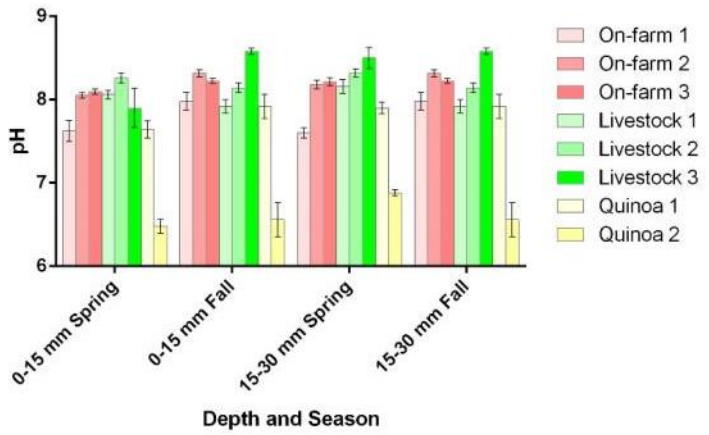

Fig. 4. Soil pH across plots

Several soil health parameters were investigated in depth including soil pH. Plant roots can absorb minerals (e.g. nitrogen and iron) when they are dissolved in water. The availability of these nutrients is largely dependent on the pH of the soil solution. Most plant nutrients dissolve easily when the pH ranges between 6.0 and 7.5. Below a pH of 6.0 than nitrogen, phosphorus, and potassium are less available. When pH exceeds 7.5 then iron, manganese, and phosphorus are less available. We found that pH differed by location and depth (ANOVA, $p < 0.001$) (Fig. 4). Additionally, there was a significant interaction between location x depth (ANOVA, $p < 0.001$) and season and depth (ANOVA, $p < 0.0148$). The lowest pH (pH ~6.5), regardless of season was in quinoa site 2. Most other locations were above the maximum pH for optimum availability of nutrients across all seasons, depths, and crops which could impact crop growth and production.

Certain soil parameters can also help inform how management practices can influence key processes such as nutrient cycling and availability, soil aggregation, and the accumulation of carbon in the soil. Many studies have shown that particulate organic carbon (POC) and microbial biomass carbon (MBC) are sensitive to changes in management such as cover cropping and land use changes, however, they remain expensive for most applications and there is a large degree of variation in how they are extracted and defined. The permanganate oxidizable carbon (POXC; i.e. reactive carbon) method is relatively rapid and inexpensive. This method has been found to have greater sensitivity to changes in management or environmental variation than POC, MBC, or soil organic carbon. The POXC method estimates labile organic carbon in the soil which breaks down relatively quickly and is the major food source for soil microbes. Here, we found significant variation in labile soil carbon (ANOVA, $p < 0.0370$), however, this is likely due to grower management practices as there is not trend by crop type (Fig 5). High levels of reactive carbon improves water infiltration and reduces soil degradation. Two sites are below 500 ppm active carbon which may indicate a constraint on the production system.

Microbial diversity

For the bacterial and fungal communities, total soil DNA was extracted from soils collected in March 2016. From this DNA, two regions were amplified to enable identification and quantification of fungal and bacterial species found within the soils. Data were then analyzed using non-metric multidimensional scaling (NMDS) analyses. The NMDS plots (Figure 5A and

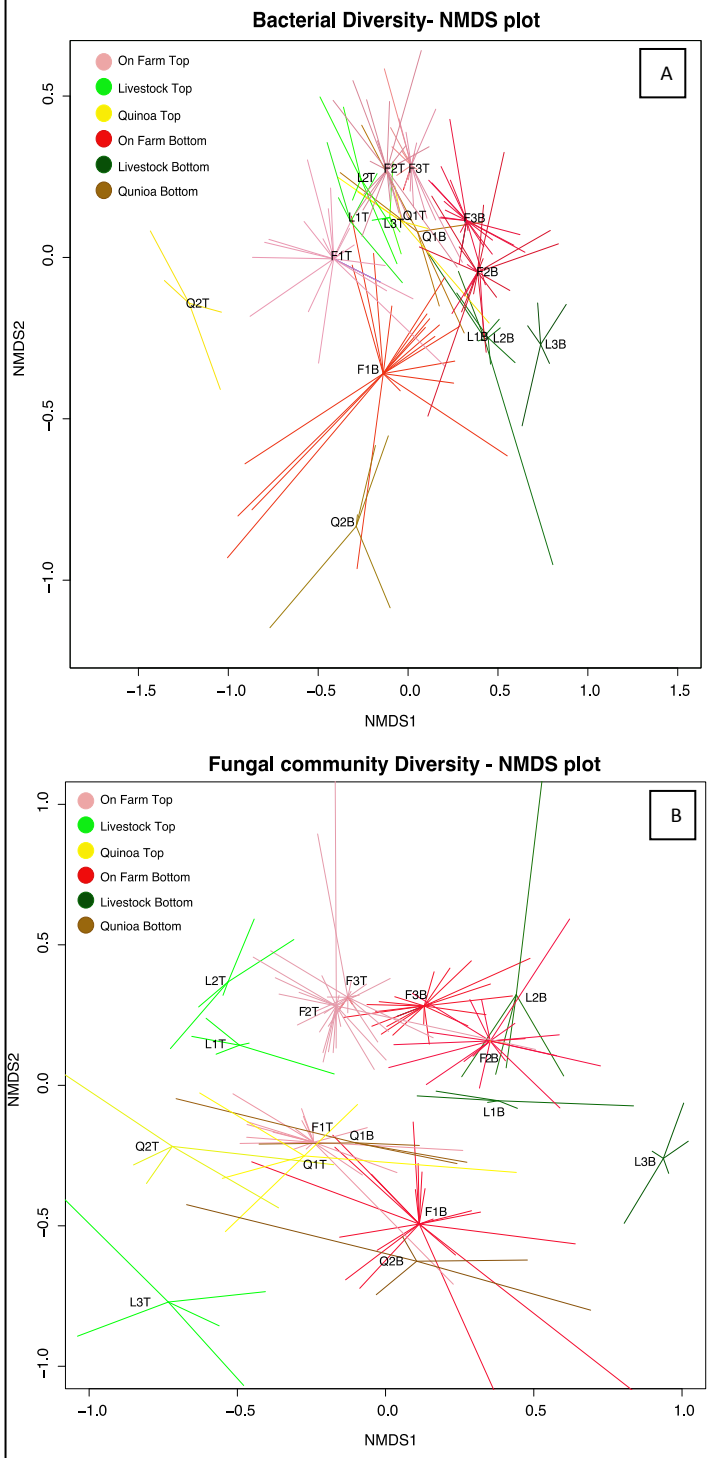

Fig. 5. Bacterial (A) and fungal (B)diversity at two depths 0-15mm (top) and 15-30mm (bottom).

5B) show overall bacterial (A) and fungal (B) community variation (per field) and estimate the similarity of plots by cover crop type (on-farm, quinoa, and livestock) and by top and bottom soils). The closer clusters are the more similar they are to each other. In Figure 5, the lighter colors (pink, light green and yellow represent the top soils from the on farm, livestock, and quinoa plots (respectively), and the dark colors represent samples collected from the bottom soils (red: on farm, dark green: livestock, and brown: quinoa.) In Figure 5a, top and bottom layer soil samples from all plots types are clustered closely. However, more variation among bacterial communities is observed in bottom soils compared to top soils. With top soils a little separation is observed among on-farm, livestock or quinoa plots. Similarly, little separation by plot type is observed among the bottom soils, where livestock and on-farm plots are cluster together. There were several plots, including quinoa site 2, where there is a larger difference between the bacterial communities found in the top and bottom soils. A similar result was also observed with the Livestock 3 plot. This may due to grower practices.

Fungal communities showed less structure as compared to the bacterial communities. There are two main clusters observed in the

NMDS plot (Figure 5B) but these clusters are not grouped by top or bottom soils. However, within each cluster, top soils were placed similarly along the NMDS x-axis, indicating similarity within the first factor. Interesting, the two quinoa plots are clustered in the second (lower) cluster. However, samples from on farm and livestock plots do not seem to follow this trend. Further, there is more variation within plots than observed for the bacterial communities, suggesting that fungal communities are potentially more diverse and variable.

Nematode abundance

Nematodes can reduce both potato yield and tuber quality. Cultural practices such as crop rotation, cover crops, and soil quality enhancements are important parts of nematode control. These practices, however, must be designed for each specific nematode, site and geographical region. To determine if there was an effect of the preceding summer crop on nematode populations, nematodes were separated from soil samples using Baermann funnels. Nematodes were visualized with a light microscope (Fig. 7) and nematode counts were taken (Fig 8). We found significant variation in total nematode counts as well as nematode size distribution (Fig. 8). Total nematode numbers varied by location (ANOVA, $p < 0.0001$) and season (ANOVA, $p < 0.0001$) (Fig. 8A). There was a significant interaction between location and season (ANOVA, $p < 0.0001$) as well as depth and season (ANOVA, $p < 0.0021$). There were significant increases in total nematode populations at on-farm test sites which grew barley this year. This trend was not observed in any of the previously grazed livestock or quinoa sites that were in potato this year. This increase in nematode populations in barley (on-farm test sites) was independent of depth and increased at both 0-15 and 15-30 cm. The greatest nematode populations were at on-farm site 3, even though the baseline populations taken in the spring season were not different from the other on-farm sites. Nematode populations at livestock site 2 were similar over season and depth. In general, the quinoa site 2 had the lowest number of nematodes over season and depth.

Fig. 7. Light micrographs from representative images of nematodes from soils (A-C and D-F). Entire body (A, D), anterior body (B, E) and tail view (C, F).

Nematode body size can be indicative of their pathogenic life-style. In general, bacteria feeding nematodes are small, while plant-parasitic nematodes are large. We counted large versus small nematodes to determine if there was an influence of crop type or soil depth on nematode size numbers (Fig. 8B & 8C). In general, we observed an increased number of nematodes in on-farm sites, regardless of size. There were more large bodied nematodes than small. There was significant variation in small nematode populations by location and depth (ANOVA, $p < 0.0001$ and $p < 0.0126$, respectively), however, there was not interaction between location and depth. On-farm site 3 had more small nematodes than any other location, and in general, the livestock and quinoa sites had the least small nematodes. Like the small nematodes, we saw significant variation in large nematode populations by location and depth (ANOVA, $p < 0.0001$ and $p < 0.0344$, respectively); however, there was no interaction between location and depth. There were increased nematode populations across depth in all locations and depths compared to small nematode populations. As seen previously, the most large nematodes were recovered from on-farm site 3 with the least large bodied nematodes recovered from livestock site 3.

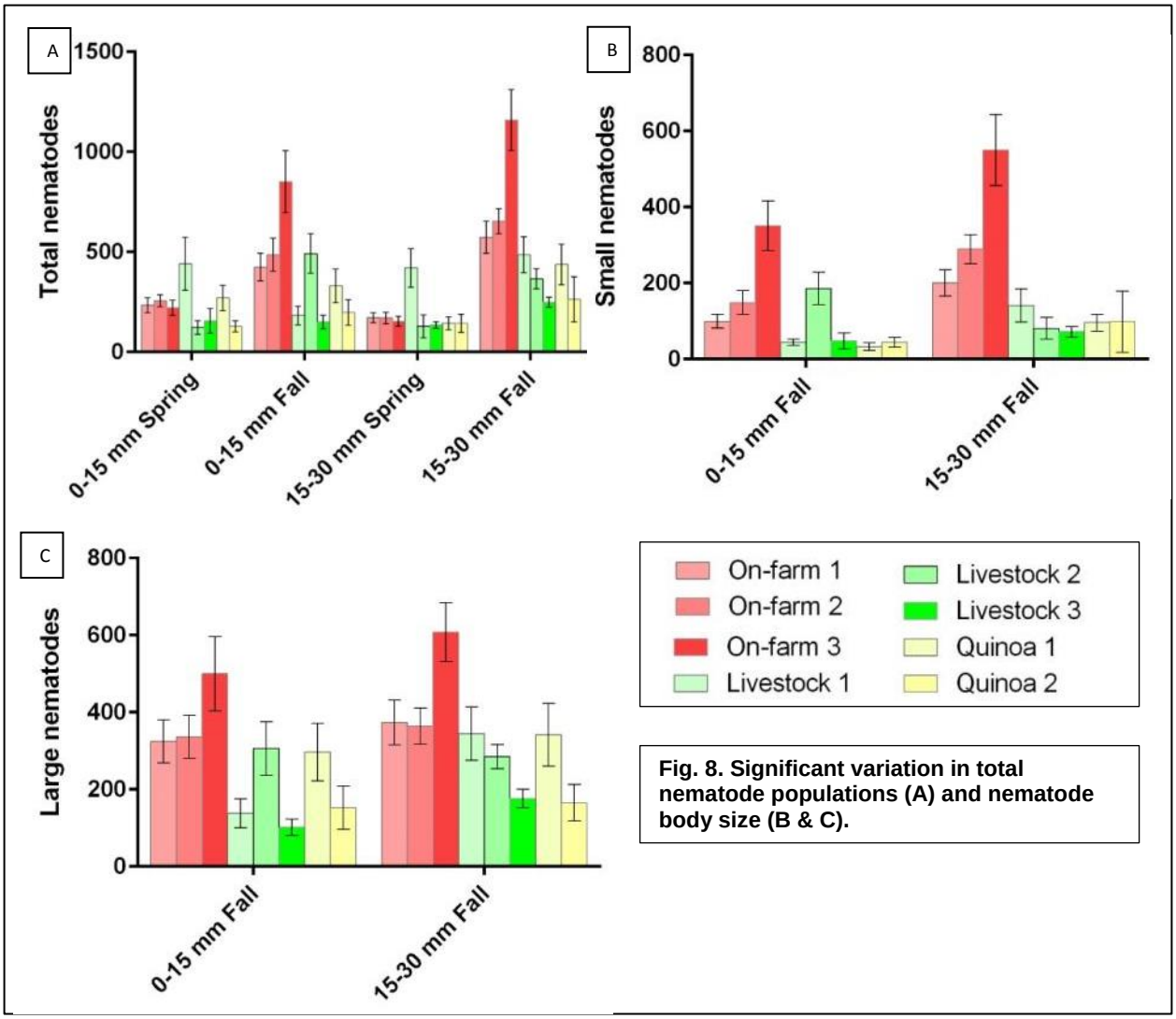

Fig. 8. Significant variation in total nematode populations (A) and nematode body size (B & C).

Goals and Outcomes Achieved

Goal	Performance Measure	Benchmark	Target 2017	Actual 2017
Enhance the competitiveness of fresh potatoes through more sustainable, diverse, and resilient specialty crop systems	Report showing differences in nematode populations across rotational practices.	N/A	Data from 1000 Acres	Data collected from 1000 Acres

In April, on-farm test and alternate crop rotation sites (quinoa and grazed livestock) were established and baseline soil samples were taken. The soil cores taken at each site were split into upper (0- 15 cm) and lower (15 – 30 cm) sections. Each section was homogenized and subsampled for DNA extraction, nematode isolation, and soil fertility characterization. After sampling, microbial DNA was extracted and amplified with 16S and ITS primers to identify bacterial and fungal species, respectively, present in the samples. Nematodes were separated from soil samples using Baermann funnels and nematode counts were taken. Several experiments were conducted to determine the best nematode DNA isolation method.

Additionally, we tested several primer sets to determine which nematode primers would amplify reproducibly. During this time period, the sequencing facility at the University of Minnesota also did several experiments to be sure that these fragments could yield sufficient quality to be useful in identifying nematode species present in soil samples. Soil samples were sent for soil fertility analysis. Our grower cooperators planted barley into on-farm test sites this growing season. In August, we took our second soil sample post barley production and at alternate crop sites. We sampled as stated above: each soil core was split into upper and lower sections. Each section homogenized and sub-sampled for microbial DNA extraction, nematode isolation, and soil fertility characterization. Nematodes were isolated using the Baermann funnel method, counted, and DNA was isolated. All microbial and nematode DNA was amplified with appropriate primers to identify bacterial, fungal, and nematode species present in the soil samples. Amplified DNA was sent to Minnesota for sequencing. Soils fertility tests were performed on these second soil samples. We have received our microbial sequencing data back from the sequencing facility and have begun data analyses to identified fungal and bacterial species present and absent in the samples.

The long-term goal of this project is to provide solutions for Colorado potato growers to build soil fertility and reduce disease loss caused by soil-borne pathogens. A significant finding of this study is that nematode populations remained low in potato production systems when they followed either grazed livestock or quinoa, while nematode populations exploded under barley production. We found significant variation across straits that indicate individual grower practice

plays a heavy hand in potato soil health. Understanding how these practices contribute will allow for wider adoption and increased productivity.

Beneficiaries

The 150 potato growers in the San Luis Valley benefit from these results.

A major concern in potato production is the sustainability of farming systems using short-term rotations that result is a less than optimum crop rotation system for most potato growers. These data will also provide valuable decision making information about future crop rotation and baseline information about the potential for some of these newer cropping systems to alter current growing conditions including pathogen pressure and soil fertility. How adoption of these practices will impact growers economically is currently unknown, but these results can help growers make informed decisions on how soil health options may change their bottom-line. While these results are universal to all growers they could benefit disadvantaged or beginning farmers with the potential to lower inputs and increase yields. These results are tailored to the SLV growing region, however, information on how the incorporation of more diverse cropping systems affect pathogen pressure, microbial dynamics, and soil fertility could be adapted or minimally tested in other potato growing states.

This project solely benefited specialty crops.

Lessons Learned

A variety of lessons were learned through the completion of this work. We were concerned that we might see seasonality issues within our data as they were sampled in different seasons. This could be true for some traits, however, at least for nematode population data we saw consistent population numbers in potato fields grown in previous quinoa or grazed-livestock fields. This is different from what we saw with nematode numbers from on-farm test sites that are currently in barley production. Determining the methods for nematode DNA extraction and sequencing took much longer than expected, and the data will be obtained shortly and will be ongoing.

Additionally, good sequencing facilities can have a long backlog and wait time for data can vary. This will continue to be a problem with other projects, however all data received to date has good read coverage with no failed runs. We have just begun to scratch the surface on microbial population dynamics and by the end of this granting date have only determined subtle differences in microbial communities. We will begin to identify changes at the species level in the coming months.

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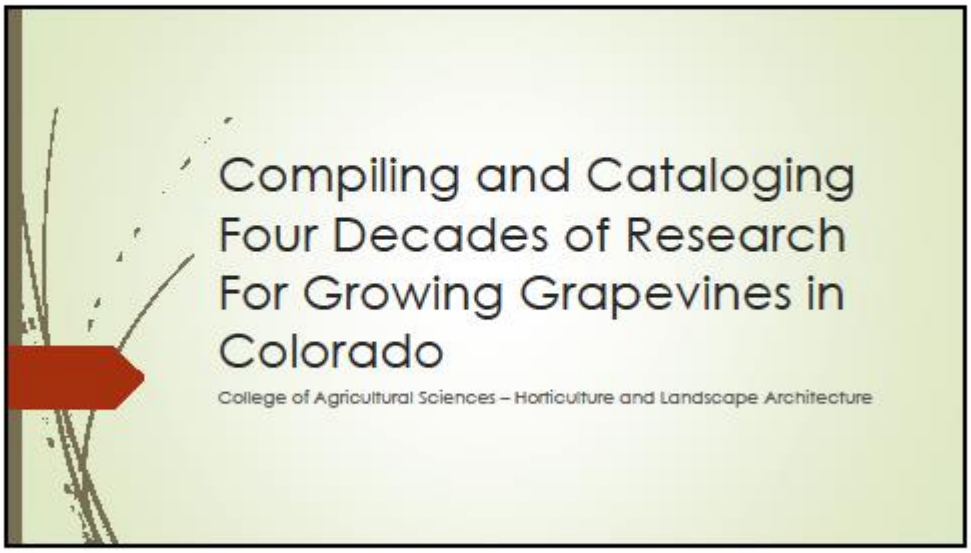
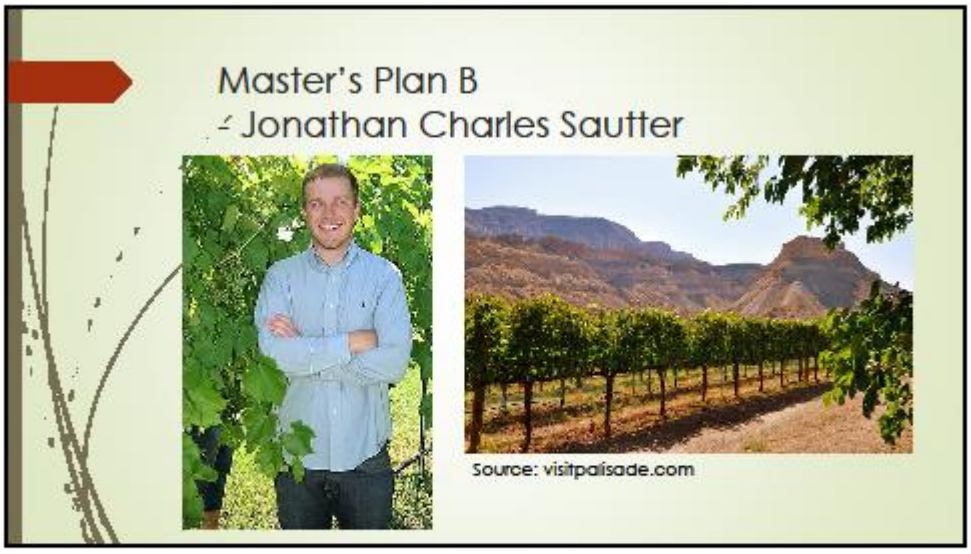
Appendix

Compiling and Cataloging Four Decades of Research to Revise the CO Grape Growers Guide – Sautter Master's Presentation PowerPoint

Click to read entire presentation:





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