

Innovation Grant Report

Project Name: **High Altitude Season Extension (HASE):** Evaluation of Season Extension Techniques in Higher Elevation (6500+ ft) Growing Areas

PI: Yvette Henson

Explain why this proposal was innovative and creative – in terms of content, audience, methodology, etc.

“This project will conduct innovative and timely research into the use of season extending techniques to produce food crops at higher elevations in Colorado. Funds will be used in three ways: 1) to compare the effect of season extension techniques on crop yields 2) to determine adaptable plant varieties for high elevation growing 3) to develop demonstration plots for market producers, home gardeners and Master Gardener trainings in the mountain areas of Colorado.

This experiment will compare three season extension techniques in three high elevation counties (Eagle, San Miguel, and Teller counties). Raised beds (>22 inches tall, 4' wide x 12' long) will be used at all locations. Crop yields under polycarbonate covers with automatic vents, and mini-hoops covered with spun-bound polyester will be compared to an uncovered bed. Plants to be tested in 2010 include lettuce and transitioning to cold-hardy greens (spinach or kale) in the fall. A minimum of three varieties of each crop will be tested. Fresh yield weights will be recorded and monthly photographs taken of each test plot. Air temperature and soil temperature in each test plot will be monitored for the length of the trial using automated data loggers. This will allow us to directly compare the effect of soil and air temperature on plant growth for each treatment.”

Clearly state the issue you addressed, why it was a priority, and why it was timely:

“This is timely research: there is an increased demand for local food production at the home gardener and commercial levels. There is also increasing concern about food insecurity in the mountains of Colorado. Rural communities and those in areas with extremely short growing seasons rely almost exclusively on fresh produce and other food items trucked into the area. Increasing local production of crops will make areas more food secure. Season extension techniques will play a large role in crop production at high elevation areas with extremely short (~60-120 day) growing seasons depending on elevation and microclimate.

One limitation to immediately implementing season extension techniques is that research-based information at high elevation areas of Colorado is non-existent. Successful studies conducted on the Front Range (<5500 ft) have been incorporated into Master Gardener training materials but these techniques have not been confirmed at higher elevations. Mountainous areas have distinctly different growing season lengths and conditions and results of research conducted on the plains cannot be directly transferred. Most season extension techniques, including the ones we will test, are decidedly low-tech and do not require expensive investments. Utilizing a protected environment, like a cold frame, is expected to extend a growing season by a month or longer. With protection, soils will be warmer and plants will be insulated from frost and excessive ultraviolet radiation. Utilizing a combination of proven season extension techniques and adapted plant varieties will allow mountain counties to become more food secure and increase the potential for additional income by selling produce.”

List faculty involved. All projects must include at least one county-based AND one campus-based OR one regional OR one experiment station-based faculty.

The original team when this project was funded was Brooke Edmunds, the original P.I. and Specialist, Mark Platten, Laurel Potts, Yvette Henson. Brooke Edmunds left CSU and Dr. Steven Newman agreed to be our campus specialist. We also consult with Frank Stonaker and Jim Self.

Provide numeric budget, budget narrative, and discuss all inputs.

In-kind donations: Water at each site; Master Gardener or other volunteers to build raised beds, plant seeds, weed, set up coverings, etc.; mileage for PI to travel to each site for set up, mid-season check, and final evaluation.

Total Requested Funding: \$4715

As of May 2011 we have spent \$3,625.00

- on Lumber and hardware for framing raised beds at Teller County and San Miguel County locations (Eagle County will use existing beds).
- Soil to fill beds (at two locations).
- Micro-sprayers and irrigation lines (at two locations)
- Covering materials (hardware cloth, spun-bond polyester, poly film, zip ties, automatic vents, poly carbonate sheets, fasteners, etc.)
- Automated soil and air temperature data loggers, base station to download data and required software.
- Soil nutrient and texture analysis (9 @ \$40): \$360

We have either not purchased or not turned in invoices for Seeds: \$150; fertilizer (for three locations): \$150; Signage for individual plots (9 total): \$150;

List outputs; discuss the activities, products, methods and services that reached people and users.

There are several outputs from this project:

- 1) research-based information on effectiveness of high elevation season extension techniques will be obtained
- 2) demonstration plots will be built for on-site Master Gardener and community training
- 3) we will use our first-year results to leverage for outside funding to continue the project in subsequent years.

Research-based information: The first year trial results will be freely distributed. A new CSU Extension factsheet "Season Extension Techniques for Colorado" will be developed. This factsheet will incorporate what is known about the Front Range and our trial results at higher elevations. The results of the trial will also be summarized and incorporated into the Master Gardener training materials (as an update to CMG GardenNotes #722). It is anticipated that additional funding will allow for multi-year results which will be summarized into a scientific journal article for submission to HortTechnology or similar publication.

Demonstration plots: The demonstration plots will be located in a readily accessible area near other gardening demonstration areas in each county. The plots will be clearly marked with signage describing the goals this study and list the benefits of season extension techniques. This will enable gardeners and commercial growers to observe the research we are conducting. It is also anticipated

that each county will incorporate these demonstration plots into their training and presentations as opportunity arises.

Leveraging outside funding to continue the project: It is our desire to obtain supplemental multi-year funding to continue testing vegetable and herb varieties that do well at high elevations. Subsequent funding will extend the research to include cold frame greenhouse structures and replicate applicable technologies and trials being done through CSU Rocky Mountain Small Farm Project under Dr. Frank Stonaker. As funding increases, it would also be interesting to continue testing new season extending techniques which may lead to eventually recommending specific techniques for specific crops.

Describe what outcomes you evaluated, how the evaluation was done, and your results.

The completion of this project has been delayed due to loss of Extension staff and other county-specific setbacks. Currently the beds in San Miguel County are planted with a trial of warm-season vegetables: 'Provider' green beans; 'County Fair' cucumbers; 'Gypsy' and 'Carmen' sweet peppers.

All three locations will be planted and evaluated in 2011 with a fall/winter crop of 'Tyee' Spinach and then a 2012 late winter early spring planting of baby romaine lettuces; 'Cimarron', 'Rouge De Hiver', and 'Paris Island Cos'.

The research data gathered in this study will be evaluated according to standard statistical methods. These results will be incorporated into several educational trainings which will be evaluated as part of that specific training. For example, knowledge gained through Master Gardener training is evaluated using that instrument. The faculty involved may also choose to present the results at local workshops which will be individually evaluated.