Bond

Development and Commercialization of a "Branded" Colorado Potato

This is the annual report for 2011which is the second year of a three year project.
Due to delay in allocation of the project funds the project is running behind schedule.
The delay was the result of internal issues at Colorado State University.

Project Summary:

Potato producers in Colorado are among the most progressive potato producers in North America and have been very supportive of trialing new potato cultivars in their operations. Currently Colorado producers raise over 100 cultivars annually. A concern that has developed recently deals with minimizing the risk in commercialization of these new cultivars. This project is attempting to determine the correct marketing mechanisms to bring new varieties to market, especially varieties with unique health and/or nutritional attributes. Using consumer research to create a model for commercialization of the four new varieties selected in this project will facilitate the transfer of knowledge about resistant starch levels, higher levels of antioxidants and Vitamin C in these varieties to potential consumers. This information will allow tailored branding of the varieties based on the marketing analysis information derived from this project. The intention is to insure all FDA nutritional guidelines are met to insure the validity of all marketing claims. This project when completed should allow Colorado producers the knowledge to be more competitive in the marketing of new, improved potato cultivars with less risk. This would be a huge step in our strategic goal of promoting the growth of new potato varieties that can be differentiated and branded as "unique to Colorado".

2011 Work Plan Elements

There are essentially three components of this project; the agricultural production and best management practices of the four potato varieties, the nutritional assay of the health attributes within the four varieties, and the consumer and marketing research necessary to understand how these varieties can be best be branded and marketed.

Agricultural Production and Best Management Practices (BMP)

The table below summarizes the current status of the project. The four varieties have been identified; Rio Grande Russet, Purple Majesty, CO-99053-3RU, and AC 99329-7PW/Y.
The two numbered lines have been given temporary names for marketing purposes. The 3RU variety is "Aspen", and the 7PW/Y is the "Lady Pinto". Each of these varieties was selected for unique characteristics that make them appropriate for the project.

Production and BMP's	Timeline	Status
Identify the cultivars	2009-2010	Completed, 4 varieties identified
Develop acreage for production	Summer of 2010	Seed production completed, commercial production being identified for 2012
Develop production strategies	Production season 2010-2011-2012	Ongoing- Currently analyzing harvest results and field notes to develop cultural BMP's
Develop Post Harvest strategies	Storage season 2011-2012	Ongoing- Plot samples undergoing storage testing

This summer each variety was planted and harvested to allow for the needed seed increase for commercial production in 2012.The agronomic practices used to grow the crop have been documented and will be evaluated for their response to nutrient management, plant population density, and disease resistance.

Nutrient Management

Nutrients being evaluated include nitrogen, phosphorus, potassium, and compost rate, along with nitrogen and calcium application timing. Weekly petiole samples were analyzed this fall for nitrogen, phosphorus, and potassium. This data will be used to establish optimum petiole nutrient concentration levels to achieve maximum yield and quality goals in production.

The last two years field studies were laid down as a randomized complete block design. Each treatment was replicated four times. Treatments included nitrogen application rates at 60, 120, and 180 lb N/ac. A control treatment was included where no nitrogen fertilizer was applied. During the spring of each year, soil samples were taken from the experimental site and analyzed for residual soil nitrate nitrogen (N). Water samples were taken from the irrigation well and analyzed for nitrate nitrogen concentration. The residual soil N and irrigation water N added up to 28, 68, 61, and 80 lb N/ac, for Rio Grande Russet, Purple Majesty, AC99329-7PW/Y, and CO99053-3RU, respectively. Knowledge of the residual soil and irrigation water N is important to help estimate how much nitrogen fertilizer is needed to apply for maximum tuber yield and quality.

Plant Population and Density

Tubers were sampled weekly after tuber initiation to determine bulking rates. The harvested plots were graded and sized. The objective of these studies was to evaluate the optimum plant population needed for maximum tuber yield and quality of four Colorado cultivars. Plant population varied depending on the in-row seed spacing treatment. Seed spacing treatments included planting potato seed tubers at 10, 12, and 14 inches.

The field studies were laid out as randomized complete block design. Each treatment was replicated four times. Specific gravity testing from plot samples was conducted in December and after analysis is complete a draft report will be prepared by Dr. Samuel Essah. This report will compare the results from the 2010 crop. This information and the nutrient management studies will then be useful in developing BMP practices for growers moving forward.

Disease Resistance

All variety plots were inspected weekly and screened for diseases during the growing season. No major problems were noted and based on this information and analysis of the field inspection notes disease prevention guidelines can be developed early in 2012 for the 2012 commercial crop production.

Storage Management

After harvest plot samples are being tested using different storage regimes. Information gathered from 2010 storage testing has been incorporated into 2011 testing. This study will continue into late spring of 2011 to mimic normal grower production practice. On problem encountered in 2010 storage results was discovering that the variety "Lady Pinto" has a very limited natural dormancy and will require special care in storage handling to insure an extended marketability window. Dr. Sastry Jayanty is working to extend the window of marketability of the specialty cultivar such as Pinto and Purple majesty. If they are stored at 38F (3.3C) with 95% relative humidity, they can maintain four to six months without sprouts. But after leaving storage they quickly develop sprouts at room temperature within days. Four different sprout inhibitors were tested (two organic and two conventional) to extend dormancy in these two cultivars after removing from long-term commercial storage. Conventional sprout inhibitors, such as CIPC, have proven more effective than of all other sprout inhibitors available. The organic sprout inhibitor L-Carvon was more effective than clove oil in reducing sprouting in Pinto and Purple majesty for 30 days in 2010 testing. Conventional sprout inhibitor Dimethyl naphthalene (DMN) was as effective as organic inhibitors. During the 2011-2012 storage season we are testing both organic and conventional at three different temperature regimes and multiple application timings to extend dormancy.

New Variety Identification and Development

Dr. David Holm continues to collect data annually on all selections in the Colorado breeding program. New varieties that are identified with improved nutrition and quality that would lend themselves to differentiation and branding may receive additional screening as part of this project in addition to the four varieties already selected. Seventy advanced selections were saved and will be increased in 2012 pending results of ongoing evaluations. Advanced selections evaluated in the Southwest Regional Trials, Western Regional Trials, or by Colorado producers in 2011, included 10 russets (AC99375-1RU, AC00395-2RU, CO97087-2RU, CO99053-3RU, CO99053-4RU, CO99100-1RU, CO03187-1RU, CO03202-1RU, CO03276-4RU, and CO03276-5RU), 4 reds (CO98012-5R, CO99076-6R, CO99256-2R, and CO00291-5R), 9 chippers (AC01151-5W, AC03433-1W, CO95051-7W, CO00188-4W, CO00197-3W, CO00270-7W, CO02024-9W, CO02033-1W, and CO02321-4W), and 15 specialties (ATC00293 -1W/Y, AC99329-7PW/Y, AC99330-1P/Y, CO97222-1R/R, CO97226-2R/R, CO97232-1R/Y, CO97232-2R/Y, CO00412-5W/Y, CO01399-10P/Y, CO03027-2R/R, CO03094-5RF/RW, CO04021-2R/Y, CO04013-1W/Y, CO04117-5PW/Y, and CO04045-4P/P).

Nutritional and Health Attributes

One of the goals for this element of the project is to determine FDA requirements for the nutritional claims we are hoping to use and the steps in the approval process. Specific testing has been done to analyze the nutritional attributes of the four selected varieties. This testing is ongoing and needs to verify the necessary FDA requirements. Dr. Jayanty presented the some of the results of his experimental testing to the Potato Association of America on August 15th, 2011 in Wilmington, North Carolina. The presentation was "Volatile compound analysis in Colorado potato cultivars and advanced selections using solid phase micro extraction technique"
This element of the project will move forward in 2012 after research team collaboration and review of the project. This is a critical piece of the overall project goal of commercializing some of these varieties.

Consumer and Marketing Research

The table below summarizes the consumer and marketing research element of the project to date:

Consumer and Marketing Research	Timeline	Status
Assessing consumer knowledge of potato nutrition	2009-2010	Completed- important consumer knowledge identified
"Brand" creation	2010-2011	Completed- specific labels designed and tested for varieties
Sensory analysis report	2010-2011	Completed- Consumer taste preferences identified
Analyze research data for information gaps	2011-2012	Ongoing- Further analysis of the data
Marketing strategy development	2012	Beginning in 2012

The marketing research under the direction of Dr. Jennifer Bond focused on assessing consumer knowledge of potato nutrition and health characteristics possessed by potatoes. The primary methods for this involved sensory analysis, label creation, secondary data review, and development of choice set survey and consumer experiment protocols. Three Colorado State University faculty members and one graduate student are assisting with this project.

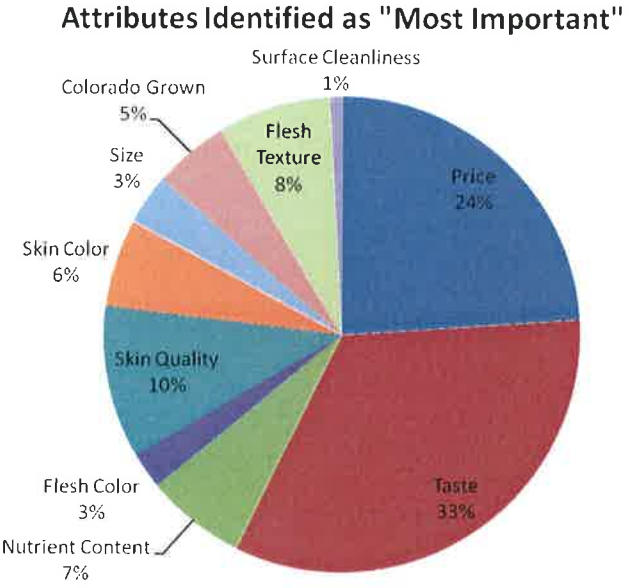
- **Sensory analysis-** Testing was conducted in mid-July of 2009. Statistical analysis of the in-home and trained panels was completed in 2010 and a draft of the keys findings has been completed.
- **Label creation-** sample labels were created by Alysce Christian and submitted to the marketing team for feedback. This feedback was instrumental in creating the final label design. The labels are appropriate for use on both poly-bags and clam-shell type packaging. Application of label claims will now be determined through analysis of the collected consumer data. Data gathered in pre- and post-revelation on nutrition information testing determined that consumers were willing to pay more after being exposed to the nutrition information. This information will be valuable in determining label information.

Sample Label

- **Secondary Data Review-** A review has been completed of national consumption trends and a published report has been completed. Further analysis of this data was conducted in early 2011 along with the consumer experiment research to determine which health attributes have the greatest value to consumers.

The date revealed that consumers were "Least Knowledgeable" about resistant starch content (44%) followed by antioxidant levels (31%). Discovering baseline consumer nutrition levels are important in developing marketing strategy moving forward.

- **Choice Set Survey and Consumer Experiments-** After developing experimental protocols the actual experiments were conducted in October and November 2009, and June of 2011. The actual experiments consisted of a consumer demand survey and analysis of willingness to pay for various combinations of label claims and product attributes. This was followed up with practice auctions, and actual potato auctions. Following the auctions sensory evaluation using the four potato varieties was conducted on both baked and microwave potatoes. Each experiment took between 1.5-2 hours and six actual experiments were conducted with over 140 volunteer subjects. Key consumer preferences have been identified through this research. The graph below illustrates consumers "most important" potato attribute preference.



PROJECT BUDGET AND EXPENSES

The project received the grant for $115,000 and CPAC contributed an additional $28,750 in matching funds. The project has been set up as a program within the Sponsored Program section of Colorado State University. This allows the CSU research team to have funds available when needed without unnecessary delay. Unfortunately this year there was a long delay in getting the internal budget set up within the CSU system for the research team. This resulted in funding delays which slowed project progress. The table below is the planned budget for the project in 2011. The 2010 actual expenses resulted in greater expense for labor/salary than what were anticipated so the 2011 budget estimate was adjusted to reflect this. Because of the initial delay actual 2011 research expenses are not available yet. The last claim for the 2010 grant allocation is still to be invoiced from CSU.

	SCBGP Funds	Applicant Cash/In-Kind Contribution	Total
Personnel	$41,775	$8,350	$50,125
Fringe Benefits	$8,225	$1,650	$9,875
Travel	$2,500	$0	$2,500
Equipment	$0	$0	$0
Supplies	$50,000	$10,000	$60,000
Contractual	$0	$0	$0
Other	$12,500	$8,750	$22,500
Indirect Charges	$0	$0	$0

Total	$115,000	$28,750	$143,750

2011 OBJECTIVES REVIEW- LESSONS LEARNED

There were two key objectives for the project as we moved forward into year two. The first was to increase the planted acreage of the four project varieties with the intention of having adequate supply to use for continuing the necessary agronomic studies, for consumer marketing studies and testing, and on a limited basis test commercial marketing. This objective was met without difficulty as the needed seed and commercial testing quantities of the four varieties were produced and are currently in storage.

The second key objective involved testing the consumer message track that is being developed. The idea was to refine the consumer message so that consumer knowledge of potato nutrition and health attributes is being clearly received and understood. The consumer studies conducted have shown that a consumer's willingness to pay for different potato varieties is influenced by the consumer's initial sensory experience with a variety, their pre-existing knowledge of potato nutritional properties, a variety of demographic variables, and the consumer's exposure to additional nutritional information prior to purchase and consumption. For example it was discovered that consumers were willing to bid higher prices for the four varieties with a health attribute after receiving nutrition education and tasting the varieties. They were unwilling to do this with the control variety of Russet Burbank after the same procedure. This knowledge will help us move closer to achieving this objective in 2011.