

**V(A). Planned Program (Summary)**

**Program # 5**

**1. Name of the Planned Program**

Plant Production Systems

Reporting on this Program

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	25%		15%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		20%	
202	Plant Genetic Resources	0%		20%	
204	Plant Product Quality and Utility (Preharvest)	15%		0%	
206	Basic Plant Biology	15%		0%	
213	Weeds Affecting Plants	15%		20%	
216	Integrated Pest Management Systems	15%		25%	
601	Economics of Agricultural Production and Farm Management	15%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	18.1	0.0	26.0	0.0
Actual Paid Professional	20.0	0.0	23.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
404236	0	1119506	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
404236	0	1119506	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
547312	0	10898978	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

- Conduct basic and applied research in plant productions systems.
- Workshops and educational classes for producers.
- Utilize demonstration plots and field days to communicate program results.
- Use individual counseling with producers and clientele on specific plant production problems

**2. Brief description of the target audience**

Individual agricultural producers, homeowners, agribusinesses, and commodity organizations.

**3. How was eXtension used?**

{No Data Entered}

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	0	0	0	0

**2. Number of Patent Applications Submitted (Standard Research Output)**  
**Patent Applications Submitted**

Year: 2013  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2013	Extension	Research	Total
Actual	2	167	0

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- PM 14) New Technologies Expected to be Adopted by Producers

Year	Actual
2013	17

**Output #2**

**Output Measure**

- PM 2) Pest diagnostics in field, urban, office, individual settings

Year	Actual
2013	1629

**Output #3**

**Output Measure**

- PM 3) Trainings/Classes/Workshops, Field Days, Activity Days

Year	Actual
2013	533

**Output #4**

**Output Measure**

- PM 4) Trainings for Volunteers

Year	Actual
2013	239

**Output #5**

**Output Measure**

- PM 5) Trainings for Extension Staff

Year	Actual
2013	5

### **Output #6**

#### **Output Measure**

- PM 6) Community Meetings Convened [examples: Advisory Groups, Councils, Coalition Meetings, Boards]

<b>Year</b>	<b>Actual</b>
2013	14

### **Output #7**

#### **Output Measure**

- PM 7) Direct Communication/Education by field call, telephone and/or e-mail

<b>Year</b>	<b>Actual</b>
2013	3052

### **Output #8**

#### **Output Measure**

- PM 8) Newsletters (This is number of newsletters, not number mailed or number of Coloradans who received them.)

<b>Year</b>	<b>Actual</b>
2013	13

### **Output #9**

#### **Output Measure**

- PM 9) Websites (number of Websites, not number of hits)

<b>Year</b>	<b>Actual</b>
2013	2

### **Output #10**

#### **Output Measure**

- PM 10) Websites hits (number of hits, not number of sites)

<b>Year</b>	<b>Actual</b>
2013	758762

### **Output #11**

#### **Output Measure**

- PM 11) Press/News Release or Column (number submitted)

<b>Year</b>	<b>Actual</b>
2013	33

**Output #12**

**Output Measure**

- PM 12) Volunteers (total) in Planned Program

<b>Year</b>	<b>Actual</b>
2013	130

**Output #13**

**Output Measure**

- PM 13) Certified Master Volunteers (of those in #12)  
Not reporting on this Output for this Annual Report

**Output #14**

**Output Measure**

- PM 15) External Grant Dollars

<b>Year</b>	<b>Actual</b>
2013	124572

**Output #15**

**Output Measure**

- PM 16) User Fees  
Not reporting on this Output for this Annual Report

**Output #16**

**Output Measure**

- SFSC 1) Trainings/Classes/Workshops, Field Days, Activity Days

<b>Year</b>	<b>Actual</b>
2013	66

**Output #17**

**Output Measure**

- SFSC 2) Direct Communication/Education by telephone and/or e-mail

<b>Year</b>	<b>Actual</b>
2013	1432

**Output #18**

**Output Measure**

- SFSC 3) New Technologies Expected to be Adopted by Producers

<b>Year</b>	<b>Actual</b>
2013	4

**Output #19**

**Output Measure**

- SFSC 4) External Grant Dollars  
Not reporting on this Output for this Annual Report

**Output #20**

**Output Measure**

- WOCS 1) Trainings/Classes/Workshops, Field Days, Activity Days

<b>Year</b>	<b>Actual</b>
2013	392

**Output #21**

**Output Measure**

- WOCS 10) Press/News Release or Column (number submitted)  
Not reporting on this Output for this Annual Report

**Output #22**

**Output Measure**

- WOCS 11) Volunteers (total) in Planned Program

<b>Year</b>	<b>Actual</b>
2013	66

**Output #23**

**Output Measure**

- WOCS 12) New Technologies Expected to be Adopted by Producers  
Not reporting on this Output for this Annual Report

**Output #24**

**Output Measure**

- WOCS 13) External Grant Dollars  
Not reporting on this Output for this Annual Report

### **Output #25**

#### **Output Measure**

- WOCS 14) User Fees  
Not reporting on this Output for this Annual Report

### **Output #26**

#### **Output Measure**

- WOCS 3) Trainings for Extension Staff  
Not reporting on this Output for this Annual Report

### **Output #27**

#### **Output Measure**

- WOCS 4) Community Meetings Convened [examples: Advisory Groups, Councils, Coalition Meetings, Boards]  
Not reporting on this Output for this Annual Report

### **Output #28**

#### **Output Measure**

- WOCS 5) Community Coalitions, Collaborations, Alliances Formed to Address a Specific Issue  
Groups: USDA-ARS at Akron & Ft Collins Units  
CSU Experiment Station  
Colorado Sunflower Association,  
Colorado Conservation Tillage Association  
Colorado Wheat Research Foundation  
Colorado Wheat Administrative Committee  
Colorado Association of Wheat Growers  
BASF Bayer Crop Science  
DuPont Syngenta  
Issue: Providing Cropping Systems Education for Producers and their Advisors

<b>Year</b>	<b>Actual</b>
2013	7

### **Output #29**

#### **Output Measure**

- WOCS 6) Direct Communication/Education by telephone and/or e-mail  
Not reporting on this Output for this Annual Report

### **Output #30**

#### **Output Measure**

- WOCS 7) Newsletters (This is number of newsletters, not number mailed or number of Coloradans who received them.)  
Not reporting on this Output for this Annual Report

### **Output #31**

#### **Output Measure**

- WOCS 8) Websites (number of Websites, not number of hits)

<b>Year</b>	<b>Actual</b>
2013	1

**Output #32**

**Output Measure**

- WOCS 9) Websites hits (number of hits, not number of sites)  
Not reporting on this Output for this Annual Report

**Output #33**

**Output Measure**

- Amount of grant dollars garnered to support crop production systems research  
Not reporting on this Output for this Annual Report

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Economic impact of the change in behavior reported.
2	Adoption of improved wheat cultivars.
3	PM 1.1 a: Participants will improve or intend to improve their practices, decisions and skills in action through timely access to pest management resources and/or pest identification and IPM implementation.
4	SFSC 1.1: Participants intend to adopt or have adopted and/or increase usage of production practices which will reduce greenhouse gas emissions, increase carbon sequestration, reduce carbon footprint and/or reduce ground water pollutants
5	SFSC 2.1: Participants intend to develop or have developed formal plans regarding succession
6	SFSC 3.1: Participants intend to further investigate alternative marketing strategies for their crop and/or livestock products
7	SFSC 3.2: Participants develop and use business, marketing and production plans
8	SFSC 3.3: Participants have implemented strategies for increasing the profitability of their crop and/or livestock enterprises (Action)
9	SFSC 3.4: Participants have implemented strategies for improving crop yield and quality
10	SFSC 3.5: Participants project they will have increased revenues and/or decreased costs
11	SFSC 4.1: Participants use a record-keeping system for financial and production records
12	SFSC 5.1: Participants have accessed resources, information and networks to improve their production enterprises
13	WOCS 1.1: % wheat (or other crop) acres planted to CSU and other recently released improved varieties.
14	WOCS 1.2: % of field crop acreage under crop and soil management systems that result in an enhancement of soil health and crop productivity (includes but is not limited to no-till or conservation tillage practices)
15	WOCS 1.3: % of producers using new marketing and/or management techniques for enhancing enterprise efficiency and optimizing net profits
16	WOCS 1.4: % of producers using research based nutrient management practices for cropping systems
17	WOCS 1.5: % of producers using research based integrated pest management practices for field crops

18	WOCS 2.1: % of farmed acreage planted to diversified cropping systems.
19	WOCS 2.2: % of farmed acreage managed with research based best management practices for water use crop efficiency
20	Adoption of crop production technology as measured by agricultural statistics
21	WOCS - Number of farmed acres planted to diversified cropping systems.
22	PM: Percentage of students in Colorado public schools who benefit from their schools' using low-risk pest management strategies and practices.
23	Bean Breeding
24	Traditional and Bioenergy Crops and Cropping Systems in Western Colorado
25	Colorado Potato Breeding Program

**Outcome #1**

**1. Outcome Measures**

Economic impact of the change in behavior reported.

Not Reporting on this Outcome Measure

**Outcome #2**

**1. Outcome Measures**

Adoption of improved wheat cultivars.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Development of improved wheat cultivars serves the wheat industry in Colorado and the western Great Plains through reduction of production costs and increased disease and insect resistance providing minimized environmental impacts and improved marketing options.

#### What has been done

In fall 2013, experimental line CO09W293 was advanced for Foundation seed production to enable release as a new cultivar in fall 2014. CO09W293 is a hard white winter wheat (HWW) from the cross KS01HW152-6/HV9W02-276W made in 2005.

In 2013 techniques were adopted for dense genome-wide marker analysis using "genotyping by sequencing" (GBS) on 1,900 breeding lines. Since implementation of GBS approximately 223 million marker datapoints have been obtained.

#### Results

Since inception of the program, 37+ CSU-bred wheat cultivars account for 61.3% (or 77.4% of the accounted-for acreage) of Colorado's 2.4 million acres (2012 crop). Average wheat grain yields in Colorado have more than doubled with at least 50% of this increase attributed to improved cultivars. Estimates of economic returns in Colorado from CSU-developed wheat varieties were approximately \$43 million for the 2011 crop alone. These estimates include yield increases resulting from improved CSU varieties (\$29 million), marketing benefits resulting from CSU varieties with enhanced end-use quality (\$9 million), and yield-protection resulting from adoption of CSU varieties carrying herbicide tolerance traits for winter annual grassy weed control (\$5 million).

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
206	Basic Plant Biology

### Outcome #3

#### 1. Outcome Measures

PM 1.1 a: Participants will improve or intend to improve their practices, decisions and skills in action through timely access to pest management resources and/or pest identification and IPM implementation.

Not Reporting on this Outcome Measure

#### **Outcome #4**

##### **1. Outcome Measures**

SFSC 1.1: Participants intend to adopt or have adopted and/or increase usage of production practices which will reduce greenhouse gas emissions, increase carbon sequestration, reduce carbon footprint and/or reduce ground water pollutants

Not Reporting on this Outcome Measure

#### **Outcome #5**

##### **1. Outcome Measures**

SFSC 2.1: Participants intend to develop or have developed formal plans regarding succession

Not Reporting on this Outcome Measure

#### **Outcome #6**

##### **1. Outcome Measures**

SFSC 3.1: Participants intend to further investigate alternative marketing strategies for their crop and/or livestock products

Not Reporting on this Outcome Measure

#### **Outcome #7**

##### **1. Outcome Measures**

SFSC 3.2: Participants develop and use business, marketing and production plans

Not Reporting on this Outcome Measure

#### **Outcome #8**

##### **1. Outcome Measures**

SFSC 3.3: Participants have implemented strategies for increasing the profitability of their crop and/or livestock enterprises (Action)

##### **2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	12

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The Small Farms and Specialty Crops Work Team strives to increase the sustainability and profitability of small and mid-sized farms whose operators report farming as their major occupation and report sales of less than \$250,000, or between \$250,000 and \$1,000,000 in less commodity oriented, diverse channels using a broad array of methodologies to provide education to producers and Team members.

**What has been done**

Adoption of improved, productive, and sustainable direct market, value added, and/or entrepreneurial agricultural systems will assure producers will continue to meet their business goals, and that individuals, families, and communities will have a safe and sufficient food supply.

**Results**

12 Participants have implemented strategies for increasing the profitability of their crop and/or livestock enterprises; 43 participants reported they had learned about these same strategies.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management

**Outcome #9**

**1. Outcome Measures**

SFSC 3.4: Participants have implemented strategies for improving crop yield and quality

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	12

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The Small Farms and Specialty Crops Work Team strives to increase the sustainability and profitability of small and mid-sized farms whose operators report farming as their major occupation and report sales of less than \$250,000, or between \$250,000 and \$1,000,000 in less commodity oriented, diverse channels using a broad array of methodologies to provide education to producers and Team members.

**What has been done**

Small Farms and Specialty producers are attaining their business goals while exploring and developing their business management practices.

**Results**

12 participants reported they have implemented strategies for improving crop yield and quality; 43 reported they had learned about these strategies.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management

**Outcome #10**

**1. Outcome Measures**

SFSC 3.5: Participants project they will have increased revenues and/or decreased costs

Not Reporting on this Outcome Measure

**Outcome #11**

**1. Outcome Measures**

SFSC 4.1: Participants use a record-keeping system for financial and production records

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	16

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The Small Farms and Specialty Crops Work Team strives to increase the sustainability and profitability of small and mid-sized farms whose operators report farming as their major occupation and report sales of less than \$250,000, or between \$250,000 and \$1,000,000 in less commodity oriented, diverse channels using a broad array of methodologies to provide education to producers and Team members.

**What has been done**

Small Farms and Specialty producers are attaining their business goals while exploring and developing their business management practices.

**Results**

16 participants report they use a record-keeping system for financial and production records.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management

**Outcome #12**

**1. Outcome Measures**

SFSC 5.1: Participants have accessed resources, information and networks to improve their production enterprises

**2. Associated Institution Types**

- 1862 Extension

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2013	17

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The Small Farms and Specialty Crops Work Team strives to increase the sustainability and profitability of small and mid-sized farms whose operators report farming as their major occupation and report sales of less than \$250,000, or between \$250,000 and \$1,000,000 in less commodity oriented, diverse channels using a broad array of methodologies to provide education to producers and Team members.

#### What has been done

Small Farms and Specialty producers are attaining their business goals while exploring and developing their business management practices.

#### Results

17 participants reported they have accessed resources, information and networks to improve their production enterprises. 238 participants reported they had gained knowledge in this same area.

The 2013 CSU Larimer County Extension office held its third Building Farmer/Rancher program from October 10 to December 5, 2013. Eleven of the 14 registered for the class completed their business plan to receive a Certificate of Completion. Many of the participants were interested in beginning a small vegetable production operation. Some were not quite as traditional. One participant will grow grass hay and alfalfa using draft horses as his only source of power. Another participant is exploring the viability of a small community veganic farm growing organic vegetables, fruits, flowers and grains. Two participants will start an ag production business focusing on herbs and salad mixes. Finally one participant will revisit the viability of a small grass hay, sheep, poultry and honey bee farm. The goal of creating a business plan is to have the students realistically consider their mission/values, their strengths, weaknesses, opportunities, and threats, identifying their markets, and creating a realistic budget. This is the first step in putting their ideas down on paper and using their business plan to help secure loans to begin their operation.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

## **Outcome #13**

### **1. Outcome Measures**

WOCS 1.1: % wheat (or other crop) acres planted to CSU and other recently released improved varieties.

### **2. Associated Institution Types**

- 1862 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	1400000

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Wheat is the most widely grown crop in Colorado with an average of 2.1 million acres harvested in 2001 - 2010. Crop value over the same period has averaged \$313 million. This compares favorably to grain corn, which has averaged 980,000 acres and \$460 million in crop value over the same period. The difference in crop value per acre is explained by the fact that roughly 90% of Colorado's wheat is grown under dry-land conditions, while about 75% of corn grown for grain is irrigated. Approximately 8% of Colorado wheat production comes from limited and fully irrigated conditions. Wheat for limited irrigation conditions is attracting more and more interest because the timing and amount of its water use minimizes competition with summer crops (alfalfa, corn, sunflower, sugar beet and soybean).

Wheat assumes even greater importance in counties classified as agriculturally dependent, accounting for nearly 24% of all crop sales and over 5% of all agricultural sales (includes crop plus animal and animal product sales). Wheat returns more than 25% of crop sales in eight Colorado counties: Kiowa (98%), Washington (53%), Cheyenne (49%), Baca (>25%), Kit Carson (>25%), Sedgwick (>25%), Logan (>25%), and Prowers (>25%).

There are approximately 9,000 wheat producers in Colorado, and their crop is an important part of the state's agricultural exports. Approximately 80% of the state's wheat production is exported, with the top 10 purchasers in 2009-2010 being Nigeria, Japan, Mexico, Philippines, Korean Republic, Taiwan, Venezuela, Colombia, Peru, and Indonesia.

#### **What has been done**

WOCS emphasizes extensively produced field crops, including potatoes, and producers grossing more than \$250,000 in annual sales. WOCS clientele tend to be associated with multi-generational farm family operations geared toward commodity production.

### **Results**

57% of Colorado's 2.4 million acres are planted to Colorado State University varieties.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources

#### **Outcome #14**

##### **1. Outcome Measures**

WOCS 1.2: % of field crop acreage under crop and soil management systems that result in an enhancement of soil health and crop productivity (includes but is not limited to no-till or conservation tillage practices)

Not Reporting on this Outcome Measure

#### **Outcome #15**

##### **1. Outcome Measures**

WOCS 1.3: % of producers using new marketing and/or management techniques for enhancing enterprise efficiency and optimizing net profits

Not Reporting on this Outcome Measure

#### **Outcome #16**

##### **1. Outcome Measures**

WOCS 1.4: % of producers using research based nutrient management practices for cropping systems

Not Reporting on this Outcome Measure

#### **Outcome #17**

##### **1. Outcome Measures**

WOCS 1.5: % of producers using research based integrated pest management practices for field crops

Not Reporting on this Outcome Measure

### **Outcome #18**

#### **1. Outcome Measures**

WOCS 2.1: % of farmed acreage planted to diversified cropping systems.

Not Reporting on this Outcome Measure

### **Outcome #19**

#### **1. Outcome Measures**

WOCS 2.2: % of farmed acreage managed with research based best management practices for water use crop efficiency

Not Reporting on this Outcome Measure

### **Outcome #20**

#### **1. Outcome Measures**

Adoption of crop production technology as measured by agricultural statistics

Not Reporting on this Outcome Measure

### **Outcome #21**

#### **1. Outcome Measures**

WOCS - Number of farmed acres planted to diversified cropping systems.

#### **2. Associated Institution Types**

- 1862 Extension

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	1087

#### **3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Cropping systems research and extension activities contribute significantly to the profitability and sustainability of field crop (including hayed or ensiled forages) production in Colorado. This is a key component of the state's rural economy. The goal of this program is to support sustainable and profitable field crop production systems in Colorado.

**What has been done**

The goal of this program is to support sustainable and profitable field crop production systems in Colorado.

**Results**

1087 acres were reported to be planted to diversified cropping systems.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
204	Plant Product Quality and Utility (Preharvest)

**Outcome #22**

**1. Outcome Measures**

PM: Percentage of students in Colorado public schools who benefit from their schools' using low-risk pest management strategies and practices.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	51

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Increase awareness, visibility and support for community IPM through presentations to a variety of audiences, national collaborations, and continued efforts to secure funding.

**What has been done**

Twenty-four presentations on community IPM were made, with more than 1,000 face-to-face contacts. Audiences include housing and dining managers, custodial and facility managers, teachers and principals in public schools, nurses, environmental health specialists, and the

general public. Publications include two abstracts at the National ESA meeting, a 44-page weed identification guide, one website, one blog and one Flickr (photo) site. New funding was received; five grants were funded and two are pending.

We have increased the number of personnel interested and aware of the program through newsletters (recipients increased from 283 to 340), Healthy Communities blog and YouTube videos (182 visitors and 2,261 visitors respectively). We have increased partnerships with federal, state and county agencies in this program. The following groups actively participate: Colorado Department of Agriculture, county health departments, National Environmental Health Association, and Colorado Department of Education.

Sixty-one hours of professional development training, including participation in a national meeting, increased technical skills related to community IPM.

Impact: Eighty-seven percent of schools in Colorado and Utah said that pest management was important, great or very great concern. However only 45% of schools said they were familiar with IPM and only 17% of school districts have an IPM coordinator.

We wrote and piloted a 3rd - 5th grade science curriculum using IPM. One of the teachers, from a STEM elementary school, said: "My kids loved the entire unit. They loved them all! We learned a ton and had a great time doing so."

### **Results**

From October 2010 to December 2013, the number of school districts participating in the program has increased from two to 14. These fourteen school districts represent 51% of the students in Colorado public schools. There were 15 schools inspected in four school districts in 2013.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
216	Integrated Pest Management Systems

### **Outcome #23**

#### **1. Outcome Measures**

Bean Breeding

#### **2. Associated Institution Types**

- 1862 Research

#### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The primary objectives of this project are to improve dry bean production in the USA, while reducing environmental impact and providing an economically viable food commodity with associated health attributes.

#### What has been done

Colorado State University concluded the final year as coordinator for the Legume ipm PIPE national network that monitored the occurrence of soybean rust, common rust, white mold, root rots, bacterial and viral diseases, and insect pests. Through this program and continued research on genetics and breeding for tolerance to heat and drought and broadening the genetic base of major bean market classes through utilization of exotic germplasm the project will continue to provide information and improved crop varieties to bean producers.

#### Results

Commercial dry bean production in Colorado was estimated at 38,000 acres in 2013. The Dry Bean Breeding Project initiated a "Fast Track" project to develop "slow darkening" pinto bean varieties for the High Plains and western U.S. The project increased 200 F4 lines for winter evaluations in New Zealand to test for yield and agronomic traits. CSU cultivars account for approximately 50% of cultivars grown in Colorado and two new Nuna bean germplasm lines were released to the public. Two recently released pinto bean lines, 'Longs Peak' and 'Croissant' continue to provide the public with adapted high yielding cultivars with excellent seed quality.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

#### Outcome #24

##### 1. Outcome Measures

Traditional and Bioenergy Crops and Cropping Systems in Western Colorado

##### 2. Associated Institution Types

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The primary objective of this project is to evaluate, develop, and integrate traditional/alternative and industrial/bioenergy crops and cropping systems to promote an economically and environmentally sustainable environment in the Western Colorado region.

**What has been done**

Trials have been conducted at the Fruita Research Center on kura clover under furrow irrigation through no-till as well as no-till with a pre plant herbicide application and strip till with varying nitrogen applications to determine biomass and irrigation regimes as well as sediment loss.

**Results**

Initial results showed that strip tillage is a promising option for producing corn in a kura clover living mulch cropping system and the best option of those treatments tested for producing the largest quantity of high forage quality crop aftermath. This residue can be grazed after grain harvest and is a valuable characteristic of the living mulch cropping system. Further studies will be conducted on biomass and bioenergy crops such as wildrye and various hybrids and other perennial plant species.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

## **Outcome #25**

### **1. Outcome Measures**

Colorado Potato Breeding Program

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2013	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The major objectives of the Colorado Potato Breeding and Selection Program are to address the needs of Colorado growers to have new potato cultivars (russets, reds, chippers, and specialties) with increased yield, improved quality, improved nutritional characteristics, resistance to diseases and pests, and tolerance to environmental stresses. by assessing production, adaptability, marketability, and other characteristics of advanced selections

#### **What has been done**

The primary emphasis is placed on the development of russet cultivars. The balance of the breeding effort is devoted to developing red, specialty, and chipping cultivars. This broad approach is important because it recognizes the diverse markets accessed by potato growers throughout Colorado and many other states in the region. Several selections were released for exclusive release in 2013 for on-farm trials with growers in the San Luis Valley of Colorado. Selections released in 2013 include Masquerade, Crestone Russet, and Mercury Russet. In 2013, AC99375-1RU, a Russet cultivar that shows tolerance for the PVYn viurs will be named.

#### **Results**

Since 1975, there have been 27 potato cultivars/clonal selections released by Colorado State University (CSU) or in cooperation with other agencies. CSU releases accounted for 58% of the 55,100 acres planted to fall potatoes in Colorado in 2012. Colorado cultivars and clonal selections accounted for 46% of the 13,286 acres of Colorado certified seed accepted for certification in 2012. Three of the top 10 russet cultivars grown for seed in the U.S. [Russet Norkotah-S3 (#5), Canela Russet (#8), Rio Grande Russet (#10), in 2012 were developed by the Colorado program. For reds, Sangre-S11 ranked #5. For colored-fleshed specialties, Mountain Rose and Purple Majesty both continue to be ranked #1 among red- and purple-fleshed cultivars.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology
601	Economics of Agricultural Production and Farm Management

### **V(H). Planned Program (External Factors)**

#### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

#### **Brief Explanation**

##### **Pest Management (PM)**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
  - weather conditions such as drought, flooding, hail, moisture/temperature trends influencing pathogen and pest life cycles, in addition to abiotic stress effects, which will require short/medium/long term redirection of effort to accommodate program needs for pest diagnostics and management strategies
  - economic issues that may lead more individuals to acquire and/or redirect their IPM strategies according to resource limitations or opportunities
  - continued funding through federal, state and county agencies
  - changes by governmental and non-governmental agencies to irrigation and pest management requirement

##### **Small Farms & Specialty Crops (SFSC)**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

- Populations changes (immigration, new cultural groupings, etc.)

Drought: affects productive capacity and is a business risk

Economy: affects direct market purchasing power and is a business risk

Appropriations changes: ABM Small Farm Specialist is a great asset and loss of that position would negatively impact outcomes

Public Policy changes: food safety policies in local markets can be a business risk, immigration policy is currently a risk for ag labor

Competing public priorities: loss of traditional farming systems via public interest in market farms (dismissive of traditional farming) can cause systemic damage to the ag input supply sector as demand for these inputs wanes, loss of input providers, and make administration and management of ditch systems problematic for irrigation

Competing programmatic challenges: Extension covering several important programs can deplete time and effort toward these POW outcomes

Population changes: market demand may vary with population changes, requiring new marketing strategies and products, also a business risk.

### **Wheat & other Cropping Systems (WOCS)**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations

Public policies and associated regulations and weather and other natural diseases will affect the adoption of new crop production technologies. Economic conditions affect commodity prices and, thus, producers' interests in and willingness to adopt new technologies and practices. Most of the advances are multi-year activities and cumulative rather than episodic in nature

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

#### **Pest Management (PM)**

- For this Planned Program, evaluation criteria will be adapted from the National Roadmap for IPM and will be performed by distributing written surveys to all program participants.
- The surveys will be done pre and post program.
- The surveys will ask questions focused primarily on pest biology, education and management.
- The surveys will help us measure the percentage of program participants who increased their knowledge on pest biology, education, and management.
- The results of the surveys will be distributed to or will be used for program prioritization and reporting by team members.

One measure of the impact of the Pest Management Work Team and BSPM IPM Program can be obtained by tracking changes in timeliness and accuracy of pest diagnostics, pest management practices, knowledge gained and behavior. For example, high correlation between changes in pesticide use and severity of pest problems would indicate practitioners have adopted sound pest management decision making with benefits to the environment, stakeholder safety, and economic return. Periodic performance surveys

of extension agents, research scientists and BSPM IPM specialists are conducted to solicit input on effectiveness from statewide extension faculty (via pre/post test instruments at meetings, clinics, field days), other clientele and commodity groups. Additional feedback will be obtained from stakeholders and administrators on IPM and individual specialist performance. Behavior change surveys have been developed and implemented to determine impact 6 months and a year after participant exposure to extension workshops. These survey instruments utilize onsite iClicker systems and email addresses of the participants and the Internet product Survey Monkey.

Survey Tools: the following sets of questions can help team members capture and report relevant information that quantifies the impact and behavior changes of Pest Management programs and products on stakeholders as measured by the following indicators, outcomes and outputs. It is recommended that 5 to 10 question surveys be adapted to the event or program, and presented as a printed or electronic form (e.g., PowerPoint, iClicker technology, etc.) The following are examples of questions that have been used or modified for WT Survey Tools:

- What was the economic impact of damage by the pest/disease/weed in 2013: a) 0, b) 25, c) 50, d) 100, e) \$150 or more/acre
- Place a pest management value on CSU extension and research from which you have benefitted - a) \$0, b) 25, c) 50, d) 100, e) more than \$125 per acre
- Has your pest biology and/or pest management knowledge increased as a result of this program by: a) 0, b) 25, c) 50, d) 75, e) 100%
- As a result of this program, will you change your action, behavior, recommendation when managing a pest: a) 0, b) 25, c) 50, d) 75, e) 100% probability
- My participation at this program resulted in a total cost (travel, lodging, registration, food, etc) and investment to the county of: a) 10, b) 25, c) 50, d) 100, e) more than \$125
- Today's speaker provided pest biology and/or management information that I can and will use: a) strongly agree, b) agree, c) neutral, d) disagree, e) strongly disagree
- What monetary value would you place on today's workshop: a) \$0, b) \$10, c) \$25, d) \$50, e) \$100
- What value change have you gained by using pest management knowledge learned from this and other CSU programs in [wheat] [you add the crop of interest]: a) 0, b) 5, c) 10, d) 20, e) more than 25%
- Does CSU Extension and/or Research programs and services have a positive economic impact on the community in which you live: a) strongly agree, b) agree, c) neutral, d) disagree, e) strongly disagree
- Can you identify [Iris yellow spot virus on onions] [you add the crop & disease/pest of interest]: a) strongly agree, b) agree, c) neutral, d) disagree, e) strongly disagree.

#### **Small Farms & Specialty Crops (SFSC)**

For this Planned Program, evaluation will be performed by:

- Evaluating impacts pre and post with written and online instruments based on stated learning and action outcomes in this POW
- Using surveys and questionnaires with participants to elicit immediate, and in some cases, longer term changes in behavior, attitudes and practices because they participated in this team's programs.

#### **Wheat & Other Cropping Systems (WOCS)**

For this Planned Program, evaluation will be performed by [for example, distributing written surveys to all program participants.]

- The surveys will be done pre and post program
- The surveys will ask questions focused primarily on knowledge and skills gained and intention to change behaviors or use knowledge & skills gained. Follow-up surveys will ask for actual changes made and practices used as well as their economic or welfare benefits.
- The surveys will help us measure the percentage of program participants who increased people's knowledge and skills as well as the profitability and sustainability of people's business enterprises (primarily farms & ranches).

The results of the surveys will be distributed to or will be used for developing further program plans for the work team as well as developing impact reports for stakeholders.

### **Key Items of Evaluation**

WOCS: CASS reports for 2013 that 56.8% of 2.2 million acres are planted to CSU wheat varieties.

Colorado's Agricultural Statistics Service report for Wheat variety plantings can be found at: [http://www.nass.usda.gov/Statistics\\_by\\_State/Colorado/Publications/Special\\_Interest\\_Reports/WWVARIETY13.pdf](http://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Special_Interest_Reports/WWVARIETY13.pdf). And, according to a report from Colorado's Wheat Administrative Committee website, 2013 harvest was done on 1.5 million acres with an average yield of 29 bu/acre = 43.5 million bushels. Average acres & yields are: 2.1 million acres and 35 bushels per acre average = 73.4 million bushels/year

PM: The Tri River Area Pest Management Workshop is designed to give licensed pesticide applicators, private and commercial, an opportunity to gather all continuing education credits (CEC's) required to maintain their licenses at a single workshop. Applicators are required to get CEC's every three years, so attendance is must for most. The ultimate goal of the Tri River Area workshop is to attract as many applicators as possible to attend whether they need CEC's or not. The way to achieve this goal is to put together a quality program at a reasonable price.

A total of 971 people have registered to attend the workshop since 2009. This represents 659 individuals. Of these 659 individuals, 207 (31.3%) have attended more than one workshop in the past five years. Sixty two individuals (9.4%) have attended three or more workshops in the past five years. It is safe to say that at least 10% of registrants are attending even though they do not need CEC's.

Four new school districts are participating in School IPM. Assuming that every school in our active districts are practicing IPM (12 school districts and 318,043 students) and every school in our initial districts are practicing IPM (2 school districts and 115,531 students), 51% of the students in Colorado schools benefit from IPM.

SFSC: Workshop evaluations have been distributed in all years, but the questions were changed in 2013 to estimate whether the program made any difference in the way the attendee did business. The question was worded "Will anything you learned in this workshop change the way you do business?" Forty-four evaluations were returned from a total of 179 registrants (24.6%). Of these 30 left the question blank, either because they hadn't decided, weren't in a position to make management decisions, or for other reasons. Of the 14 who answered the question, 12 had a yes answer. So depending on how you view the totals, 86% of those who answered the question said the program would

change some aspect of the way they conducted business. 27.3% of individuals who had an opportunity to answer the question said it would affect the way they did business. On the other side, 4.5% of those who had the opportunity to express an opinion said it would not affect the way they conduct business.