

# 2009 Colorado State University Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

Colorado State University is committed to research and Extension programs that address economic and environmental viability and sustainability issues related to agriculture, natural resources, families and consumers, youth and other community members. This executive summary highlights research and Extension outcomes, the scope of programs and their impact, the range of challenges and response to stakeholders and others, for 2009. It also highlights the collaborative, integrated and interactive efforts between University researchers and Extension campus and field staff.

Two of the seven program areas reported here are solely Extension programs (4-H Youth Development and Strong Families, Healthy Homes) that integrate research, planning and execution from CSU colleges in their development. Five of the seven program areas incorporate integrated Agricultural Experiment Station (AES) research and Extension in planning and execution.

The AES at Colorado State University employs 41 FTEs and Extension employs 170 on campus and throughout the state. Stakeholder input from local and industry advisory councils helps to inform and shape the research and Extension outreach efforts.

In mid-2009, Extension Family and Consumer Science (FCS) specialists and agents participated in a two-day focusing process which resulted in agreement to focus the majority of statewide Extension work related to FCS programming to Food Safety, Nutrition and Family Financial Stability. Based on stakeholder input and economic indicators, this programmatic focusing continued throughout the year in other program areas. In late 2009 we began evaluating the effectiveness of the current structure, which continued into early 2010, with the goal of providing more focus for Extension programming efforts statewide.

#### 4-H Youth Development

With the guidance of an evaluation specialist, the 4-H Youth Development work team developed several survey instruments designed to capture and compile data about the 4-H experience in a consistent manner. The surveys include life skill development, volunteer leadership skills, perception of 4-H alumni, community service and attributes of the livestock projects in relation to life skill development.

4-H Youth Development programs have continued an emphasis on Science, Engineering, Technology and Math (STEM). One example of this increased focus was when 633 youth participated in a National Youth Science Day program, representing every school in the Grand County, including the high school levels and private schools. This program helped to open the door with many of the school teachers, administrators and students to showcase what CSU Extension and 4-H can offer to school enrichment programs. More than 90% of participants reported increased knowledge and gained an understanding of science concepts and science in everyday life. Recruitment in fall, 2009 for a STEM specialist resulted in the hiring in January, 2010. Additionally, recruitment for three regional STEM coordinator positions is planned for 2010.

#### Strong Families, Healthy Homes

Radon is the second leading cause of lung cancer, behind smoking, in the US. According to EPA radon level maps, parts of Colorado may have some of the highest levels in the country. To educate the public and promote testing, CSU Extension

delivered 43 air quality trainings and distributed 1977 radon kits. 91% of participants surveyed reported knowledge gained in potential radon problems in the home; radon testing; radon mitigation; and/or indoor air quality issues and solutions. 89% of participants surveyed reported they intended to test for radon and mitigate if/where necessary. 76% (1005/1324) of participants surveyed reported they tested their homes for radon and implemented mitigation if/where needed.

## Nutrition and Food Safety

The National Animal Identification System (NAIS) is designed to protect the national livestock and poultry health and maintain market access. An AES study aims to develop science-rooted strategies and technologies to reduce food borne illness and improve the effectiveness of policies related to food safety and trade and evaluate the cost/benefit of traceability and assess its value in market-based programs. Researchers have concluded that if not adopted, the U.S. will lose market access, and the beef industry will suffer losses of \$18.25 per head and lose 25% of export market share. A 23% increase in beef export demand would completely pay for 70% adoption of full animal ID and tracing in the U.S. beef herd over a 10-20-year period. AES recommendations are that NAIS (1) be a mandatory program; (2) operate with a single national database to avoid creating unnecessary and confusing database differences; (3) standardize radio frequency identification technology and establish specific requirements for tag manufacturers to meet in order to be eligible to sell official animal identification tags; (4) be implemented as a phase-in program; and, (5) be harmonized with the identification programs of trading partners to extend their potential value across borders.

## Animal Production Systems

Anaerobic digestion is a promising technology for conversion of animal waste to methane biogas which can be utilized as a renewable source of energy. Waste generated by typical dairy operations in Colorado has very high solids content and is not suitable for classic anaerobic digestion technologies. The CSU AES is engaged in research with the objective to develop a two-stage anaerobic digestion process capable of generating methane from dairy and feedlot wastes.

In-depth feasibility studies for installation of anaerobic digesters were conducted at three dairies in Colorado. Where cattle are kept in barns with concrete floors which are scraped with machinery or flushed with water, installation of anaerobic digestion technology is technically feasible. A web based decision tool has been developed which provides the user with a very simple preliminary feasibility assessment for installation of anaerobic digestion technology based on management practices.

Tools are being provided to producers so that installations are successful and failures do not occur due to a site being a poor fit for anaerobic digestion. Increased installation of anaerobic digesters in Colorado will result in a new source of renewable energy, improved waste management, improved water and air quality, and decreased emission of greenhouse gases.

## Plant Production Systems

CSU-bred wheat cultivars account for over 61% (or 72% of the accounted-for acreage) of Colorado's 2.4 million acres (2009 crop). Since program inception, 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 from two of the most widely grown releases (Hatcher and Ripper) are approximately \$24 million (considering both yield and quality improvements) for the 2009 crop alone. Estimates from Colorado wheat industry leaders on CSU-developed quality improvements suggest that end-use quality enhancements from cultivars developed at CSU provide an average of \$17.5 million per year increased income for Colorado wheat producers (70 million bushels average x \$0.25 per bushel price increase; 2009 dollars).

Development of improved wheat cultivars serves the wheat industry in Colorado by reducing wheat production costs, reducing pesticide use, and providing improved marketing options. During the past five years, Colorado wheat farmers have planted an average of 20% of their fields to newly released and improved wheat varieties. This is a faster adoption rate of improved wheat varieties than for growers from comparable states.

## Natural Resources and Environment

Small acreage landowners have a significant impact on the conditions of soil, water, plants, animals, and other natural and man-made resources through their cumulative effects. Management of weeds, insect pests and plant diseases is one of the most costly inputs that clientele in agriculture, the green industry and consuming households must finance every year in Colorado. Invasive, non-native weeds are a concern in many communities and threaten native ecosystems. Fire mitigation and management of forest resources in response to mountain pine bark beetle infestation has increased many of these concerns.

Increasing urbanization and the resulting rural/urban interface presents challenges for landowners who are new to 'small acreage management.' A Small Acreage Management website, with 13 areas of interest, provides information not previously available. The lack of reliable and comprehensive information sources prompted a collaborative effort between Natural Resource Conservation Service (NRCS) and CSU Extension to develop web-based multimedia educational tools to educate a greater number of small acreage landowners in the any-time/any-place modality that the Internet offers. In addition, a quarterly Sustainable Small Acreages e-newsletter reaches 1140 landowners in Colorado, 77 Conservation districts and NRCS field offices.

Sustainable Colorado farms and ranches are founded on principles of environmental health, economic profitability, and enhancing local communities. Farms must be profitable enough to provide an adequate return on the management, labor, and investment inputs as well as to provide investment capital for adapting to changing trends in markets and societal values. Sustainable agricultural business practices must also include enhancing the productivity of soils and the surrounding natural and social environment, as well as increasing biodiversity on the farm. The Building Farmers Program, which includes eight night classes and mentorship opportunities for participants, expanded to five counties. In addition to immediate benefit to participants (99% reported they had increased their knowledge), this program was used as a model to secure a Building Farmer and Rancher Development grant from USDA to CSU for a multi-state implementation.

Farmer interest in both the dry land and limited irrigation research continues to be strong as demonstrated by their demand for cropping systems information and by practice adoption rates. The overall objective of this multidisciplinary research and outreach project is to advance understanding of biophysical processes in water-limited agro ecosystems and develop management practices that promote long term sustainability.

In 2009 AES research evaluated the biomass production potential of dry land systems for bioenergy. We are investigating the quantities of crop biomass needed for maintaining water storage and soil carbon levels to determine if biomass removal for feed stocks can be sustained. A major challenge is the annual variability in biomass production. In 2009 a crop simulation model was calibrated and validated to evaluate water use of limited irrigation cropping systems. This conversion increased net return by \$22,275,000 per year under normal precipitation conditions. Overall summer crop acreage has increased by about 500,000 acres in Colorado since 1986. Assuming that summer crops are grown in a 3 year rotation, there are about 1,500,000 acres under more intensive cropping systems compared to 75,000 in 1986.

## Community Development

Community development is intrinsic in Extension work. As this Core Competency Area changed leadership and direction, new indicators are being determined. Internal training for Extension personnel was held on the topics of community mobilization, facilitation and economic development. As a result, 60 community capacity-building meetings were held, in addition to over 60 trainings, consultations, workshops, etc. Sixty-six percent of participants evaluated reported increasing their knowledge related to one of the following: individuals' roles in community capacity building; built environment community capital development; natural environment capacity building as related to community vibrancy; building community political capacity; and understanding the role of cultural capacity in community development.

## Clean Energy

A knowledge gap exists for people interested in renewable energy and energy efficiency which has been proven to slow the implementation of energy efficient measures and installation of renewable energy projects. The Clean Energy Strategic

Initiative Team (CESIT) was convened in fall, 2008. In their 18 months of existence, they have documented the need for their work and have engaged team members within Extension, across campus, and from other state agencies and organizations. Extension is partnering with Energy Outreach Colorado and the Governor's Energy Office to hire regional clean energy coordinators and compile evaluation components.

### Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	150.0	0.0	50.0	0.0
Actual	170.0	0.0	41.0	0.0

## II. Merit Review Process

### 1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Combined External and Internal University External Non-University Panel

### 2. Brief Explanation

CSU Extension requires that all curriculum and publications be reviewed to assure an appropriate and accurate research base. Programming efforts, including curriculum are peer reviewed through the Work Team and Core Competency Area (CCA) process. All proposed programs, curriculum, and publications are submitted to the appropriate work team (consisting of extension campus and regional specialists and extension agents) for review and approval. Only those programs, curriculum and publications accepted and approved by the work teams are then submitted to the CCA leaders (Extension specialists and/or Department Heads) for review by the Program Leadership Team (PLT) including Associate Director, all CCA leaders, Extension Regional Directors, Assistant Director for Operations, Assistant Director for Community Relations, and the Extension Director. Considerations for approval include a completed logic model, including situation statement, target audience, inputs, outputs and outcomes, as well as fiscal and marketing plans. Finally, on a regular basis, the Colorado Extension Advisory Committee (CEAC) also reviews Work Team plans and progress. We have also implemented a further review process where Work Teams, on a scheduled basis, provide face-to-face reporting to PLT on their progress to date, plans for the future, and specific obstacles they have encountered and overcome. At the county level, county programs are reviewed by local county program advisory councils made up of local experts, as well as stakeholders.

The AES uses a college and department based peer review process for all Hatch and McIntire-Stennis research projects. Several of the colleges involved in AES research use peer review in a competitive process to allocate projects and funds. All multi-state projects are peer reviewed using procedures implemented by the Western Association of Agricultural Experiment Station Directors.

## III. Stakeholder Input

### 1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups

- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (Survey of County Commissioners regarding Extension Programs in their county.)

**Brief explanation.**

CSU Extension requires a functioning advisory committee in each county or area. In most counties, these committees are appointed by county commissioners, assuring wide representation. The committees are most often comprised of local residents who have an interest in Extension programming. This may include a representative of the commissioners, school personnel, participants in Extension programs, volunteers, youth, and others. In addition to an overall Extension Advisory Committee in each county, many counties also have program specific advisory committees such as 4-H, horse, livestock, etc.

The Advisory Committee Manual is available online at: [www.ext.colostate.edu/staffres/cad\\_adv\\_cmte.pdf](http://www.ext.colostate.edu/staffres/cad_adv_cmte.pdf).

Marketing efforts on the part of CSU Extension continue to ramp up. Based in part on results from the 2008 NASLGUC survey (nationwide survey with Colorado over-sampling) our communications marketing staff provided training for agents to develop communication plans and market programs to reach existing and new clientele.

Research programs in the AES are guided by advisory committees active at several levels. Each of the eight off campus research centers has an advisory committee composed of local agricultural producers, CSU Extension staff, and agency representatives. The advisory committees meet annually with our AES staff. Results of past research are shared and new research initiatives are discussed with committee members. Several agricultural check off organizations annually provide funding for AES programs which involves a joint review of proposals and research topics. The CSU President's Agricultural Advisory Committee includes agricultural leaders who are briefed on programs, and discuss current new and emerging research needs.

**2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

**1. Method to identify individuals and groups**

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Use Surveys
- Other (Council for Agricultural Research, Extension, and Teaching)

**Brief explanation.**

CSU Extension requires a functioning advisory committee in each county or area. In most counties, these committees are appointed by the County Commissioners, assuring that wide representation occurs. The Committees are most often comprised of local residents who have an interest in Extension programming. This may include a representative of the commissioners, school personnel, recipients of Extension programs, volunteers, youth participants, and others. In addition to an overall Extension Advisory Committee in each county, many counties also have program-specific advisory committees (such as 4-H, horse, livestock, etc.). The Advisory Committee Manual is available on line at: [www.ext.colostate.edu/staffres/cad\\_adv\\_cmte.pdf](http://www.ext.colostate.edu/staffres/cad_adv_cmte.pdf). Communication and marketing efforts on the part of CSU Extension continue to ramp up. Our communications/marketing staff provided training for agents, including developing a communication plan, and other marketing efforts of programs to existing and new clientele.

The 2008 nationwide NASLGUC survey on the value of the Extension brand included oversampling in Colorado, with additional questions asking participants to rank the importance of local issues that might be addressed by Extension and CSU research-based information. These findings were evaluated by CSU Extension and found to be

in line with with Extension's mission and vision. These findings were useful in helping determine clusters of counties for more regionalized programming efforts.

Research programs in the AES are guided by advisory committees active at several levels. Each of the eight off-campus research centers has an advisory committee composed of local agricultural producers, CSU Extension staff, and agency representatives. The advisory committees meet annually with our AES staff. Results of past research are shared and new research initiatives are discussed with committee members. Several agricultural check-off organizations annually provide funding for AES programs which involves a joint review of proposals and research topics. The CSU President's Agricultural Advisory Committee includes state agricultural leaders who are briefed on programs discuss current, new and emerging research needs.

## **2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

### **1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

#### **Brief explanation.**

At the county level, advisory committees are appointed by county commissioners and may be individuals who have indicated an interest in Extension programming, or individuals identified by Extension agents or commissioners. They may be representatives of partner agencies, collaborators, representatives of the local school district, volunteers, or others in the community. At the state level, the Colorado Extension Advisory Committee has (by Bylaws requirement) membership representing all areas of the state, partnering agencies (the Green Industry, Farm Bureau, Farmers' Union, etc.) There is gender and racial distribution among the members. Regional representatives are suggested by Extension professionals from across the state and often are either an Extension volunteer or a representative of a partnering agency (such as Colorado State Patrol, Area Council on Aging). Efforts have been made to ensure that commodity groups are represented.

Stakeholders for AES research programs involve many of the individuals described above for Extension programs in the agricultural and natural resource arena as AES and Extension serve a common set of organizations and industry constituents. Local representatives and faculty are involved in selected members of advisory committees.

### **3. A statement of how the input will be considered**

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

#### **Brief explanation.**

Input from stakeholders is used in the planning for and revising CSU Extension programming. Ideas and suggestions are provided through local county advisory committees and the Colorado Extension Advisory Committee (CEAC) regarding the

need for new or renewed efforts. CEAC provides guidance to the Extension Director, Associate Director, and Assistant Directors who then work with the PLT and work teams to establish new programs or modify existing ones. One recent example is the emphasis, based on our stakeholders' input and urging, to pursue the area of clean energy.

Stakeholder input is used to annually adjust the AES research program. Major stakeholders in directing research programs are funding agencies such as commodity organizations, and state and federal agencies and advisory committees. One example in southwest Colorado was the concerns of clientele, research center and Extension advisory committees about having economically viable feed stocks for a developing bio-diesel plant in Dolores, Colorado. Based upon their input, the AES made a decision to retain the SW Colorado Research Center to conduct research and provide information to growers on crops suited to the growing conditions in the region and in turn, for growers to provide reliable sources of feed stocks for the bio-diesel plant. Depending upon the continued need for this center at the end of our five year commitment, a decision will be made to retain or close the center.

With respect to a search for the dean, College of Agricultural Sciences, stakeholder groups provided input to CSU President Frank on the characteristics that they value in a dean and also provided members to serve on the search committee. Another example is the annual evaluation and recommendation by the Colorado Potato Administrative Committee (CPAC) and others, in conjunction with the AES, of on-going research and jointly recommend funding research projects from CPAC funds at the San Luis Valley Research Center.

### Brief Explanation of what you learned from your Stakeholders

Stakeholders have encouraged CSU Extension to focus efforts on the following: 1. Those programs for which a public value can be articulated. The discussion centered on work that has clear outputs and outcomes, impacts that can be identified and explained to the general public (who may not be current stakeholders of Extension). 2. Stakeholders reaffirm the need for focused programming in the areas of energy, 4-H Youth Development, consumer horticulture, natural resource conservation and protection. These include efforts to combat deforestation due to the pine beetle, small acreage management, agricultural sustainability, family financial management, and nutrition and health, and food safety.

### IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2923080	0	2948409	0

2. Totalled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	3078206	0	2594579	0
Actual Matching	3078206	0	2594579	0
Actual All Other	10556354	0	23329609	0
Total Actual Expended	16712766	0	28518767	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from</b>				
<b>Carryover</b>	2760747	0	821036	0



**V. Planned Program Table of Content**

<b>S. No.</b>	<b>PROGRAM NAME</b>
1	4-H Youth Development
2	Strong Families, Healthy Homes
3	Nutrition and Food Safety
4	Animal Production Systems
5	Plant Production Systems
6	Natural Resources and Environment
7	Sustainable Community Development

**V(A). Planned Program (Summary)****Program # 1****1. Name of the Planned Program**

4-H Youth Development

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
216	Integrated Pest Management Systems	2%		0%	
307	Animal Management Systems	3%		0%	
802	Human Development and Family Well-Being	3%		0%	
806	Youth Development	92%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	0.0	0.0	0.0
Actual	58.6	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
1060496	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1060496	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3636850	0	0	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

- Support traditional club program by recruiting members to organized clubs and establishing new clubs
- Conduct after school and school enrichment programs that provide curriculum in leadership, citizenship and life skills development.
  - Develop new curriculum in response to new audience needs
  - Strengthen the volunteer management system needed to implement the 4-H program by: conducting agent trainings to develop volunteer management skills; developing tools to support volunteer management system; conducting volunteer leader training
  - Develop new funding support through individual and group solicitation, grant applications and fee-for-service programs.

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

For 4-H programming - all Colorado youth. For volunteers - interested adults, parents, community members, seniors, partner agencies. For increased funding - potential funders, including grant providers.

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	6500	1000	16250	85000
<b>Actual</b>	5857	562	84644	322265

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	0	2	
<b>Actual</b>	13	2	0

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

**Output Target**

**Output #1**

**Output Measure**

- Increased funding for 4-H through private dollars by increasing support from the Colorado 4-H Youth Fund. (These have been increased based on 2005-6 actual of \$240,000.)

Year	Target	Actual
2009	250000	3108980

**Output #2**

**Output Measure**

- Number of web hits regarding 4-H topics

Year	Target	Actual
2009	2000000	502034

**Output #3****Output Measure**

- Number of youth reached by all 4-H delivery methods-club, after school, school enrichment. These numbers are being revised upward based on actual numbers for 06-07 program year.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	100000	84644

**Output #4****Output Measure**

- New/revised curriculum to meet changes in needs for youth audiences.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	5	38

**Output #5****Output Measure**

- Number of volunteer management trainings held and tools developed.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	40	220

**Output #6****Output Measure**

- Number of volunteer leaders. (These have been reduced to reflect the anticipated increase from a current base of 8900.)

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	9000	6151

**Output #7****Output Measure**

- Number of on-line e-Learning orientation modules completed by volunteers.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	500	538

**Output #8****Output Measure**

- Amount of grant dollars generated to support 4-H Youth Development programs.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	80000	1383187

**Output #9****Output Measure**

- The value of volunteer time that Colorado adult 4-H volunteers provide for 4-H programming based on an

average of 128 hours/volunteer @\$20.25(national average of volunteer time)

Year	Target	Actual
2009	{No Data Entered}	15038784

**Output #10**

**Output Measure**

- increased effectiveness of volunteer leaders as measured by retention rate (%) of first year leaders.

Year	Target	Actual
2009	{No Data Entered}	98

**Output #11**

**Output Measure**

- Number of unique visits to 4-H Web site

Year	Target	Actual
2009	{No Data Entered}	108068

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percent of youth reporting positive change in life skills including leadership, citizenship, decision making and communications skills as a result of 4-H participation.
2	Percent of volunteers reporting increased skills in area of responsibility.
3	Effectiveness of 4-H in influencing positive youth development
4	4-H Livestock projects provide learning for participants in life skills, including making good ethical decisions, keeping records, making goals and plans, understanding their responsibility in producing safe and wholesome food.
5	4-H members have a greater capacity to work well with others

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

Percent of youth reporting positive change in life skills including leadership, citizenship, decision making and communications skills as a result of 4-H participation.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	75	78

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The benefits of 4-H programs in Colorado have historically been communicated through anecdotes and success stories. These typically reflected the quality of the programs through the feelings of those familiar with the program, but did not demonstrate the public value of the youth development program in quantifiable measures.

Little sound, research-based information was available to inform the public about the effect 4-H membership (particularly related to life-skill development, an important aspect of 4-H) has on the lives of youth.

**What has been done**

Colorado 4-H collects information from 4-Hers on a regular basis to determine the impact that the 4-H program has on its members. Evaluation instruments have been designed to capture and compile the impacts in a consistent manner.

**Results**

This past year, 3715 out of 4744 4-Hers surveyed (78%) reported positive changes in behavior in life skills.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

**Outcome #2****1. Outcome Measures**

Percent of volunteers reporting increased skills in area of responsibility.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	83

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

**Issue (Who cares and Why)**

The success of the 4-H program depends, in part, on willing and effective volunteers who contribute numerous hours to the 4-H program. Volunteers who do not develop the necessary skills or find satisfaction in their volunteer work do not stay in the program. Retention of trained, effective volunteers is essential to the growth and stability of the 4-H program.

**What has been done**

Continued emphasis on leader training, mandatory new leader training, and the use of on-line leader development resources have resulted in increasing opportunities for 4-H leaders to become effective by learning new or improving existing skills in working effectively with youth.

**Results**

83% of volunteers surveyed reported they increased their skills in their area of responsibility as a 4-H volunteer. Based on the evaluation of first year to second year leaders, a retention rate of 97.9% was attained this year. A volunteer's increase in knowledge and appropriate leadership skills application not only contributes to positive and safe learning environments for 4-H youth, but also provides a positive and satisfying volunteer experience for the individual. Leadership and volunteer development training increases the number of community leaders, as well as increases community-wide youth-adult relationships which has been proven to decrease community resources expended on law enforcement, the judicial system, and incarcerations.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

**Outcome #3**

**1. Outcome Measures**

Effectiveness of 4-H in influencing positive youth development

**2. Associated Institution Types**

- 1862 Extension



**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	83

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The benefits of the 4-H program in Colorado have historically been communicated through anecdotal evidence and personal success stories. This type of information typically reflected the quality of the programs through the feelings of those familiar with 4-H, but did not demonstrate the public value of 4-H in quantifiable measures.

**What has been done**

In the fall of 2008, data were collected from 35 randomly selected counties. A total of 1,750 questionnaires were distributed to Colorado 4-H alumni and non-4-H alumni. Two hundred and eighty-three Colorado 4-H alumni and 55 non-4-H alumni participated in this survey. The population of interest for this study was Colorado 4-H alumni (ages 25-45) who were enrolled in the Colorado 4-H Youth Development Program for a minimum of one year between 1973 and 1993.

**Results**

Citizenship and volunteerism are cornerstones of 4-H youth development. Assessment of continuing civic engagement by 4-H alumni is a long-term impact of the program. Participants were asked if they are or have in the past volunteered for a youth-serving organization. Nearly 62 percent of non-4-H responses reported being involved in volunteering activities while 82.9 percent of 4-H respondents are or have volunteered for youth-serving organizations.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #4****1. Outcome Measures**

4-H Livestock projects provide learning for participants in life skills, including making good ethical decisions, keeping records, making goals and plans, understanding their responsibility in producing safe and wholesome food.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

One of the most important responsibilities of 4-H members enrolled in market livestock projects is the proper handling and care of animals destined to enter the food chain. 4-H teaches young people about proper animal husbandry practices through animal science projects. Exhibiting animal science projects at the county fair is one of the most popular project offerings in 4-H.

**What has been done**

There was a significant difference between "before" and "now" responses in the six knowledge-related questions. There was also a significant difference between "before" and "now" responses to the five behavior-related questions.

**Results**

4-H members who are involved in livestock projects learn more than just animal science. They also learn how to:

- \* make good ethical decisions,
- \* keep records,
- \* set goals and plan, and
- \* understand their responsibility in producing safe and wholesome food.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #5****1. Outcome Measures**

4-H members have a greater capacity to work well with others

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Community service is one of the core elements of the 4-H experience. All Colorado 4-H members are required to complete at least one community service activity per year.

**What has been done**

Data were collected at various county fairs across the state of Colorado to determine the effect that engaging in community service activities has on the lives of Colorado 4-H members. The community service survey asked the

members to relate their perspective of community service before and after their participation in community service activities.

### Results

The data reported in this paper suggest that community service does have a significant effect on the lives of 4-H members. When one looks at the difference in these young people because of their 4-H and community service experience, these 4-H members are different in a profoundly positive way because of their experience. More importantly, their communities and the state of Colorado have benefited because of it.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

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

### External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)
- Other (competing family priorities)

### Brief Explanation

The economic downturn, a reduced state budget, and increasing extracurricular activities for youth in some communities provide challenges to the expansion of the 4-H program. This past year has seen an increase in FTEs dedicated to 4-H due to increased funding by counties specifically to support the 4-H program. While this can be seen as positive for the 4-H program, it also presents the challenge of directing a coordinated state-wide effort as opposed to having many independent county programs. Colorado's 4-H State Program Leader convenes a "roundtable" conference call monthly so communication can flow to and from campus on a regular basis. This is in addition to regular Work Team meetings and conference calls, and the 4-H Winter Muster convened for professional development, team building, and program planning.

We entered 502,034 as the number of Web hits regarding 4-H topics. According to Google Analytics, for the period of time 10/01/2008 to 09/30/2009, the statistics for the colorado4h.org website are as follows:

- 518,611 hits = total hits
- 506,346 hits = this is the number of hits minus the Agent Resources section of our website
- 513,796 hits = this is the number of hits minus the Blog
- This means that the Agent Resources area experienced 12,265 hits during this time period.
- The Blog experienced 4,815 hits during this time period. Unfortunately, we are unable filter out just the number of hits on the 4-H Update blog posts, so this number reflects hits on the entire blog during this time.
- $518,611 (12,265 + 4,815) = 501,531$ , the total number of hits on [www.colorado4h.org](http://www.colorado4h.org) minus the Agent Resources and Blog areas of the website.

The 4-H feature page off the main Extension page, from the dates 10/01/2008 to 09/30/2009, there were **503** hits on [http://www.ext.colostate.edu/4\\_h/stem.html](http://www.ext.colostate.edu/4_h/stem.html).

## V(I). Planned Program (Evaluation Studies and Data Collection)

### 1. Evaluation Studies Planned

- After Only (post program)

- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

## Evaluation Results

There is a common assumption that the main goal of the 4-H program is to teach 4-H members subject matter knowledge and skills through 4-H projects. While gaining subject matter knowledge and developing mastery is an important function of 4-H, the primary focus of the 4-H program is positive youth development by instilling life skills in its members. The project is merely the vehicle. A recognition of the long term benefits to children learning life skills along with developing mastery in their project is important. Categories of life skills are identified and divided on the basis of the familiar four H's from the 4-H Clover that represent Head, Heart, Hands, and Health. 4-H project curriculum identifies both the subject matter content and the life skills being taught. Some of these skills are best learned in group settings through active participation in 4-H club meetings.

The highest quality youth development experiences are carefully planned to encourage life skill development while delivering subject matter content. Life skills are abilities individuals can learn that will help them to be successful in living a productive and satisfying life. In the Targeting Life Skills Model,

The questions asked of the respondents to assess the seven life skills to be analyzed in this study were:

In order to measure the life skill development of Colorado 4-H members, data were collected from 10 counties in Colorado in the summer of 2009. There were a total of 552 surveys returned for analysis. The respondents were 354 female and 196 male.

Responses to these seven behavior-related questions were limited to 1) Almost never, 2) Not usually, 3) Usually, or 4) Almost always.

Program Outcomes: There were statistically significant differences

Survey Item Before Now Change

Q1: Problems 2.9 3.5 + .6

Q2: Resources 2.8 3.4 + .6

Q3: Plan 2.6 3.4 + .8

Q4: Decisions 3.2 3.6 + .8

Q5: Tools 2.7 3.4 + .7

Q6: Technology 2.9 3.4 + .5

Q7: Instructions 3.2 3.6 + .4

While all seven questions represent valuable life skills, the questions with the greatest increase in mean scores were question 3) Plan a project, and question 4) Make good decisions.

These findings support the focus of life skill development as the goal of the Colorado 4-H Youth Development Program and help document that the program is an effective mechanism for development of life skills in youth audiences.

"Please tell us how often you did these things before your 4-H experience and how often you do them now."

1. Work out problems.
2. Use resources wisely.
3. Plan a project.
4. Make good decisions.
5. Use project tools.
6. Use technology.
7. Follow instructions.

## Key Items of Evaluation

National Youth Science Day 2009 was a huge success for Grand County in contributing to preparing the next generation of scientists. 633 youth participated in the program, representing every school in the county including the high school levels and private schools. This program helped to open the door with many of the school teachers, administrators and students to showcase what 4-H and CSU Extension can offer to the school enrichment programs. Not only did the youth participate in inquiry-based education with

the science experiment, they learned hands-on about some of the upcoming technologies involved with bio-fuels. Grand County was recognized with an award from National 4-H Council due to the high participation of this county program and received \$400 in an award to spend on STEM program advancement in the local communities. More than 90% of participants reported increased knowledge and gained an understanding of science concepts and science in everyday life.

**V(A). Planned Program (Summary)****Program # 2****1. Name of the Planned Program**

Strong Families, Healthy Homes

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

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	35%		0%	
802	Human Development and Family Well-Being	61%		0%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	4%		0%	
	<b>Total</b>	100%		0%	

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

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	0.0	0.0
Actual	8.8	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
159314	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
159314	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
546349	0	0	0

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

## 1. Brief description of the Activity

Educational activities include:

- Adoption of curriculum, training for agents, educational programs on financial management for families.
- Training (face-to-face and on-line) for care givers.
- Training for couples, parents of young children and disabled farmers
- Parenting classes for parents and train-the-trainer classes for individuals who work with parents
- Training using EPA-based indoor air quality education for agents, then the general public, builders, realtors, homeowners' associations, and home owners.

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

Colorado families, including diverse and difficult to reach populations; care givers in day care and out-of-school-age care locations; parents of young children; disabled farmers; owners and potential owners of homes.

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	5000	15000	0	0
<b>Actual</b>	10358	170030	613	0

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	0	5	
<b>Actual</b>	11	5	0

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

**Output Target**

**Output #1**

**Output Measure**

- Number of trainings held on indoor air quality issues.

Year	Target	Actual
2009	10	43

**Output #2**

**Output Measure**

- Number of parenting programs held.

Year	Target	Actual
2009	150	85

**Output #3****Output Measure**

- Agrability workshops held.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	5	19

**Output #4****Output Measure**

- Number of trainings held for care providers.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	25	44

**Output #5****Output Measure**

- Trainings held in family financial management.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	35	272

**Output #6****Output Measure**

- Number of newsletters/publications distributed.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	250000	283484

**Output #7****Output Measure**

- Grant dollars/user fees generated to support this program.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	35000	85016

**Output #8****Output Measure**

- Number of individuals trained in indoor air quality issues and re-mediation.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	750	2479

**Output #9****Output Measure**

- Number of individuals trained in parenting skills.



<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	2500	790

**Output #10****Output Measure**

- Number of individuals trained in agribility issues (dealing with disabilities on the farm/ranch.)

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	25	216

**Output #11****Output Measure**

- Number of care provides trained in parenting, positive discipline, child and family development, communication.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	25	624

**Output #12****Output Measure**

- Number of individuals trained in family financial management, financial management in later life, teen financial management, and other family finance programs.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	100	10358

**Output #13****Output Measure**

- Managing in Tough Times (MTT)workshops for producers at a time of financial uncertainty (stress management).

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	12

**Output #14****Output Measure**

- Number of volunteers supporting this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	91

**Output #15****Output Measure**

- Number of agencies partnered with to support this work.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	121

**Output #16**

**Output Measure**

- Number of radon kits distributed.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	1977

**Output #17**

**Output Measure**

- Number of curricula developed and/or reviewed to support this work.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	6

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percent of attendees gaining knowledge in parenting skills, effective communication, positive discipline, stress management.
2	Percent of participants changing attitudes regarding parenting, communication, positive discipline, stress management.
3	Percent of participants intending to change behavior as a result of parenting training.
4	Percent of individuals documenting change in behavior in parenting skills, communication, positive discipline, stress management.
5	Percent of attendees in indoor air quality training reporting increase in knowledge.
6	Percent of attendees changing attitudes/intending to change behavior based on knowledge gained at training on indoor air quality.
7	Percent of participants reporting change in behavior based on knowledge gained through training in indoor air quality.
8	Individual homes, and thus communities will have significantly improved indoor air quality based on remediation of indoor air pollutants.
9	Percent of participants demonstrating change in knowledge of financial management.
10	Percent of participants intending to change behavior/reporting change in attitudes regarding financial management.
11	Percent of participants in financial management training demonstrating change in behavior.
12	Family financial health significantly improved due to changes based on skills learned in financial management trainings.
13	Percent of individuals demonstrating increase in knowledge regarding strategies for dealing with disabilities on the farm/ranch.
14	Percent of participants in agrability workshops reporting change in behavior regarding coping with disabilities on the farm/ranch.

**Outcome #1**

**1. Outcome Measures**

Percent of attendees gaining knowledge in parenting skills, effective communication, positive discipline, stress management.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	91

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

**Issue (Who cares and Why)**

When parents are educated about children's developmental stages, hold reasonable expectations for their child's abilities and are aware of effective discipline strategies, they are less likely to engage in abusive parenting behaviors.

**What has been done**

83 parent education classes were conducted for parents, and 44 professional development opportunities were delivered for caregivers.

**Results**

91% of participants (1700/1862) evaluated reported that they gained knowledge in their ability as parents to set and maintain age-appropriate limits; provide age-appropriate discipline, child development and expected behavior, community resources for their family. Caregivers reporting gaining knowledge in the effects of divorce on children, curriculum topics, effective training, family development, awareness of stress and burnout.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being

**Outcome #2**

**1. Outcome Measures**

Percent of participants changing attitudes regarding parenting, communication, positive discipline, stress management.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	91

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

**Issue (Who cares and Why)**

When parents are educated about children's developmental stages, hold reasonable expectations for their child's abilities and are aware of effective discipline strategies, they are less likely to engage in abusive parenting behaviors.

**What has been done**

83 parent education classes were conducted for parents, and 44 professional development opportunities were delivered for caregivers.

**Results**

343 of 379 (91%) participants who completed an evaluation reported they changed an attitude as a result of the program they attended. Attitudes addressed were empathy and beliefs about corporal punishment.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being

**Outcome #3**

**1. Outcome Measures**

Percent of participants intending to change behavior as a result of parenting training.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	98

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

**Issue (Who cares and Why)**

When parents are educated about children's developmental stages, hold reasonable expectations for their child's abilities and are aware of effective discipline strategies, they are less likely to engage in abusive parenting behaviors.

**What has been done**

83 parent education classes were conducted for parents, and 44 professional development opportunities were delivered for caregivers.

**Results**

Of participants evaluated, 98% (720/733) indicated they had received at least one idea, strategy, and/or skill they would implement to improve and enhance their parenting experience.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being

**Outcome #4**

**1. Outcome Measures**

Percent of individuals documenting change in behavior in parenting skills, communication, positive discipline, stress management.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	88

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

**Issue (Who cares and Why)**

When parents are educated about children's developmental stages, hold reasonable expectations for their child's abilities and are aware of effective discipline strategies, they are less likely to engage in abusive parenting behaviors. Positive parenting skills reduce the risk of negative outcomes for children, including school failure and juvenile criminal activity. Necessity for foster care is reduced.

**What has been done**

83 parent education classes were conducted for parents, and 44 professional development opportunities were delivered for caregivers.

**Results**

88% of participants surveyed (2772/3157) indicated they had changed a behavior or used a skill related to at least one of 20 parenting topics.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
802	Human Development and Family Well-Being

**Outcome #5****1. Outcome Measures**

Percent of attendees in indoor air quality training reporting increase in knowledge.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	70	92

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Radon is the second leading cause of lung cancer, behind smoking, in the US. According to EPA radon level maps, parts of Colorado may have some of the highest levels in the country.

**What has been done**

To educate the public and promote testing, CSU Extension delivered 43 air quality trainings and distributed 1977 radon kits.

**Results**

91% of participants surveyed reported knowledge gained in potential radon problems in the home; radon testing; radon mitigation; and/or indoor air quality issues and solutions.ir

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
801	Individual and Family Resource Management
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

**Outcome #6****1. Outcome Measures**

Percent of attendees changing attitudes/intending to change behavior based on knowledge gained at training on indoor air quality.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	89

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

**Issue (Who cares and Why)**

Radon is the second leading cause of lung cancer, behind smoking, in the US. According to EPA radon level maps, parts of Colorado may have some of the highest levels in the country.

**What has been done**

To educate the public and promote testing, CSU Extension delivered training and distributed 1977 radon kits.

**Results**

89% of participants surveyed reported they intended to test for radon and mitigate if/where necessary.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

**Outcome #7**

**1. Outcome Measures**

Percent of participants reporting change in behavior based on knowledge gained through training in indoor air quality.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	76

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



**Issue (Who cares and Why)**

Radon is the second leading cause of lung cancer, behind smoking, in the US. According to EPA radon level maps, parts of Colorado may have some of the highest levels in the country.

**What has been done**

To educate the public and promote testing, CSU Extension delivered training and distributed 1977 radon kits.

**Results**

76% (1005/1324) of participants surveyed reported they tested their homes for radon and implemented mitigation if/where needed.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

**Outcome #8**

**1. Outcome Measures**

Individual homes, and thus communities will have significantly improved indoor air quality based on remediation of indoor air pollutants.

Not Reporting on this Outcome Measure

**Outcome #9**

**1. Outcome Measures**

Percent of participants demonstrating change in knowledge of financial management.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	75	80

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

**Issue (Who cares and Why)**

When individuals are educated and adopt good financial management skills, they start or increase the amounts of their emergency savings accounts; more easily avoid bankruptcy and foreclosure; maintain their dignity; avoid fraud; and are better able to contribute to community philanthropic causes.

**What has been done**

276 trainings and workshops were conducted and new curriculum developed to educate individuals and families, as well as other professionals who support family financial stability.

**Results**

80% of participants surveyed reported they gained knowledge on one or more of 12 topics related to family financial stability.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

**Outcome #10**

**1. Outcome Measures**

Percent of participants intending to change behavior/reporting change in attitudes regarding financial management.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	71

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

**Issue (Who cares and Why)**

When individuals are educated and adopt good financial management skills, they start or increase the amounts of their emergency savings accounts; more easily avoid bankruptcy and foreclosure; maintain their dignity; avoid fraud; and are better able to contribute to community philanthropic causes.

**What has been done**

276 trainings and workshops were conducted and new curriculum developed to educate individuals and families, as well as other professionals who support family financial stability.

**Results**

71% of participants surveyed reported they intended to change a behavior associated with family economic stability. Some behaviors include increased savings; reduced debt; creating a spending plan; use credit wisely; obtain and review credit report; organize important papers; avoid fraud; manage investment risk; manage financial risk; teach children healthy money habits; create or increase an emergency fund; use wise consumer shopping skills; set financial goals; avoid high-cost credit sources; reduce energy consumption; consider long-term care financing.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management

802 Human Development and Family Well-Being

**Outcome #11****1. Outcome Measures**

Percent of participants in financial management training demonstrating change in behavior.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	96

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

When individuals are educated and adopt good financial management skills, they start or increase the amounts of their emergency savings accounts; more easily avoid bankruptcy and foreclosure; maintain their dignity; avoid fraud; and are better able to contribute to community philanthropic causes.

**What has been done**

276 trainings and workshops were conducted and new curriculum developed to educate individuals and families, as well as other professionals who support family financial stability.

**Results****4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

**Outcome #12****1. Outcome Measures**

Family financial health significantly improved due to changes based on skills learned in financial management trainings.

Not Reporting on this Outcome Measure

**Outcome #13**

**1. Outcome Measures**

Percent of individuals demonstrating increase in knowledge regarding strategies for dealing with disabilities on the farm/ranch.

Not Reporting on this Outcome Measure

**Outcome #14**

**1. Outcome Measures**

Percent of participants in agrability workshops reporting change in behavior regarding coping with disabilities on the farm/ranch.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	81

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

**Issue (Who cares and Why)**

Through the use of information and assistive technology, farmers and ranchers who have a disability are better able to maintain their independence in producing agriculture in Colorado.

**What has been done**

Since 1998, Colorado's AgrAbility Project has developed, delivered, and evaluated workshops to Colorado producers with disabilities and to the professionals who work with them. 19 workshops were presented in 2009 to 216 professionals and ag producers.

**Results**

81% of participants surveyed reported behavior change/use of skills in relation to maintaining independence in agriculture with disabilities.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

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

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

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

### **Brief Explanation**

Review of 2008 Report gave strong support for FCS agents who planned and implemented a retreat to focus their work. New Plans of Work resulted, with small numbers of specific indicators determined in three areas: Food Safety, Nutrition and Health, and Family Economic Stability. Work Teams are identifying, modifying and delivering programs across the state that will result in outcomes that can be reported as aggregated statements of FCS success in Colorado. Two Work Teams were suspended, in order to have a clear message that FCS is focusing in three areas. In support of the FCS focus areas. We have approval to hire a Family Economics Specialist under a three-year contract. We expect a small number of indicators to be used across the state as agents attempt to meet the needs of Colorado families during difficult financial times.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparison between locales where the program operates and sites without program intervention

### **Evaluation Results**

Since 2007, a family success program has helped 234 county residents improve their debt management skills, financial decision-making skills, family communication skills, sense of well being, and self efficacy. The direct annual cost per participant is \$268. With improvements noted above, participants become more likely to maintain strong, healthy families. Each family that maintains a safe and healthy environment for children contributes to the child's school success and reduces the chance of the child engaging in risky behavior that could lead to juvenile justice intervention. Each child that graduates from high school and does not enter the juvenile justice system saves the state and the county a minimum of \$58765/year.

### **Key Items of Evaluation**

Confusion and consternation continue as NIFA priorities do not clearly include families (outside of nutrition). Our stakeholders want support for family economics; what is the vehicle for reporting this work under the new priorities?

**V(A). Planned Program (Summary)****Program # 3****1. Name of the Planned Program**

Nutrition and Food Safety

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
701	Nutrient Composition of Food	0%		20%	
703	Nutrition Education and Behavior	70%		40%	
704	Nutrition and Hunger in the Population	1%		0%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	1%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		20%	
721	Insects and Other Pests Affecting Humans	1%		0%	
723	Hazards to Human Health and Safety	4%		0%	
724	Healthy Lifestyle	13%		0%	
805	Community Institutions, Health, and Social Services	0%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	28.0	0.0	6.0	0.0
Actual	26.2	0.0	5.1	0.0

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

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
473574	0	622691	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
473574	0	622691	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
1624069	0	5953116	0

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

**1. Brief description of the Activity**

Food Safety Education

- Food Safety training for consumers, high risk audiences and their caregivers.(Eat Well for Less, La Cocina Saludable, Worksite Wellness, Safe Home Food Preparation and Preservation, Promotion at Farmers Markets.)
- Food Safety Training for Food Service Managers and Workers (Food Safety Works, ServSafe, Food Safety for Food Bank Workers).

Promoting Food Security

- Multi-lesson series programs-Eat Well for Less, La Cocina Saludable]
- Single event programs targeting limited resource families
- Newsletters-Senior Nutrition News

Health Promotion/Chronic Disease Prevention

- Multi-lesson series - Dining with Diabetes, Small Changes Make a Big Difference, Strong Women-Strong Bones, Moving Toward a Healthier You, Healthy Heart, Smart-START for a Healthy Heart
- Self-paced program - Self-Care for a Healthy Heart
- Single lessons - Workable Wellness (worksite wellness).
- Youth program- Food Friends-Making New Foods Fun for Kids, Eating Right Is Basic, Chef Combo's Fantastic Adventures in Tasting and Nutrition, Professor Popcorn

Research

- Technical and extension publications
- Development of new technologies for improving food safety
- Development of recommendations on diet, exercise or other health related topics

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

Food Safety Education

- Consumers, High Risk Audiences (pregnant, immune-compromised, elderly).
- Food Handlers and their managers at retail food establishments.
- Producers and processors of plant and animal agricultural products. Health Promotion/Chronic Disease Prevention
- Individuals at risk for diabetes, heart disease, obesity(adults and youth)
- Seniors at risk for osteoporosis.
- Youth - nutrition focus

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	50000	250000	250	10000
<b>Actual</b>	20107	414033	8913	0

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	20	20	
<b>Actual</b>	19	70	0

**V(F). State Defined Outputs****Output Target****Output #1****Output Measure**

- Number of trainings in Food Safety Education, Health Promtion and Disease Prevention held.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	200	2031

**Output #2****Output Measure**

- Amount of grant dollars received to support Nutrition, Health and Food Safety

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	250000	1641923

**Output #3****Output Measure**

- Number of individuals reached by newsletters on Food Safety Education, Food Security, and Health Promotion and Disease Prevention distributed.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	250000	2081573

**Output #4****Output Measure**

- Technical publications on food safety and nutrition.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	20	19

**Output #5****Output Measure**

- Number of individuals trained via workshops in Food Safety, Nutrition, and Health.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	5000	20207



**Output #6**

**Output Measure**

- Number of partnering agencies in Colorado who collaborated in nutrition, diet and health efforts.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	100	361

**Output #7**

**Output Measure**

- User fees generated through these programs

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	49997

**Output #8**

**Output Measure**

- Number of volunteers engaged with these programs

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	409

**Output #9**

**Output Measure**

- Number of curricula developed or reviewed that support nutrition and food safety work.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	29

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percent of participants at trainings in Food Safety indicating an increase in knowledge gained
2	Percent of participants reporting a change in attitude regarding Food Safety.
3	Percent of participants indicating a change in behavior as a result of Food Safety training
4	Percent of participants demonstrating a change in knowledge regarding Nutrition, Diet and Health.
5	Percent of participants documenting a change in behavior following participation in workshop on nutrition, diet, and health.
6	Facilitation of international trade of food products.
7	Basic research on human nutrition.

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

Percent of participants at trainings in Food Safety indicating an increase in knowledge gained

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	96

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Understanding and adopting safe food handling, preparation, storage, and preservation practices helps enhance food quality and decrease incidence of foodborne illness. Benefits to the broader community include lowered associated health care and insurance costs, strengthening the local economy, and improving confidence in the safety of our food supply.

**What has been done**

377 workshops were delivered to 2976 adult participants and 552 K-12 participants. Five workshops were conducted for Extension staff. 15 Fact Sheets and refereed journal articles were published. Twenty new curriculum pieces were developed and reviewed.

**Results**

96% of workshop participants evaluated reported that they gained knowledge in relation to seven content areas, including three for high risk audiences (food safety issues concerning children, pregnant women, and seniors).

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

**Outcome #2****1. Outcome Measures**

Percent of participants reporting a change in attitude regarding Food Safety.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	90

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

**Issue (Who cares and Why)**

Understanding and adopting safe food handling, preparation, storage, and preservation practices helps enhance food quality and decrease incidence of foodborne illness. Benefits to the broader community include lowered associated health care and insurance costs, strengthening the local economy, and improving confidence in the safety of our food supply.

**What has been done**

377 workshops were delivered to 2976 adult participants and 552 K-12 participants. Five workshops were conducted for Extension staff. 15 Fact Sheets and refereed journal articles were published. Twenty new curriculum pieces were developed and reviewed.

**Results**

90% of workshop participants surveyed (3878/4290) indicated they had an attitude change in relation to consumer and/or retail safe food handling practices, when and how to wash hands, and/or safe food preservation methods. In addition, high risk audiences reported attitude change concerning food safety issues concerning children, pregnant women, and/or seniors.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

**Outcome #3**

**1. Outcome Measures**

Percent of participants indicating a change in behavior as a result of Food Safety training

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	71

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Understanding and adopting safe food handling, preparation, storage, and preservation practices helps enhance food quality and decrease incidence of foodborne illness. Benefits to the broader community include lowered associated health care and insurance costs, strengthening the local economy, and improving confidence in the safety of our food supply.

**What has been done**

377 workshops were delivered to 2976 adult participants and 552 K-12 participants. Five workshops were conducted for Extension staff. 15 Fact Sheets and refereed journal articles were published. Twenty new curriculum pieces were developed and reviewed.

**Results**

71% of workshop participants surveyed reported behavior/use of skills in relation to consumer and/or retail safe food handling practices, when and how to wash hands, and/or safe food preservation methods. In addition, high risk audiences reported attitude change concerning food safety issues concerning children, pregnant women, and/or seniors.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle

**Outcome #4****1. Outcome Measures**

Percent of participants demonstrating a change in knowledge regarding Nutrition, Diet and Health.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	70	93

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Adoption of healthful behaviors may reduce the incidence of chronic diseases such as diabetes, heart disease, obesity, and cancer, thus affecting health insurance premiums, mortality rates, and employee productivity.

**What has been done**

Strong Women Strong Bones (331 women); Diabetes Awareness/Education (190 participants); Nutrition and Wellness classes.

**Results**

95% of workshop participants who completed Strong Women Strong Bones program reported knowledge gained about using hand and ankle weights for strength training. 90% of participants who completed diabetes education reported that people with diabetes are at higher risk for heart disease. 93% of participants who completed a nutrition and wellness class reported knowing foods high in fiber.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

**Outcome #5****1. Outcome Measures**

Percent of participants documenting a change in behavior following participation in workshop on nutrition, diet, and health.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	81

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The number of persons with Type 2 diabetes in Colorado has increased over 70 percent in the past ten years. The Colorado Department of Public Health and Environment (CDPHE) estimates that 143,000 adults are diagnosed

with diabetes, but another 74,200 are likely to have the disease and not know it. Poor dietary habits and physical inactivity are contributors to the chronic diseases such as diabetes. Only 25 percent of Coloradans eat the recommended 5 or more servings of fruits and vegetables, while 54percent meet the recommended physical activity guidelines for moderate (30 minutes per day, 5 or more days per week) or vigorous (20 minutes per day, 3 or more days per week). Research-based nutrition and health education presentations to a variety of audiences across Colorado promote healthful nutrition, activity and lifestyle behaviors. Adoption of healthful behaviors may reduce the incidence of chronic diseases, including diabetes, heart disease, obesity, and cancer. These reductions can influence health insurance premiums, mortality rates, and employee productivity.

**What has been done**

Colorado State University Extension delivered two programs, Dining with Diabetes and Small Changes Make a Big Difference. Some of the 190 attendees were pre-diabetic, had been diagnosed with diabetes, had a family history of diabetes or were caregivers of those who have diabetes. Programming focused on improving knowledge of healthful food choices, increasing awareness of the importance of physical activity, and avoidance of diabetes complications. Strong Women Strong Bones was delivered to 331 participants, and various nutrition and wellness presentations and classes reached almost 800.

**Results**

81% of participants evaluated after completing a diabetes awareness program reported making changes in food choices. 50% reported participating in physical activity or exercise in the past month.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

**Outcome #6**

**1. Outcome Measures**

Facilitation of international trade of food products.

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Basic research on human nutrition.

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	0	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

As a person ages, skeletal muscle quantity and quality irreversibly decline. Deterioration of muscle quality with age is associated with an increased risk of falls and subsequent disability. Muscle wasting cannot be arrested totally; however, physical activity and nutrition interventions are currently the most promising means of delaying it. This project focuses on maximizing the nutritional value of protein for maintaining skeletal muscle mass.

#### What has been done

We evaluated how changing when protein is consumed (after exercise) changes the effectiveness, or quality, of that protein to increase the making of body protein to decrease muscle loss with age. We confirmed that timing protein after exercise increased nitrogen balance (a measure of body protein accretion) over a three-day period as compared to having that protein at another point in the day. These findings have been disseminated at two conferences.

#### Results

Currently the recommended daily allowance (RDA) for macronutrients is based on absolute quantities (gm/day) or percentages (% of daily intake). However, our study found the nutritional quality of the protein source can change simply by changing the timing of its intake. Our results represent a change in knowledge in that it is the first to demonstrate that changing the timing of protein intake changes protein accretion over a short-term. Our results also represent a change in action in that practical strategies can be advised to maintain lean mass in older subjects. Finally, our results indicate that nutritional guidelines should include the consideration of timing of intake beyond just absolute quantities.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

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

##### Brief Explanation

FCS professionals met in June to prioritize work for the near future. Food Safety and Nutrition & Health were two of the three focus areas selected during a facilitated process. This change in program expectations is reflected in work teams' recommended programs and determined outcomes. We expect results for the full program year 2010 to show value of the implementation of focused programming.

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)



## **Evaluation Results**

Surveys and observations allow presenters to measure participant satisfaction and perceived results of various workshops and trainings conducted in Nutrition and Food Safety.

### **Key Items of Evaluation**

Colorado FCS agents and specialists have selected three areas in which to focus their work in the immediate future. Food Safety and Nutrition and Health are two. This well positions our professional staff to ensure that nutritious foods are affordable and available, and provide guidance so that individuals and families are able to make informed, science-based decisions about their health and well-being. We will also work to reduce the incidence of foodborne illness and provide a safer food supply by addressing and eliminating causes of microbial resistance to contaminants, educating consumer and food safety professionals, and developing food processing technologies to improve safety

**V(A). Planned Program (Summary)****Program # 4****1. Name of the Planned Program**

Animal Production Systems

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
301	Reproductive Performance of Animals	1%		10%	
302	Nutrient Utilization in Animals	3%		10%	
303	Genetic Improvement of Animals	3%		20%	
307	Animal Management Systems	35%		30%	
308	Improved Animal Products (Before Harvest)	3%		0%	
311	Animal Diseases	10%		10%	
315	Animal Welfare/Well-Being and Protection	14%		10%	
601	Economics of Agricultural Production and Farm Management	31%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	15.0	0.0	5.0	0.0
Actual	13.3	0.0	3.1	0.0

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

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
239889	0	207350	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
239889	0	207350	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
822672	0	4234191	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

- Workshops and educational classes for producers
- Demonstration plots and field days to showcase the results

- Individual counseling on producers specific problems
- Conduct basic and applied research on livestock, primarily beef, dairy, sheep, and horses

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

Individual agricultural producers, commodity groups, agri-business partners

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	25000	5000	10000	15000
<b>Actual</b>	9213	22814	1124	0

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	2	20	
<b>Actual</b>	31	38	0

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

**Output Target**

**Output #1**

**Output Measure**

- Number of attendees at workshops/trainings/field days

Year	Target	Actual
2009	2000	9213

**Output #2**

**Output Measure**

- Amount of grant dollars garnered to support animal research and outreach programs

Year	Target	Actual
2009	30000	815449

**Output #3****Output Measure**

- Number of technical and refereed journal articles published

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	20	31

**Output #4****Output Measure**

- Number of workshops presented.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	50	225

**Output #5****Output Measure**

- Number of agencies partnering in this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	30

**Output #6****Output Measure**

- User fees generated through this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	4025

**Output #7****Output Measure**

- Number of curricula generated in this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	15

**Output #8****Output Measure**

- Number of volunteers engaged in this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	68

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained
2	Percent of participants indicating change in behavior/ best practices adopted
3	Economic impact of the change in behavior reported
4	Animal Decision Support Systems
5	Animal Feed as By-Product of Biofuel Production
6	Pasture Options for Organically Produced Livestock
7	Students/Graduates in Integrated Resource Management Master's Degree Program

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

Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	93

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Colorado ranks 5th in the nation for value of cattle and calves (\$3.2 billion) which is over half of the total market value of agricultural products sold in Colorado. According to the 2007 Census of Agriculture, the number of farms in Colorado with beef cows decreased 6.4% from 1997 to 2007, and the number of farms with all cattle and calves decreased 28.1% during the same ten-year period.

**What has been done**

Workshops, site visits, consultations

**Results**

93% of participants reported they gained knowledge in various topics related to successful beef production.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management

**Outcome #2****1. Outcome Measures**

Percent of participants indicating change in behavior/ best practices adopted

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	66

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Colorado ranks 5th in the nation for value of cattle and calves (\$3.2 billion) which is over half of the total market value of agricultural products sold in Colorado. According to the 2007 Census of Agriculture, the number of farms in Colorado with beef cows decreased 6.4% from 1997 to 2007, and the number of farms with all cattle and calves decreased 28.1% during the same ten-year period.

**What has been done**

Workshops, consultations, site visits, conferences

**Results**

66% of participants evaluated reported behavior change/use of skills in relation to various best practices in beef production. 74% of participants reported changing an attitude about successful beef production, and 71% reported they intended to change a behavior as a result of CSU Extension training.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management

**Outcome #3****1. Outcome Measures**

Economic impact of the change in behavior reported

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	100000	27200

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Colorado ranks 5th in the nation for value of cattle and calves (\$3.2 billion) which is over half of the total market value of agricultural products sold in Colorado. According to the 2007 Census of Agriculture, the number of farms in Colorado with beef cows decreased 6.4% from 1997 to 2007, and the number of farms with all cattle and calves decreased 28.1% during the same ten-year period.

**What has been done**

Simple soil testing, hay analysis

**Results**

Throughout programs, 64% of participants evaluated reported they made behavior changes/use of skills in relation to multiple beef/range trainings, workshops, and field days. Examples of economic impact were documented in at least two cases.

1. Based on a simple soil test, CSU Extension saved a producer the cost of 60 pounds of nitrogen which equates to a production savings of \$38.40/acre; across the field the total savings was \$19,200.
2. CSU analyzed hay for a producer who had been purchasing protein tubs and feeding grass hay. The nutritional content was analyzed and a ration was calculated for the beef herd. The protein tubs were not needed, and the savings to the producer was \$8,000 for the remainder of the feeding period.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management



**Outcome #4****1. Outcome Measures**

Animal Decision Support Systems

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The primary goal of this project is to continue development and enhancement of a flexible, user-friendly online decision support system that can be utilized by commercial and seedstock producers of beef cattle to improve profitability through improved selection of breeding animals and better design of mating systems. The tool will allow the producer to evaluate the effect of selection and mating decisions on profitability of the enterprise and various marketing endpoints including weaning, post-weaning, and harvest.

**What has been done**

We continue improvements to this system, which is designed to be operation-specific accounting for unique differences specific to each producer's operation. A prototype post-weaning model has been developed and will be added as new genetic evaluations for time-to-finish in the feedlot are released to the beef cattle breeding industry. The two models (cow-calf and feedlot production) will be combined to give users additional options of simulation outputs.

**Results**

Users represent multiple breed associations that contribute expected progeny differences of sires from their herd books to the database upon which the decision support system relies. Based on breed association records, two of the participating associations transfer nearly 10,000 bulls in a single year. If bulls are used for 3 breeding seasons with an average of 25 offspring produced per season, each of these 10,000 bulls would produce 75 offspring. If all breeders adopted this technology it would therefore impact the performance of 750,000 commercial progeny from just these two breeds. If the system yields only an average of \$10 more profit per progeny produced, the economic result would be a more than \$7 million increase in profit.

**4. Associated Knowledge Areas**

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

**Outcome #5****1. Outcome Measures**

Animal Feed as By-Product of Biofuel Production

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

As the demand for fossil fuel continues to increase, the need for sustainable, alternative fuels is becoming more important. Algae meal is a by-product resulting from the bio-fuel conversion process. Whether algae meal provides both safety and nutritional benefits as animal feed is explored.

**What has been done**

The use of high oil producing algal species to produce bio-fuel is being explored as a more sustainable and economical alternative to both fossil fuels and bio-fuels derived from grain crops. A study was conducted to explore the safety and possible nutritional benefits of utilizing the algae meal that remained after the oil was extracted from the algae species *Nannochloropsis oculata*. These data have been reported at the Institute for Livestock and the Environment Stakeholder Summit in Fort Collins CO in November 2009.

**Results**

Overall, the results showed that the algae meal of *Nannochloropsis oculata* was a safe and nutritionally adequate source of protein for young, growing rat diets. These data will form the foundation of results necessary to enhance the availability of biofuel coproducts for use in livestock feeds.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
308	Improved Animal Products (Before Harvest)

**Outcome #6****1. Outcome Measures**

Pasture Options for Organically Produced Livestock

**2. Associated Institution Types**

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

One of the goals of this project is to recommend for pasture species suitable for organic dairies in the western US. This information is critical as the National Organic Program - Access to Pasture (Livestock) proposed rule is currently under review. If approved, the rule will require organically produced livestock to be on pasture year-round with only a few exceptions. Organic dairies rely primarily on irrigated pastures for grazing and will need information on species that are extremely durable and can withstand constant hoof traffic.

#### What has been done

Based on results from this study, it appears that monocultures of tall fescue may be one of the better options for organic dairies, even though this species is not the most palatable. It is very hardy and productive, regrows quickly in our environment, especially in the fall, and should provide the minimum 30% dry matter intake specified in the proposed organic pasture rule.

#### Results

The management implications of this study vary based on the relative importance of pasture in an animal's diet. This study found that the addition of legumes to grass-based pasture is an excellent tool for increasing forage quality, especially crude protein content. When results of this study were presented to personnel from Aurora Organic Dairy, they determined that monocultures of TF would best fit their needs for pasture due to its high total yield, good late season growth, and durability under intensive grazing. Even though lower in CP content, overall forage quality was adequate to meet the needs of their cows.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

### Outcome #7

#### 1. Outcome Measures

Students/Graduates in Integrated Resource Management Master's Degree Program

#### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Condition Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

We developed the interdisciplinary modular Master's degree program, and are converting the materials to an electronic format. The distance education program was launched in Fall 2008 and each semester offers new courses to both degree-seeking students as well as students seeking to add to their management skills. These online courses accommodate a variety of students, including those currently working in government agencies, on independent farms and ranches, and students wishing to change careers.

#### What has been done

Our educational materials utilize a multidisciplinary problem-solving approach, including carefully selected factual material combined with problems that require critical knowledge, problem solving proficiency, and self-directed learning strategies. Eighty percent of the program materials are not region specific. We are using Adobe Connect technology that allows easy modification of any class to address specific regional issues.

#### Results

We currently have 10 degree-seeking students and other students enrolled in our courses who are taking them for professional development. Several Extension personnel in the state of Colorado plan on immediately utilizing the courses in this application for producers in their local areas. This model of agriculture education is adaptable to other institutions and countries. Also, the 28 universities that are involved in the AG\*IDEA consortium have agreed to accept all 11 courses for their program. The consortium believes that the integrated courses are needed and will be utilized by students from all 28 universities.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
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

Colorado's dairy industry faced a crisis in 2009. Multiple face-to-face meetings were facilitated by

Extension and extensive information, education, and resources were provided to producers. The closure of New Frontier Bank by FDIC triggered discussions of the bank closure and funding alternatives.

Between 300,000 and 500,000 acres under CRP contracts in Colorado are set to expire in each of the next five years. CSU Extension developed a decision tool to help landowners determine how to best use the land as it comes out of CRP.

#### **V(I). Planned Program (Evaluation Studies and Data Collection)**

##### **1. Evaluation Studies Planned**

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study

#### **Evaluation Results**

1. Goats are able to metabolize cull onions as a significant portion of their diet.
2. Farmers show improvements in their quality of life and economic vitality via learned business management, production, and marketing techniques. Indicators of improvement include increased profits, enhanced farm environmental quality and sustainability, and (as appropriate) preservation of agricultural land and water for agricultural use.

#### **Key Items of Evaluation**

Specialists and agents in this content area are focusing the expertise to boost U.S. agricultural production, improve global capacity to meet the growing food demand, and foster innovation in fighting hunger by addressing food security for vulnerable populations, and to generate knowledge to develop an agriculture system that maintains high productivity in the face of climate changes. This will help producers to plan for and make decisions to adapt to changing environments and sustain economic vitality, and can take advantage of emerging economic opportunities offered by climate change mitigation technologies.

**V(A). Planned Program (Summary)****Program # 5****1. Name of the Planned Program**

Plant Production Systems

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

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	1%		0%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	2%		10%	
204	Plant Product Quality and Utility (Preharvest)	3%		0%	
205	Plant Management Systems	52%		20%	
206	Basic Plant Biology	6%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		10%	
212	Pathogens and Nematodes Affecting Plants	1%		10%	
213	Weeds Affecting Plants	10%		10%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	1%		0%	
215	Biological Control of Pests Affecting Plants	2%		10%	
216	Integrated Pest Management Systems	17%		10%	
	<b>Total</b>	100%		100%	

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

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	0.0	26.0	0.0
Actual	19.3	0.0	15.3	0.0

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

Extension		Research	
<b>Smith-Lever 3b &amp; 3c</b> 348905	<b>1890 Extension</b> 0	<b>Hatch</b> 911715	<b>Evans-Allen</b> 0
<b>1862 Matching</b> 348905	<b>1890 Matching</b> 0	<b>1862 Matching</b> 911715	<b>1890 Matching</b> 0
<b>1862 All Other</b> 1196529	<b>1890 All Other</b> 0	<b>1862 All Other</b> 4380509	<b>1890 All Other</b> 0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

- Conduct basic and applied research in plant productions systems.
- Utilize demonstration plots and field days to communicate program results.
- Workshops and educational classes for producers.
- 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.

**V(E). Planned Program (Outputs)****1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	50000	5000	0	0
<b>Actual</b>	0	0	0	0

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

Year: 2009

Plan: 0

Actual: 1

**Patents listed**

Atpdr2 gene mutation invention disclosure

**3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	5	25	
<b>Actual</b>	5	149	0

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

**Output Target****Output #1****Output Measure**

- Release of technologies adopted by growers such as crop cultivars, crop germplasm, or components of crop production systems.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	2	175

**Output #2****Output Measure**

- Number of attendees at workshops/trainings/field days.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	2000	21932

**Output #3****Output Measure**

- Amount of grant dollars garnered to support natural plant production systems research and outreach.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	200000	1551434

**Output #4****Output Measure**

- Technical publications in the topical area of plant production systems.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	25	63

**Output #5****Output Measure**

- Number of basic and applied research efforts in plant production systems: Number of workshops, educational classes for producers Number of demonstration plots and field days Number of individual consultations  
Not reporting on this Output for this Annual Report

**Output #6****Output Measure**

- Number of Extension workshops focusing on plant production systems.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	50	608



**Output #7****Output Measure**

- Number of agencies partnering in this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	119

**Output #8****Output Measure**

- Number of volunteers engaged in this work, including certified master volunteers

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	516

**Output #9****Output Measure**

- User fees generated through this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	56815

**Output #10****Output Measure**

- Number of newsletters distributed in support of this plan of work.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	74

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percent of participants at workshops/trainings/field days indicating an increase in knowledge gained.
2	Percent of participants indicating change in behavior/best practices adopted.
3	Economic impact of the change in behavior reported.
4	Adoption of crop production technology as measured by agricultural statistics.
5	Adoption of improved wheat cultivars.
6	Potential of living mulches to decrease soil erosion.
7	Crops for Ethanol Production
8	Adoption of Improved Bean Cultivars
9	Advances in the Development of Wheat Cultivars and Germplasm
10	Adoption of Herbaceous and Woody Plant Species in the Rocky Mountain and High Plains Region
11	Improving Acceptance of Certified Seed Potato Acreage
12	Advances in the Development of Potato Cultivars
13	Genetics of Resistant Weeds
14	Advances in Plant Genetics
15	Fruit and Vegetable Production Practices to Improve Returns to Growers

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

Percent of participants at workshops/trainings/field days indicating an increase in knowledge gained.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	96

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Correct identification or diagnosis of pests, increased use of IPM, increased use of safe chemical handling, improved timing of pest control, and expanded awareness of biosecurity and invasive pest response contributes to reduced use of pesticides, decreased pesticide exposure, and increased profitability in all sectors of the economy.

**What has been done**

workshops, trainings, newsletters, Websites, consultations

**Results**

96% of participants surveyed reported changing an attitude (immediate outcome) about various aspects of pest management and safe use of chemicals.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

**Outcome #2****1. Outcome Measures**

Percent of participants indicating change in behavior/best practices adopted.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	31

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Optimizing dollar returns on fertilizer and other input investments; using different crop tillage practices; improving management of soil, precipitation, and irrigation; optimizing farm operation using rotational cropping systems; controlling volunteer plants in rotational systems are steps farmers can take to sustain their business.

**What has been done**

Nebraska and Colorado Tillage Crop Clinic, attended by 45 High Plains farmers, crop advisers, and agricultural professionals.

**Results**

14 of 45 participants reported that together, they manage 49,200 acres. Two said that the program was worth \$4.50/acre to them, totaling \$33,940 in savings on the land they manage.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

**Outcome #3****1. Outcome Measures**

Economic impact of the change in behavior reported.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	300000	500000

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Importing unfumigated sweet corn into California and Arizona was prohibited, limiting the market for Western Slope sweet corn growers.

**What has been done**

Under contract to Colorado West Sweet Corn Marker Order, Tri River Extension provided a survey of European Corn Borer incidence in Colorado.

**Results**

Results of the survey allowed import of unfumigated sweet corn into California and Arizona, opening a market worth more than \$500,000 for Tri River Area sweet corn growers.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

**Outcome #4****1. Outcome Measures**

Adoption of crop production technology as measured by agricultural statistics.

Not Reporting on this Outcome Measure

**Outcome #5****1. Outcome Measures**

Adoption of improved wheat cultivars.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	0	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Certified wheat seed was used for 31% of Colorado's 2009 wheat crop. Of all wheat planted in Colorado in 2008, 32% was Hatcher, a CSU variety with a 3.5 bushel yield advantage over the average of wheat currently used in Colorado. During the past five years, Colorado wheat farmers have planted an average of 20% of their fields to newly released and improved wheat varieties. This is a faster adoption rate of improved wheat varieties than for growers from comparable states.

**What has been done**

The CSU Extension Wheat Improvement Work Team provides 18% of the total investment in developing and promoting CSU wheat varieties.

**Results**

Plantings of improved wheat varieties increased Colorado farmers' farm gate income by \$12,840,000 in 2008. Extension's share (18%) of this impact for the Colorado wheat industry is \$2,311,000, or about \$13.70 returned for each \$1.00 invested.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)

- 205 Plant Management Systems
- 206 Basic Plant Biology
- 211 Insects, Mites, and Other Arthropods Affecting Plants
- 212 Pathogens and Nematodes Affecting Plants
- 213 Weeds Affecting Plants

**Outcome #6**

**1. Outcome Measures**

Potential of living mulches to decrease soil erosion.

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Crops for Ethanol Production

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

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

**Issue (Who cares and Why)**

Sorghum is a well-adapted crop for the dryland areas in the Southern High Plains. Expanding the marketing crop options of sorghum, by increasing its utilization for ethanol production, would raise grower profit and bolster rural communities. The developers of high starch grain sorghum hybrids surmise that high starch grain sorghum has the potential to increase ethanol yield by 40 to 50%. If higher ethanol yield gains were realized from high starch grain sorghum, these high starch grain sorghums would merit price premiums for growers.

**What has been done**

A comparison of the high starch to conventional-starch grain sorghums revealed that there were minimal differences between the average grain yield, ethanol yield, and total ethanol production for the two years of this study. There appears to be no ethanol production advantage with high starch grain sorghums compared to conventional starch grain sorghums.

**Results**

The high starch grain sorghum hybrids did not produce higher average grain yields, higher ethanol yields, or higher ethanol production than the standard starch grain sorghums. Without higher ethanol yield, none of the high starch grain sorghum would garner price premiums. Therefore, there would be no economic advantage or impact to sorghum growers for raising high starch grain sorghums.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)

#### Outcome #8

##### 1. Outcome Measures

Adoption of Improved Bean Cultivars

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

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

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

Commercial dry bean production in Colorado was estimated at 57,000 acres in 2009, which was one of the lowest since the 1930s. There continues to be a need to provide producers and processors with updated information on cultivars and pest control to maximize economic return and reduce pesticide use.

###### What has been done

Research on cultural practices that influence yield determined that when plant population was increased 50 percent, yield increased for cultivars that had upright growth habit such as Matterhorn and Vision. The economic benefit to these findings should enhance the net return for production of dry beans up to twenty five percent and reduce the impact of white mold on the quality of commercial beans.

###### Results

Two highly white mold resistant interspecific lines (VCW 54 and VCW 55) and one recurrent-backcross line (VRW 32) were developed and released by the Idaho and Colorado Agricultural Experiment Stations in 2008. Breeding efforts resulted in the receipt of Plant Variety Protection on pinto cultivar Croissant. Colorado State University-released cultivars also contribute to a viable certified seed program in western Colorado with a farm gate value between \$500,000 and \$1,000,000 annually.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
212	Pathogens and Nematodes Affecting Plants



**Outcome #9****1. Outcome Measures**

Advances in the Development of Wheat Cultivars and Germplasm

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Development of improved wheat cultivars serves the wheat industry in Colorado by reducing wheat production costs, reducing pesticide use, and providing improved marketing options.

**What has been done**

Diverse germplasm sources continue to be used extensively in the crossing program. These include several sources of resistance to wheat rusts, Russian wheat aphid biotype 2, wheat streak mosaic virus, and multiple sources of alternative semi-dwarfing genes that do not shorten the coleoptile. Several lines with Russian wheat aphid biotype 2 resistance were advanced for testing in our CSU Elite trial and one two-gene Clearfield\* line was advanced for testing in the 2009 state variety trials.

**Results**

CSU-bred wheat cultivars account for over 61% (or 72% of the accounted-for acreage) of Colorado's 2.4 million acres (2009 crop). Since program inception, 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 from two of our most widely grown releases (Hatcher and Ripper) are approximately \$24 million (considering both yield and quality improvements) for the 2009 crop alone. Estimates from Colorado wheat industry leaders on CSU-developed quality improvements suggest that end-use quality enhancements from cultivars developed at CSU provide an average of \$17.5 million per year increased income for Colorado wheat producers (70 million bushels average x \$0.25 per bushel price increase; 2009 dollars).

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

**Outcome #10****1. Outcome Measures**

Adoption of Herbaceous and Woody Plant Species in the Rocky Mountain and High Plains Region

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Specific performance results from these annual, perennial and woody plant trials help determine which new and superior annual and perennial varieties growers throughout the state and region should grow and market.

**What has been done**

Woody and herbaceous plants continue to be evaluated for adaptability to the High Plains. Approximately 1076 varieties of annual flowers and 25 varieties of herbaceous perennials were evaluated in 2009, and six plant species were recommended or introduced by Plant Select. Over 66 demonstration gardens are displaying Plant Select plants throughout Colorado. The multi-site woody plant trial continued at five locations throughout the state with 12 additional taxa planted in 2009.

**Results**

A performance report for both annual and perennial trials was published and sent to all cooperators and industry personnel in the state and region. Many new seed and vegetatively propagated varieties including bacopa, coleus, gomphrena, New Guinea impatiens, and spreading petunias have become very important bedding plant crops in the state. Plant Select plants, which are either introductions or recommendations throughout the state and region, mean marketing more profitable plants for growers and retailers throughout state and region. In 2009, over 1.5 million Plant Select plants were sold, over 314,000 hits on the website and over 1.3 million people visited 41 demonstration gardens.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
213	Weeds Affecting Plants

**Outcome #11****1. Outcome Measures**

Improving Acceptance of Certified Seed Potato Acreage

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Potato Virus Y (PVY) continues to be an ongoing disease threat to the Colorado potato industry. This disease has continued to be epidemic in certain cultivars such as Russet Norkotah and Shepody. Producers, especially certified seed producers, have been having severe difficulties in keeping seed in the certification program because of PVY infection. Additionally, commercial producers have seen a drop in overall yield of larger tubers due to virus infection.

**What has been done**

The results and recommendations from this research include the use of better field placement of the most susceptible cultivars, early planting and killing dates for those same cultivars, using improved roguing techniques to remove infected plants where appropriate, and increased accuracy during the field and post harvest test inspections for certified PVY seed. Growers have been utilizing the findings from these projects to help reduce the overall impact from PVY.

**Results**

The recommendations have been utilized by growers to reduce their overall PVY load in the crop and to make better decisions regarding whether or not to plant a given seed lot. Numerous producers have dropped the most susceptible cultivars from their programs and have had good success with production of newer, less susceptible cultivars. Additionally, the CSU Cultivar Development program has released several new russet clones in the last two to three years which demonstrate limited impact to PVY. This, in turn, has allowed an additional 1000 ha of seed to pass certification requirements resulting in a potential additional revenue generation of approximately \$2.2 million in seed sales for the certified seed producers.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

**Outcome #12****1. Outcome Measures**

Advances in the Development of Potato Cultivars

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The Colorado Potato Breeding and Selection Program develops new potato cultivars with increased yield, improved quality, improved nutritional characteristics, resistance to diseases and pests, and tolerance to environmental stresses to help assure that the potato industry in Colorado will remain profitable and competitive.

**What has been done**

Mesa Russet was named in 2009. Mesa Russet is a high yielding, dual-purpose russet. It has a medium maturity and a high percentage of US #1 tubers. It is resistant to second growth, blackspot bruise, shatter bruise, powdery scab (tuber and root galling) and verticillium wilt. An analysis was conducted in mid-February 2009 on the incremental economic impacts of new CSU potato cultivars, Russet Norkotah-Selection 3 and Rio Grande Russet, on grower returns in the San Luis Valley of Colorado.

**Results**

Based on the price structure in mid-February 2009, using multiple year yield and grade data, and current production area, grower' returns/ha (warehouse packing and handling charges deducted) were calculated for Russet Norkotah-Selection 3 and Russet Norkotah. Shifting production to Russet Norkotah-Selection 3 resulted in an increase in grower' returns of \$314/ha. Shifting from production of Russet Norkotah-Selection 3 to Rio Grande Russet added another \$255/ha to grower' returns. Overall grower' returns have increased by \$569/ha by moving acreage from Russet Norkotah to Rio Grande Russet. Total industry impact was estimated to be \$14.4 million. A similar analysis regarding fertilizer inputs also indicated opportunity for significant nitrogen input savings by shifting to newer more sustainable cultivars.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants

**Outcome #13****1. Outcome Measures**

Genetics of Resistant Weeds

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Knowing the severity of crop yield losses from resistant weeds helps growers appreciate the need for proactive steps to minimize the risk of such problems on their farms. One aspect of our research is to determine the basis for glyphosate resistance in Palmer amaranth and to evaluate the impact of this resistance trait on Palmer amaranth biology and on gene flow from Palmer amaranth to other pigweed species.

**What has been done**

We made a first ever discovery of a totally new mechanism of glyphosate resistance in a weed due to gene amplification in Palmer amaranth, a pigweed. The very high level of resistance provided by this mechanism precludes any utility from glyphosate for control of this weed. This discovery was based on our robust use of new molecular techniques to unravel the gene duplication events that had occurred.

**Results**

This will encourage growers to more quickly adopt IPM strategies to minimize herbicide resistant weeds from dominating key Colorado crops. Our improved understanding of the dicamba resistance trait in kochia will help us monitor the spread and impact of this weeds, especially as companies stack dicamba resistance in Roundup Ready crops to help manage weeds that are glyphosate resistant.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

**Outcome #14****1. Outcome Measures**

Advances in Plant Genetics

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Whether plants can influence and take advantage of the surrounding community of organisms has been debated for years. Evidence published to date suggesting that plants manipulate the soil microbial communities has been largely correlative, but a clear-cut mechanism used by plants to accomplish and benefit from this manipulation of microbial communities is lacking in the literature. Our laboratory has recently achieved results that allow us to make some generalizations about the plant-soil microbial community interaction.

**What has been done**

We have found that the ratio of phenolics vs. sugars in the root exudates of Arabidopsis had a profound effect on soil microbial composition. Specifically, we have determined that ABC (ATP Binding Cassette) transporters are involved in root secretion and that a mutant lacking the AtPDR2 transporter elicits dramatic quantitative and qualitative changes in Arabidopsis native soil microbial communities.

**Results**

These changes are correlated with an increase in phenolic compounds and a decline in sugars in the root exudates of the mutant compared to the wild type (wt) and several other ABC transporter mutants. Interestingly, exudates from Atpdr2 cultivated a microbial community with a relatively greater abundance of potentially beneficial bacteria (i.e., plant growth promoting rhizobacteria-PGPRs, nitrogen fixers); and were specifically enriched in bacteria involved in heavy metal remediation. An invention disclosure was filed on the Atpdr2 gene mutation.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources

**Outcome #15****1. Outcome Measures**

Fruit and Vegetable Production Practices to Improve Returns to Growers

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Watermelons and muskmelons are important fresh market crops in the Arkansas Valley of Colorado. Growers are increasingly using drip irrigation to produce these crops as a means to improve overall production. Concurrent with the conversion to drip irrigation, growers have switched to ground water for irrigation instead of traditional surface water sources. Both characteristics make ground water more amenable for use in drip systems. Our goal is to identify and mitigate problems associated with fruit and vegetable crop production.

**What has been done**

In 2008 and 2009, studies were conducted to characterize the response of commonly grown watermelon and muskmelon cultivars to low EC surface water and high EC ground water. In both years, total marketable yields and quality were not significantly different. These studies suggest that watermelon and muskmelon response to relatively saline irrigation water in the Arkansas Valley of Colorado may not be as detrimental as that predicted by other studies.

**Results**

Drip irrigation, used along with the other forms of plasticulture, can double yields and improve gross returns by \$3000-4000 per acre. As growers adopt more intensive production practices, they are finding that, although higher in salt content, ground water is functionally easier to use in drip systems than traditionally-used surface water sources. These studies suggest that growing drip-irrigated watermelon and muskmelon with relatively saline ground water does not significantly alter yields. Overall, growers using ground water in drip irrigation systems may be able to maintain yields, manage salinity in the soil profile, and in some cases, improve melon quality.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

## **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**

Small acreage landowners have a significant impact on the conditions of soil, water, plants, animals, and other natural and man-made resources through their cumulative effects. Management of weeds, insect pests and plant diseases is one of the most costly inputs that clientele in agriculture, the green industry and consuming households must finance every year in Colorado. Invasive, non-native weeds are a concern in many communities and threaten native ecosystems. Fire mitigation and management of forest resources in response to mountain pine bark beetle infestation has heightened much of these concerns.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study

### **Evaluation Results**

Consistent use of reporting templates has increased the usefulness of evaluation data from Work Teams. Templates are updated annually to reflect the updated plans of work, in order that the most current needs can be addressed through the most effective programming.

### **Key Items of Evaluation**

Specialists and agents in this content area are focusing their expertise to boost Colorado and U.S. agricultural production, improve global capacity to meet the growing food demand, and foster innovation in fighting hunger by addressing food security for vulnerable populations.



**V(A). Planned Program (Summary)****Program # 6****1. Name of the Planned Program**

Natural Resources and Environment

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
101	Appraisal of Soil Resources	0%		10%	
102	Soil, Plant, Water, Nutrient Relationships	26%		10%	
103	Management of Saline and Sodic Soils and Salinity	0%		10%	
104	Protect Soil from Harmful Effects of Natural Elements	1%		0%	
111	Conservation and Efficient Use of Water	29%		20%	
112	Watershed Protection and Management	4%		10%	
121	Management of Range Resources	17%		10%	
123	Management and Sustainability of Forest Resources	3%		10%	
124	Urban Forestry	2%		0%	
131	Alternative Uses of Land	16%		0%	
132	Weather and Climate	0%		10%	
133	Pollution Prevention and Mitigation	1%		0%	
134	Outdoor Recreation	1%		0%	
403	Waste Disposal, Recycling, and Reuse	0%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	18.0	0.0	11.0	0.0
Actual	38.5	0.0	12.1	0.0

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

Extension		Research	
<b>Smith-Lever 3b &amp; 3c</b> 696083	<b>1890 Extension</b> 0	<b>Hatch</b> 568857	<b>Evans-Allen</b> 0
<b>1862 Matching</b> 696083	<b>1890 Matching</b> 0	<b>1862 Matching</b> 568857	<b>1890 Matching</b> 0
<b>1862 All Other</b> 2387134	<b>1890 All Other</b> 0	<b>1862 All Other</b> 7875607	<b>1890 All Other</b> 0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

•Conduct workshops and educational classes for producers, landowners, and agency personnel. •Establish demonstration plots and field days to share research and outreach results. •Consult with individual producers and landowners to address local problems. •Conduct basic and applied research on environmental and natural resources issues.

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

Individual agricultural producers, landowners, commodity groups, regulatory agencies, agribusinesses, and local, state, and federal land management agencies.

**V(E). Planned Program (Outputs)****1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	30000	5000	0	0
<b>Actual</b>	17645	2503245	2596	0

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

Year: 2009  
Plan: 0  
Actual: 0

**Patents listed****3. Publications (Standard General Output Measure)****Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	25	25	
<b>Actual</b>	55	75	0

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

**Output #1****Output Measure**

- Number of attendees at workshops/trainings/field days.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	500	20241

**Output #2****Output Measure**

- Amount of grant dollars garnered to support natural resources research and outreach.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	250000	1218885

**Output #3****Output Measure**

- Number of technical and refereed journal articles published.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	25	55

**Output #4****Output Measure**

- Number of Master Gardener and Wildlife Master volunteer hours

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	55000	55230

**Output #5****Output Measure**

- Value of volunteer time at \$20/hr (nationally recognized value.)

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	1000000	1118407

**Output #6****Output Measure**

- Number of Native Plant Master volunteer hours

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	58624

**Output #7****Output Measure**

- Value of NPM Volunteers hours (at \$20.25 current rate)

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	1187136

**Output #8****Output Measure**

- Number of agencies partnering in this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	209

**Output #9****Output Measure**

- User fees generated through this work

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	113419

**Output #10****Output Measure**

- Number of new technologies adopted by producers.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	3

**Output #11****Output Measure**

- Pounds of produce donated to local food banks via Colorado Master Gardener supported projects.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	31150

**Output #12****Output Measure**

- Number of curriculums developed and/or reviewed in support of this planned program

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	7

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained.
2	Percent of participants indicating change in behavior/best practices adopted.
3	Economic impact of the change in behavior reported.
4	Reducing cost of irrigation.
5	Impact of UV-B radiation on agriculture.
6	Small acreage management workshops.
7	Advances in Intense Cropping Systems Under Limited Irrigation
8	Management Tools for Mutual Ditch and Reservoir Companies

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

Percent of participants in workshops/trainings/field days indicating an increase in knowledge gained.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	99

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Sustainable Colorado farms and ranches are founded on principles of environmental health, economic profitability, and enhancing local communities. Farms must be profitable enough to provide an adequate return on the management, labor, and investment inputs as well as to provide investment capital for adapting to changing trends in markets and societal values. Sustainable agricultural business practices must also include enhancing the productivity of soils and the surrounding natural and social environment, as well as increasing biodiversity on the farm.

**What has been done**

Building Farmers Program includes eight night classes and mentorship opportunities for participants has now expanded to five counties.

**Results**

In addition to immediate benefit to participants (99% reported they had increased their knowledge), this program was used as a model to secure a Building Farmer and Rancher Development grant from USDA to CSU for a multi-state implementation.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
124	Urban Forestry
131	Alternative Uses of Land

**Outcome #2****1. Outcome Measures**

Percent of participants indicating change in behavior/best practices adopted.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	47

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Building capacity in producers contributes to excellence in sustainable agriculture production, business planning and management, and marketing of agricultural products for economic stability. It builds community that can and will support local food and agriculture systems.

**What has been done**

45 High Plains farmers, crop advisers and agricultural professionals attended the Nebraska/Colorado Tillage Crop Clinic.

**Results**

Participants said they would implement at least one of five new or best practices. Of these, 14 said they together manage 14,500 acres. Two said that the program was worth \$4.50/acre to them, for a total of \$33,940 saved on the land they manage.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
124	Urban Forestry
131	Alternative Uses of Land

**Outcome #3****1. Outcome Measures**

Economic impact of the change in behavior reported.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	150000	234447

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Citizens require knowledge and skills so they can successfully identify and use native plants for sustainable landscapes which require reduced inputs such as water, pruning, and pest control; and effectively control alien invasive weeds that threaten sustainable landscapes and native ecosystems.

**What has been done**

32 NPM courses (three sessions at four hours each), including 164 adult participants who are taking the course for credit to become Certified Native Plant Masters and 203 who are not taking it to become certified; 16 introductory classes with 929 registrants; trainings for volunteers and Extension staff, web sites (20,177 hits); newsletters; ten new curriculum pieces.

**Results**

77% of participants reported land condition changes as a result of participation in Colorado's Native Plant Masters program. 63% together saved money (\$49,201), and 57% together realized weed control cost savings of \$151,306.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
124	Urban Forestry
131	Alternative Uses of Land



**Outcome #4**

**1. Outcome Measures**

Reducing cost of irrigation.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	0	0

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

**Issue (Who cares and Why)**

Reducing the need for irrigation can result in less cost to producers and less salt run-off into native water flows.

**What has been done**

This was the second year of testing a peach irrigation practice that has been demonstrated in California and other countries such as Spain and Australia. The practice relies on stressing the tree in later maturing varieties during the second phase of fruit growth - pit formation and hardening. In Palisade this was successfully demonstrated on small plots with two larger producers saving approximately 4 inches of applied water and significant cash savings in pumping costs and winter pruning labor.

**Results**

Across the 10 acres it was tested on this amounts to about 20 tons of salt savings in return flows to the Colorado River. The project is set to expand to more growers and acreage in 2010 and will hopefully include growers from the North Fork valley in Delta County.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

**Outcome #5**

**1. Outcome Measures**

Impact of UV-B radiation on agriculture.

Not Reporting on this Outcome Measure

**Outcome #6**

**1. Outcome Measures**

Small acreage management workshops.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	5	54

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

**Issue (Who cares and Why)**

Increasing urbanization and the resulting rural/urban interface presents challenges for landowners who are new to 'small acreage management.' The lack of reliable and comprehensive information sources prompted a collaborative effort between NRCS, CSU, and CSU Extension to develop a web-based multimedia educational tools to educate large numbers of small acreage landowners

**What has been done**

A quarterly Sustainable Small Acreages e-newsletter reaches 1140 landowners in Colorado, 77 Conservations districts and NRCS field offices. A Small Acreage Management website with 13 areas of interest provides information not previously available from one source. More than 800 hits per month demonstrate the need for this consolidated resource.

**Results**

A coordinated approach to small acreage management throught partnerships among government agencies provides a comprehensive database of resources for small acreage landowners.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
121	Management of Range Resources

**Outcome #7****1. Outcome Measures**

Advances in Intense Cropping Systems Under Limited Irrigation

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Farmer interest in both the dryland and limited irrigation research continues to be strong as demonstrated by their demand for cropping systems information and by practice adoption rates. The overall objective of this multi-disciplinary research and outreach project is to advance understanding of biophysical processes in water limited agroecosystems and develop management practices that promote long term sustainability.

**What has been done**

In 2009 we evaluated the biomass production potential of dryland systems for bioenergy. We are investigating the quantities of crop biomass needed for maintaining water storage and soil carbon levels to determine if biomass removal for feedstocks can be sustained. A major challenge is the annual variability in biomass production. In 2009 we calibrated and validated a crop simulation model to evaluate water use of limited irrigation cropping systems.

**Results**

Intensive dryland cropping systems build soil organic carbon, improve soil quality, and improve both air and surface water quality because they provide high amounts of year around cover. These benefits have been realized for about 1,500,000 acres in CO that have been converted from wheat-fallow to wheat-summer crop-fallow. This conversion increased net return by \$22,275,000 per year under normal precipitation conditions. Adoption of crop rotations with summer crops illustrates the impact of this project on dryland agroecosystems. Overall summer crop acreage has increased by about 500,000 acres in Colorado since 1986. Assuming that summer crops are grown in a 3 year rotation, there are about 1,500,000 acres under more intensive cropping systems compared to 75,000 in 1986.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

**Outcome #8****1. Outcome Measures**

Management Tools for Mutual Ditch and Reservoir Companies

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Mutual ditch and reservoir companies use spreadsheets extensively in the management and accounting of their irrigation water. Unfortunately these companies often lack the personnel and resources to adequately develop these spreadsheet tools. We are developing three generic spreadsheets to address needs of mutual ditch and reservoir companies in Colorado. These spreadsheets will allow ditch and reservoir companies to better manage the water they deliver to irrigated agriculture.

**What has been done**

Ditch and reservoir companies are increasingly using information from data loggers to process data and create required reports for their organizations and the State. We have developed several spreadsheets to facilitate and expedite the processing and reporting and well as providing training materials for users which are available on the web at <http://www.engr.colostate.edu/~fontane/AES>. We are using the developed spreadsheet tools in classes in the Civil and Environmental Engineering department.

**Results**

Primary impact is significant time savings for staff of ditch and reservoir companies that are processing information to satisfy reporting requirements. The staff of the Central Colorado Water Conservancy District was summarizing information from a single data logger file with a week's worth of data requiring 30 minutes to one hour to process. Our spreadsheet application has reduced this time to less than 1 minute. Similarly a spreadsheet application for the South Platte Ditch Company also reduced the manual processing of multiple data logger files from hours to less than 1 minute. In addition, potential errors from manually processing the data were eliminated.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and 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**

Colorado is part of a multi-state region including Arizona, Nevada and Utah that is now characterized as the fastest growing area in North America. Many new residents are moving to rural areas where their values come in conflict with existing values. Often this conflict is expressed around water and other environmental quality issues. Colorado household and business expenditures on garden, landscape and lawn products and services have averaged almost 10% annual growth. Sustainable landscapes use site-appropriate native plants and can reduce the need for water, maintenance time and pesticide use. Regular and expected periods of drought as well as the public demand for reduced pesticide use drives much of this change.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study

### **Evaluation Results**

Some reporting complexities are under review in this content area. Several Work Teams report as delivery mechanisms (Master Gardener, Native Plant Masters, for example). Others have overlapping programs and delivery strategies (small acreage/small farms, for example). These overlaps involve evaluation strategies as well as reporting procedures.

### **Key Items of Evaluation**

CSU Extension emphasizes this area with major impact on the quality of our world, integrating research, education, and extension expertise to address contemporary environmental and natural resource problems with new approaches that are economically sound and environmentally advantageous.

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

**Program # 7**

**1. Name of the Planned Program**

Sustainable Community Development

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	0%		40%	
602	Business Management, Finance, and Taxation	5%		0%	
604	Marketing and Distribution Practices	2%		0%	
605	Natural Resource and Environmental Economics	0%		30%	
607	Consumer Economics	1%		0%	
608	Community Resource Planning and Development	22%		20%	
610	Domestic Policy Analysis	5%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	12%		10%	
805	Community Institutions, Health, and Social Services	53%		0%	
<b>Total</b>		100%		100%	

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

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	5.0	0.0	6.0	0.0
Actual	5.5	0.0	5.4	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
99945	0	283966	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
99945	0	283966	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
342751	0	886186	0

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

**1. Brief description of the Activity**

- Internal training for CE personnel in community mobilization, facilitation, economic development.
- Working with rural communities on a regional approach to small town tourism including making optimal use of environmental resources, respecting the socio-cultural authenticity of host communities while conserving their built and living cultural heritage and traditional values, and ensuring viable, long-term economic operations , including stable employment and income-earning opportunities.
  - Conduct basic and applied research in areas exploring the interface between agribusiness, rural development, and natural-resource-amenity-based opportunities.
  - Conduct workshops and other educational activities with community stakeholders.

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

Community members, general public, consumers, community organizations.

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	7500	3000	0	0
<b>Actual</b>	2183	6550	265	0

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	5	10	
<b>Actual</b>	1	25	0

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

**Output Target**

**Output #1**

**Output Measure**

- Training opportunities for community members

<b>Year</b>	<b>Target</b>	<b>Actual</b>
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2009	7	82
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**Output #2****Output Measure**

- Technical publications related to economics, public policy, community development and related areas.

Year	Target	Actual
2009	10	1

**Output #3****Output Measure**

- Amount of grant dollars garnered to support community development research and outreach.

Year	Target	Actual
2009	200000	1053100

**Output #4****Output Measure**

- Number of volunteers engaged in this program of work

Year	Target	Actual
2009	{No Data Entered}	207

**Output #5****Output Measure**

- New technologies adopted by producers

Year	Target	Actual
2009	{No Data Entered}	23

**Output #6****Output Measure**

- Number of community capacity-building activities (Meetings, presentations, committee meetings, needs assessment, etc.)

Year	Target	Actual
2009	{No Data Entered}	60

**Output #7****Output Measure**

- Number of agencies partnering in this work

Year	Target	Actual
2009	{No Data Entered}	26



**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percent of community residents, businesses and leaders who increase their understanding of sustainable community development, tourism and economic development principles.
2	The number of communities which evaluate The potential for sustainable community development, tourism and economic development and prioritize to target specific interests, actions, and valued community resources to maintain and grow.
3	The number of communities which experience increased economic gain from sustainable community development, tourism, and economic development efforts including increased tax revenues, employment, and retention of community valued resources.
4	Planning, development and implementation of bio-based, renewable energy projects (such as processing plan, wind farm).
5	Percent of program participants reporting knowledge gained in relation to clean energy(wind, solar, biomass/biofuel, geothermal/hydropower, homes/community energy
6	Technology Assessment of Animal Waste as a Source of Renewable Energy
7	Percent of participants reporting intent to change behavior, and/or changed behavior as a result of these programs
8	ROI in Community Rural Technical Assistance Program

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

Percent of community residents, businesses and leaders who increase their understanding of sustainable community development, tourism and economic development principles.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	45	66

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Community development is intrinsic in Extension work. As this Core Competency Area changed leadership and direction, new indicators are being determined.

**What has been done**

60 community capacity-building meetings and over 60 trainings, consultations, workshops, etc.

**Results**

66% of participants evaluated reported increasing their knowledge related to one of the following: individuals' roles in community capacity building; built environment community capital development; natural environment capacity building as related to community vibrancy; building community political capacity; and understanding the role of cultural capacity in community development.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

**Outcome #2****1. Outcome Measures**

The number of communities which evaluate The potential for sustainable community development, tourism and economic development and prioritize to target specific interests, actions, and valued community resources to maintain and grow.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	5	42

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
610	Domestic Policy Analysis

**Outcome #3****1. Outcome Measures**

The number of communities which experience increased economic gain from sustainable community development, tourism, and economic development efforts including increased tax revenues, employment, and retention of community valued resources.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	5	1

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Dead wood resulting from pine beetle infestation was underutilized and going to waste.

**What has been done**

Four sessions were convened to review possible uses for the dead wood. A CSU business class was engaged to study options and present recommended business plans for dealing with blue-stained wood.

**Results**

Tree removal funds were secured from the State Forest Service. One logger received \$1 million for tree removal, and saved an estimated 20 jobs in the community during this winter and the coming year.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
610	Domestic Policy Analysis

**Outcome #4****1. Outcome Measures**

Planning, development and implementation of bio-based, renewable energy projects (such as processing plan, wind farm).

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	1	75

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

**Issue (Who cares and Why)**

A knowledge gap exists for people interested in renewable energy and energy efficiency. This gap slows the implementation of energy efficient measures and installation of renewable energy projects.

**What has been done**

training, workshops, Webinars, presentations, consultations, partnering

**Results**

75% of participants reported they gained knowledge about wind, solar, biomass/biofuel, geothermal/hydropower, homes/community energy.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
607	Consumer Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

**Outcome #5**

**1. Outcome Measures**

Percent of program participants reporting knowledge gained in relation to clean energy(wind, solar, biomass/biofuel, geothermal/hydropower, homes/community energy)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	75

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

**Issue (Who cares and Why)**

The renewable energy and energy efficiency industries generate \$102 billion in annual revenue and provide more than 91,000 jobs in Colorado (2007) with potential for these industries to grow six-fold by 2030.

**What has been done**

This Strategic Initiative Team has focused on teaching and training CSU Extension Agents to know answers to the first few questions consumers have about various clean energy technologies. At the same time, information is shared with community members.

**Results**

75% of participants evaluated indicated they had reduced the knowledge gap around renewable energy and energy efficiency. This may increase implementation of energy efficient measures and installations of renewable energy projects. In turn, this will contribute to reducing carbon footprints, global warming, and pollution and help to drive the new energy economy

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
607	Consumer Economics
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

#### Outcome #6

##### 1. Outcome Measures

Technology Assessment of Animal Waste as a Source of Renewable Energy

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

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

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

Anaerobic digestion is a promising technology for conversion of animal waste to methane biogas which can be utilized as a renewable source of energy. Waste generated by typical dairy operations in Colorado has very high solids content and is not suitable for classic anaerobic digestion technologies. Our objective is to develop a two-stage anaerobic digestion process capable of generating methane from dairy and feedlot wastes.

###### What has been done

In-depth feasibility studies for installation of anaerobic digesters were conducted at three dairies in Colorado. Where cattle are kept in barns with concrete floors which are scraped with machinery or flushed with water, installation of anaerobic digestion technology is technically feasible. A web based decision tool has been developed which provides the user with a very simple preliminary feasibility assessment for installation of anaerobic digestion technology based on management practices.

###### Results

Technology providers often misguide producers and convince them that their site is a good fit for anaerobic digestion even when it may not be. We have developed a web-based tool that producers will be able to use to make informed decisions about feasibility at their site, and be more comfortable working with technology providers. Therefore, more animal feeding operations will adopt anaerobic digestion. In addition, tools will be provided to producers so that installations are successful and failures do not occur due to a site being a poor fit for anaerobic digestion. Increased installation of anaerobic digesters in Colorado will result in a new source of

renewable energy, improved waste management, improved water and air quality, and decreased emission of greenhouse gases.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
602	Business Management, Finance, and Taxation

**Outcome #7**

**1. Outcome Measures**

Percent of participants reporting intent to change behavior, and/or changed behavior as a result of these programs

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
608	Community Resource Planning and Development

**Outcome #8**

**1. Outcome Measures**

ROI in Community Rural Technical Assistance Program

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Rural communities often do not have staffing or local skills to design and plan community services. CSU-DOLA Technical Assistance (TA) work helps towns look at possible development of community improvement projects and make preliminary design recommendations that the town can fold into grant and other funding requests.

**What has been done**

Over the five-year study period, CSU-DOLA TA Program expended approximately \$1,389 million to employ the two community development coordinators, pay project expenses, transportation, and other office expenses of the program. Additionally, these funds were directed to a range of non-construction efforts producing projects such as labor, housing, and market studies, on-site consultations, Main Street Resources studies, and a range of community and regional economic surveys and analyses.

**Results**

From 2004 - 2008 the TA Program was able to commit \$1.635 million of program and community matching funds in 77 design/construction projects. This resulted in the construction of over \$57 million projects in the Eastern Colorado service area. For every dollar of community matching funds, \$34 was returned to the community in construction dollars.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

**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 Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

**Brief Explanation**

The Clean Energy Strategic Initiative Team was convened in fall, 2008. In their 18 months of existence, they have documented the need for their work and have engaged team members within Extension, across campus, and from other state agencies and organizations.

**V(I). Planned Program (Evaluation Studies and Data Collection)**



## 1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study

## Evaluation Results

Projects funded by Energy Outreach Colorado and the Governor's Energy Office have evaluation components that will be available as the work is completed. In the first 18 months of the Clean Energy Strategic Initiative Team, most evaluations focused only on knowledge gained which is the first step.

### Key Items of Evaluation

Two team leaders installed photovoltaic (solar) systems on their own homes, as a result of their work with this team. One community installed a wind demonstration project to allow residents to see for themselves what a turbine looks and sounds like, how it interacts with Internet technology, and how it might affect wildlife. Production data streams live on the county Extension Web site so residents can observe how much electricity is generated. The same community contracted for solar heating of the community pool.

Agents and Specialists in this content area are focusing their expertise to contribute to the US President's goal of energy independence.