# 2010 University of Arizona Combined Research and Extension Annual Report of Accomplishments and Results

**Status: Accepted**

**Date Accepted: 06/13/2011**

## I. Report Overview

### 1. Executive Summary

Although continuing budget cuts have reduced our ability to conduct meaningful programs the research and extension programs at the University of Arizona remain strong. In the following we describe some of the accomplishments, particularly those related to federal support dollars.

An integrated pest management program (IPM) established in Arizona in 1996, refined in 2006 and continued through today uses insect growth regulators (IGRs--effective against whiteflies), transgenic cotton (with Bt--Bacillus thuringiensis--effective against pink bollworms), and a reduced-risk feeding inhibitor (effective against Lygus) has reduced pesticide use patterns in Arizona from 1979 through 2010 on cotton for all insects combined--including whiteflies, pink bollworm, Lygus bug and others to a 32-year low. The estimated cumulative savings in control costs and yield (from reduced losses to insects) from 1996 through 2010 was more than $223 million.

Arizona currently leads the country in production per dairy cow, yet heat stress during the warmest months causes decreases in milk yield, increases in disease incidence and also increases in maintenance costs per cow. Studies at the University of Arizona have focused on ways to minimize heat gain and maximize heat loss in dairy cattle to maintain or improve yields, while reducing water and electricity costs. A prototype conduction cooling system with an array of heat exchanger 'panels' installed beneath--rather than above--the cows' bedding area in dairy barns may result in a savings of over 75 percent in electricity costs compared to the traditional overhead electric fan systems and water misting systems that have been the norm in Arizona dairies during the hot months.

Estrous synchronization trials conducted on a range herd in Southern Arizona included 310 cows and 55 heifers. over 80 percent of the cows calved in a three-week period, resulting in a more uniform, marketable calf crop. By having more cows become pregnant at the beginning of the breeding season to artificial insemination, fewer bulls were needed to breed the cow herd, decreasing the producer's cost per pregnancy. Carcass data analyzed to determine genetic improvements of marketed cattle (based on harvest data of steers), showed that cattle from the past year (majority sired by artificial insemination) improved percent choice by 15 to 37 percent. The Choice-Select spread (the premium paid for Choice grade) was $10.50/cwt. Based on a 700- pound carcass, this represents an additional $73.50 per head to the producer.

The financial crisis that hit the United States in 2009 and continued through 2010 has affected numerous sectors of the American economy, including agricultural enterprises. In general, the agricultural industry has always faced price fluctuations, but the rate of change for factors affecting the agricultural economy has accelerated. In 2009, the pioneering webinar series "Ag in Uncertain Times" was launched as a multi-state effort. The "Managing Volatility in Agriculture" webinars offered in 2010 averaged about 75 to 80 people per session. According to post-session surveys, 98.6 percent of the respondents agreed

that this webinar was worth their time and 72.7 agreed that they would likely participate in the next webinar. Eighty-two percent agreed their greatest take home message from the webinar was "a better understanding of the current underlying factors causing the new and/or increased market volatility."

Water quality and availability in the arid West are issues that affect all Arizonans, including youth. Arizona Project WET trains teachers to present water awareness education in K-16 classrooms. in 2010, this project developed 52 new workshops and reached 733 educators who report teaching 30,408 students annually. Results from three successful pilot School Water Audit Program (SWAP) projects indicate a projected water savings at of 7 million gallons from school and home water savings due to installation of water efficient faucet aerators.

Foodborne diseases are a widespread and growing public health problem, both in developed and developing countries. In the United States, for example, around 76 million cases of foodborne diseases, resulting in 325,000 hospitalizations and 5,000 deaths, are estimated to occur each year. Detecting waterborne and foodborne contaminants usually involves collecting a water or food sample, sending it to a laboratory and waiting for the samples to be filtered, incubated, tested and identified under a microscope.

A series of "lab- on-a-chip" (LOC) applications in development at the University of Arizona can identify pathogens in minutes rather than days, using a simple device that delivers results locally. The degree of accuracy is three orders of magnitude greater than for conventional real-time or rapid tests. The method can be used to monitor early spread of pathogens, rather than being used after the outbreaks, thus potentially saving lives and money.

Osteoporosis -a silent disease that causes porous bones that break easily--is both treatable and preventable. Yet it is the number 1 crippler of women. One in 2 women and one in 5 men will have osteoporosis fractures in their lifetime. The Bone Builders program teaches women of all ages, young adolescent girls, and older men in Arizona. Over the past twelve years (1998-2010) Bone Builders staff and volunteers have taught 2,192 classes to 45,000 participants and reached 131,375 people at 687 health fairs to change their dietary and exercise habits to reduce the risks of osteoporosis and improve bone health.

Most people are familiar with Salmonella and its potential to make people ill. But few know about Campylobacter jejuni, even though it competes yearly with Salmonella in making people sick. Campylobacter is one of the main causes of bacterial foodborne disease in the United States and worldwide. Raw chicken is one of the most common carriers of the bacteria. A new poultry vaccine using an attenuated strain of Salmonella to express Campylobacter proteins in chick intestines has been developed. the vaccine has significantly reduced the pathogen's ability to colonize young chickens' intestines. Preliminary studies indicate that Campylobacter infection was reduced by 99.9 percent compared with a control group.

Finally, the College has filed 17 patent applications and 2 patents were issued during the past year.

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 46.0 | 0.0 | 100.0 | 0.0 |
| Actual | 44.0 | 0.0 | 98.0 | 0.0 |

## II. Merit Review Process

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

- ☑ Internal University Panel
- ☐ External University Panel
- ☐ External Non-University Panel
- ☑ Combined External and Internal University Panel
- ☐ Combined External and Internal University External Non-University Panel
- ☐ Expert Peer Review
- ☐ Other

### 2. Brief Explanation

All new proposed Hatch projects are reviewed by an ad hoc review panel of 3 qualified faculty with no conflicts of interest. All renewal projects are reviewed by a panel of 2 similarly qualified faculty. The Associate Director oversees this process and ensures that any suggested changes are made to the satisfaction of the reviewers and the Associate Director. External review of programs and projects is obtained from County Extension Advisory Boards established under Arizona state law and from Agricultural Center Advisory Boards who meet on a regular basis.

## 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 of the general public
- ☐ Survey specifically with non-traditional groups
- ☐ Survey specifically with non-traditional individuals
- ☐ Survey of selected individuals from the general public
- ☐ Other

**Brief explanation.**

A major rewrite of the College's Strategic Plan that covers the research, extension and academic programs of the College was completed last year. This effort involved review and comment by all faculty and staff, all advisory boards, major commodity organizations and selected stakeholders across the state. The major input this year was obtained from our advisory boards and meetings with major commodity organizations.

**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
- ☑ Needs Assessments
- ☐ Use Surveys
- ☐ Other

**Brief explanation.**

Over 100 county advisory board members provide input and priorities to county programs on an annual basis. Input for the research program is provided by advisory boards for our outlying Agricultural Centers. These groups plus numerous meetings with commodity organizations provide input annually for both Extension and Research programs.

**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 with the general public (open meeting advertised to all)
- ☐ Survey of the general public
- ☐ Meeting specifically with non-traditional groups
- ☐ Survey specifically with non-traditional groups
- ☐ Meeting specifically with non-traditional individuals
- ☐ Survey specifically with non-traditional individuals
- ☑ Meeting with invited selected individuals from the general public
- ☑ Survey of selected individuals from the general public
- ☐ Other

**Brief explanation.**

This is normally done by meeting with the stakeholder groups or providing them with written materials for their review and input.

**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
- ☐ Other

**Brief explanation.**

Input received from a variety of sources is considered when developing annual plans.

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

Stakeholders are very concerned about the federal debt, the national and world economy, and the decided lack of federal and state support for agricultural research and extension programs.

## IV. Expenditure Summary

| 1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS) | | | |
|---|---|---|---|
| Extension | | Research | |
| Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| 1943949 | 0 | 2230471 | 0 |

| 2. Totaled Actual dollars from Planned Programs Inputs | | | | |
|---|---|---|---|---|
| | Extension | | Research | |
| | Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| Actual Formula | 1068307 | 0 | 431488 | 0 |
| Actual Matching | 3455192 | 0 | 1867514 | 0 |
| Actual All Other | 0 | 0 | 0 | 0 |
| Total Actual Expended | 4523499 | 0 | 2299002 | 0 |

| 3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous | | | | |
|---|---|---|---|---|
| Carryover | 458474 | 0 | 4314880 | 0 |

# V. Planned Program Table of Content


| S. No. | PROGRAM NAME |
|---|---|
| 1 | ENVIRONMENT, WATER, LAND AND NATURAL RESOURCES |
| 2 | PLANT SCIENCES |
| 3 | ANIMAL SCIENCES |
| 4 | MARKETING TRADE AND ECONOMICS |
| 5 | FAMILY, YOUTH, AND COMMUNITY |
| 6 | HUMAN NUTRITION, HEALTH AND FOOD SAFETY |


**Add previously unplanned program**

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

**Program # 1**

**1. Name of the Planned Program**

ENVIRONMENT, WATER, LAND AND NATURAL RESOURCES

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

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships | 35% | | 44% | |
| 111 | Conservation and Efficient Use of Water | 30% | | 25% | |
| 112 | Watershed Protection and Management | 15% | | 10% | |
| 121 | Management of Range Resources | 20% | | 21% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 11.0 | 0.0 | 21.0 | 0.0 |
| Actual | 10.0 | 0.0 | 22.0 | 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 |
| 545636 | 0 | 77041 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 1688825 | 0 | 585080 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

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

**1. Brief description of the Activity**

**Issue**

Water quality and availability in the arid West are issues that affect all Arizonans, including youth. By training teachers to present water awareness education in K-16 classrooms, Arizona Project WET (APW; "WET" stands for "Water Education for Teachers"), administered through the University of Arizona's Water Resources Research Center, assists in building water-related decision making skills in both students and adults. APW is recognized as the only comprehensive water education program for K-16 audiences with a statewide partnership and delivery system. APW programming also assists city water conservation staff in meeting Groundwater Management Act requirements and helps private water company staff in meeting Corporation Commission best management practices. The APW Advisory Council, consisting of water and education specialists from across the state, guides program promotion and long-term sustainability planning.

**What has been done?**

Water education curricula are developed and administered by water resource specialists working together with teachers--all curricula meet state academic standards. In addition to curriculum guides, other teaching tools include drinking water and stream water testing kits, macroinvertebrate sampling kits, watershed models, groundwater flow models and history trunks. A new teaching support center is available online to supplement lessons, and APW has an active blog and Facebook page. In 2010, 52 newly developed workshops reached 733 educators who report teaching 30,408 students annually. APW staff and facilitators conducted these workshops logging 465 hours of face time. Workshops varied in content depending on the needs of various communities and groups. In response to a needs assessment for the Phoenix area, APW teamed with Arizona State University's Global Institute of Sustainability for the fifth year in a row to deliver a two-day Advanced Water Educators' workshop: Water and Agriculture. Seven experts from UA, ASU and the Phoenix community presented. The workshop engaged 22 educators who report reaching 2,357 students annually. Another workshop involved 46 K-3 teachers who were part of the Biosphere 2 STEM (Science, Technology, Engineering and Mathematics) Academy. These teachers will reach 1,864 students annually with locally relevant STEM education. Also, a Northern Arizona University workshop taught 36 pre-service teachers how to teach relevant water topics through interactive APW lessons.

**Impact**

Survey data shows that 97 percent of the teachers participating in the statewide workshops strongly agreed or agreed that "the resource materials provided will be helpful for teaching about water & environment," 96 percent agreed "the information, strategies and instructional methods presented during the workshop were helpful to me; 93 percent "intend to become a better water steward as a result of an APW workshop," and 94 percent said "the workshop activities were relevant and improved my knowledge." In the Advanced Educator Workshop on Energy and Water, 100 percent of the participants strongly agreed with the statements "The workshop was excellent--one of the best I've ever attended; and "I have a better understanding of the relationship between water and agriculture." After the Biosphere 2 STEM Academy for K-3 Teachers, 100 percent of the participants agreed or strongly agreed that "the workshop activities were relevant and improved my knowledge" and "the workshop met my expectations and will have an impact on my teaching. Ninety-eight percent thought it was excellent--the best workshop they'd ever attended.

At a teacher workshop in Phoenix, comments included, "This workshop answered questions about all you wanted to know about water but were afraid to ask" and "this curriculum has changed the disenfranchised culture of our school to one of empowered stewardship!"' In Tucson , a RinseSmart program taught in schools has replaced 667 pre-rinse spray valves which will save an estimated

37,055,160 gallons per year in the Tucson service area.

**Issue**

Prolonged drought has reduced water resources in Arizona, making water sustainability a critical issue for all generations. Arizona Project WET (Water Education for Teachers) aims to deepen young students' understanding of water as an essential resource that connects all earth systems, thus helping them to become better water stewards themselves and emissaries of wise water use in Arizona communities

**What has been done?**

Arizona Water Festivals use structured Arizona Project WET lessons that meet 4th grade water education standards, covering the water cycle, value of water and conservation, watersheds, and the ground water system. Nine water festivals were held in 2010 in Nogales, Casa Grande, Apache Junction, Verde Valley, Payson, Tucson, Yuma, Flagstaff and Chandler, serving 5,130 students, 175 teachers and 177 parents. Arizona Water Festivals are a collaboration success story and the number of students served grows each year. Specialized volunteer training around the state reached 451 volunteers and an additional 79 student volunteers who learned valuable water content as well.

**Impact**

The Arizona Project WET Water Festival program has grown from reaching 300 students in 2000 to reaching several thousand in succeeding years: 6,289 in 2006; 4,121 in 2007; 5,103 in 2008; 4,877 in 2009; and 5,130 in 2010. The Arizona Department of Environmental Quality, Salt River Project and Central Arizona Project became strong proponents of the program in 2001 and remain so today. Since 2000, the Arizona Water Festival program has served 43,118 young Arizonans in 21 Arizona communities--youth who are caring for watersheds, conserving water and sharing this knowledge with their friends and families. A total of 1,647 teachers have worked with their students to enhance the learning experience of the Water Festival by carrying the learning goals into the classroom. This model creates a learning community where teachers and students alike are motivated to learn about water and to work together to protect Arizona's water future. Hundreds of volunteers trained over the years to deliver effective water education have increased their own water literacy and are now more able to talk about water issues with friends and colleagues throughout the community. In 2010, volunteers provided 3,034 service hours delivering the festivals, a contribution valued at $63,259 (using Independent Sector value of $20.25). One hundred percent of all volunteers surveyed in 2010 said their time was well spent; 98 percent reported they would volunteer again.

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

Natural resouce managers, Governor's Office and state agencies, municipal organizations and leaders, households, consumers, youth, master gardening and master watershed programs

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

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 15000 | 20000 | 6000 | 500 |
| **Actual** | 15000 | 22000 | 5000 | 550 |

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

**Patent Applications Submitted**

Year: 2010
Plan: 1
Actual: 1

**Patents listed**
Aquaculture raceway Integrated Design

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Plan** | 20 | 60 | |
| **Actual** | 20 | 60 | 80 |

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

**Output Target**

**Output #1**

**Output Measure**

- Effectiveness of the research program will be used to reach direct and indirect contacts

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 3 | 3 |

**Output #2**

**Output Measure**

- Number of individuals participating in educational programs

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 15000 | 17500 |

**Output #3**

**Output Measure**

- Number of individuals adopting new technology

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 1000 | 800 |

## V(G). State Defined Outcomes

# V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Effectiveness of research programs will be based on publications, external grant support, and integration into existing extension programs |
| 2 | Number of individuals gaining knowledge by participating in educational programs |
| 3 | Volunteers completing Master Gardening training |
| 4 | Create awareness and increase knowledge |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

**Outcome #1**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Effectiveness of research programs will be based on publications, external grant support, and integration into existing extension programs

**2. Associated Institution Types**

☐ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 35 | 0 |

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

**Issue (Who cares and Why)**
All participants in the research and extension programs and the respective clientele for these programs care.

**What has been done**
Arizona has a fully integrated research and extension program and all faculty strongly pursue competitive grants.

**Results**
More than $1 million dollars in non USDA grants were obtained to support this program.

**4. Associated Knowledge Areas**

☑ 102 - Soil, Plant, Water, Nutrient Relationships
☑ 111 - Conservation and Efficient Use of Water
☑ 112 - Watershed Protection and Management
☑ 121 - Management of Range Resources

**Outcome #2**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Number of individuals gaining knowledge by participating in educational programs

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

◉ Change in Knowledge Outcome Measure
◯ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 10000 | 8000 |

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

**Issue (Who cares and Why)**
Water is always a critical issue in the desert southwest

**What has been done**
Intensive educational programs have been delivered to schools and the general public

**Results**
Awareness of the need to conserve and reuse water has increased significantly

**4. Associated Knowledge Areas**

☐ 102 - Soil, Plant, Water, Nutrient Relationships
☑ 111 - Conservation and Efficient Use of Water
☑ 112 - Watershed Protection and Management
☐ 121 - Management of Range Resources

**Outcome #3**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Volunteers completing Master Gardening training

**2. Associated Institution Types**

☑ 1862 Extension
☐ 1862 Research

**3a. Outcome Type:**

◉ Change in Knowledge Outcome Measure
◯ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 350 | 400 |

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

**Issue (Who cares and Why)**
The Master Gardner program is an important component of our Cooperative Extension program.

**What has been done**
4864 volunteers completed Master Gardner training.

**Results**
The Master Gardner's provided over 80,000 volunteer hours which has a value at $21/hour of over $1.6 million dollars.

**4. Associated Knowledge Areas**

☑ 102 - Soil, Plant, Water, Nutrient Relationships
☑ 111 - Conservation and Efficient Use of Water
☑ 112 - Watershed Protection and Management
☑ 121 - Management of Range Resources

## Outcome #4

### 1. Outcome Measures

☐ Not Reporting on this Outcome Measure

Create awareness and increase knowledge

### 2. Associated Institution Types

☑ 1862 Extension
☐ 1862 Research

### 3a. Outcome Type:

◯ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 8000 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
All recipients of our programs care about increasing their knowledge.

**What has been done**
Materials were distributed to more than 200,000 adults and youth in the state.

**Results**
Seventy percent of the recipients indicated a change in behavior resulting from the programs and materials.

### 4. Associated Knowledge Areas

☑ 102 - Soil, Plant, Water, Nutrient Relationships
☑ 111 - Conservation and Efficient Use of Water
☑ 112 - Watershed Protection and Management
☑ 121 - Management of Range Resources

## 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.)
- ☐ Other

### Brief Explanation

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

### (OPTIONAL SECTION)

### 1. Evaluation Studies Planned

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study
- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

### Evaluation Results

### Key Items of Evaluation

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

**Program # 2**

**1. Name of the Planned Program**

PLANT SCIENCES

### 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 | 15% | | 25% | |
| 205 | Plant Management Systems | 8% | | 0% | |
| 206 | Basic Plant Biology | 8% | | 26% | |
| 211 | Insects, Mites, and Other Arthropods Affecting Plants | 47% | | 32% | |
| 212 | Pathogens and Nematodes Affecting Plants | 18% | | 14% | |
| 215 | Biological Control of Pests Affecting Plants | 4% | | 3% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 8.0 | 0.0 | 30.0 | 0.0 |
| Actual | 8.0 | 0.0 | 29.0 | 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 |
| 227127 | 0 | 130881 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 443448 | 0 | 587013 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

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

### 1. Brief description of the Activity

#### Issue

Properly tailored weather information can assist with important management decisions related to variety selection, planting dates, crop assessment, pest control, irrigation and harvest, particularly during times of prolonged drought. The Arizona Meteorological Network (AZMET) was developed in 1987 to provide weather data and information in near real time to the state's producers of agricultural and horticultural crops.

#### What has been done?

The AZMET network of 29 automated weather stations located across Arizona supplies meteorological data (air and soil temperature, humidity, solar radiation, wind speed and direction, and precipitation) from important agricultural production areas and selected urban locations. Data obtained by the stations are transferred to a Tucson-based data processing center nightly, where computers process the data into a variety of informational formats to assist in decision making. AZMET data and reports are available to the public free of charge via three Web pages.

AZMET data provide reliable information on heat unit accumulation, used to monitor general crop development, to time planting and harvest dates for melons, sweet corn and other horticultural crops, and to predict pest development. For example, the AZMET Southeast Arizona Crop Water Use Advisory provides corn, forage, chile and nut growers in Cochise and Graham counties with information on weather, water requirements and crop development. For cotton, AZMET generates weekly updates on heat unit accumulation, crop water use and current and projected weather conditions. The updates are distributed to nearly 500 growers each week as part of the Cotton Advisory Program. AZMET also provides daily updates on heat stress, which can significantly reduce cotton fruit retention and yield.

AZMET data on evapotranspiration (ET) are used to estimate the water use of vegetation, including field crops and turf. AZMET generates daily turf water use reports for the Phoenix area and distributes this information to the public via a turf water management web page and email; turf industry professionals may also receive this information via email daily. AZMET also generates a lawn watering guide published daily in major and regional newspapers in the Phoenix metropolitan area. AZMET's turf water management program includes weather stations in the low desert, and also in Prescott and Payson. A Web site offers information on landscape irrigation to residents of northern Arizona. AZMET provides reference ET data to the Bureau of Reclamation for use in the Lower Colorado River Accounting System (LCRAS). LCRAS represents a new and improved means of assessing water use along this portion of the Colorado River.

#### Impact

AZMET is widely accepted as an important (and often the only) source of meteorological information pertaining to the production of agricultural and horticultural crops in Arizona. Demand for AZMET information remains high based on hits, sessions and data downloaded. Users accessed AZMET web pages 1,638,000 times in 2010, and the total number of user sessions equaled 267,000 or 732 per day. The length of user sessions averaged about 10 minutes, while data transferred from AZMET's websites totaled 344 gigabytes. Phone calls, emails and face-to-face contacts indicate AZMET is viewed as a reliable source of meteorological data/information by a diverse clientele base. Demand for new weather stations remains high among rural clientele.

Of particular importance are the evapotranspiration (ET) data generated for irrigation management and for the Integrated Cotton Management Program (ICMP). Urban programs that utilize ET data include the web-based Phoenix and Tucson area turf water use reports, accessed 9,600 times in 2010 and the

Northern Arizona Turf Water Use Webpage, accessed 4, 323 times. Rural programs using ET include the Southeast Arizona Crop Water Use Report, accessed 1,468 times; cotton water use estimates, generated as part of the ICMP's weekly distribution of planting date and crop development advisories for 15 locations throughout southern and western Arizona, accessed more than 16,000 times; and the 20,000+ acres of farmland now irrigated using ET-based scheduling systems. The ICMP also uses AZMET data for online heat stress advisories that allow growers to monitor the impact of heat stress on boll retention. The heat stress reports were accessed approximately 10,800 times during the summer of 2010.

**Issue**

During the mid-90s, insecticide applications in cotton typically accounted for about half of all insecticide use in the United States. In 1995, nearly 100 percent of Arizona's cotton acreage was sprayed multiple times for pink bollworm Lygus bug and silverleaf whitefly. New technologies have enabled cotton growers to reduce their spray applications significantly while achieving among highest cotton yields worldwide. Behind only California and Australia, Arizona now produces the highest-yielding cotton in the world, nearly 1,500 pounds of fiber per acre, far exceeding the U.S. national average of about 800 pounds per acre. These technologies also help growers implement more ecologically-based, sustainable IPM programs and become less dependent on broadly toxic insecticides.

**What has been done**

An integrated pest management program (IPM) established in Arizona in 1996, refined in 2006 and continued through today uses insect growth regulators (IGRs--effective against whiteflies), transgenic cotton (with Bt--Bacillus thuringiensis--effective against pink bollworms), and a reduced-risk feeding inhibitor (effective against Lygus bugs.) Safe for humans, these tools kill only their target pests, allowing natural processes to play a larger role in the management of all other pest insects. Growers have been taught to deploy fully selective materials first and whenever possible. The UA College of Agriculture and Life Sciences initiated the program in collaboration with growers, USDA, Arizona Department of Agriculture, Arizona Cotton Growers' Association, Cotton Incorporated, Arizona Cotton Research & Protection Council, industry and others.

**Impact**

The fully implemented, collaborative cotton IPM program has registered significant gains since its inception in 1996:

· Statewide averages for cotton insecticide use patterns in Arizona from 1979 through 2010 show that insecticide use on cotton for all insects combined--including whiteflies, pink bollworm, Lygus bug and others reached a 32-year low over the last 5 years, while also reducing costs to all-time lows. The estimated cumulative savings in control costs and yield (from reduced losses to insects) from 1996 through 2010 was more than $223 million.

· Growers applied 4.15 pounds of active insecticide ingredient per acre of cotton in 1995. In 2009 and also in 2010 the amount of active ingredient applied per acre was reduced by 3.66 pounds, or 88.3 percent, to just 0.48 pounds per acre. This is the equivalent of applying less than a can of soda on an area the size of a football field just once over the cotton season (March to October).

· The last 5 years have shown the lowest insecticide use in cotton on record (32 years), at just 1.5 sprays season-long, reducing insecticide loads on the environment by more than 1.6 million pounds of active ingredient annually and saving growers over $10 million annually in combined control costs and yield savings.

· Compared to 10 years ago, the types of insecticides used now are much safer, with high selectivity and safety for beneficial insect populations. Specifically, there has been a 95 percent reduction in organophosphate use, comparing the last 5 years to an all-time high in 1995; a 98 percent reduction in pyrethroids; 80 percent reduction in endosulfan; and 92 percent reduction in carbamates; with an 85 percent reduction overall in cotton insecticide use. By 2010, 88 percent of all cotton insecticides used were either fully (61 percent) or partially (27 percent) selective, meaning they are safer to use and safer for the natural enemies in the cotton system. The total number of sprays applied in cotton has been reduced by 85 percent.

· For Lygus control, the percentage of cotton growers choosing reduced-risk insecticides over standard broad-spectrum options increased from 0 percent in 2005, 52 percent in 2007 and 75 percent in 2008 to 81 percent in 2009, the most recent year measured. One grower reported adopting this feeding inhibitor on 1,200 acres, resulting in 0 percent loss to Lygus in 2007 and again in 2010.

· For the first time in over 40 years, Arizona cotton growers did not apply a single spray against pink bollworm in the years 2008 through 2010. Through statewide grower-coordinated strategic uses of Bt cotton, sterile moth releases and pheromones, farmers are close to eradicating this pest from our borders.

· The percentage of cotton acres never sprayed for insects in 2010 was 29.3 percent, the highest level ever measured. Overall, cotton acreage in Arizona is expanding, from 150,000 acres in 2009, to 201,000 in 2010, and close to 250,000 acres in 2011 (projected), indicating a health in the industry that can be attributed at least in part to higher yields and lower pest control costs.

· The cotton IPM plans developed in Arizona have been exported for use in California, Texas, northern Mexico, Australia and Latin America.

**Issue**

The powdered roots and/or extracts derived from roots of the winter cherry plant--Withania somnifera (L.) Dunal--have been used for more than 3,000 years in India as a general tonic to build stamina, improve mental concentration, relieve stress and enhance health. Commonly known as "ashwagandha" in Ayurvedic medicine, scientific tests on the preparation have shown that it has anti-inflammatory, cardio-protective, antioxidant and antitumor properties, among others. Withania is widely cultivated for commercial use in its native India, and also in the Middle East and in North America. Ashwagandha is sold as a dietary supplement in the United States and Europe. The compound withaferin A, scientifically studied since the 1960s, seems to play the largest role in the plant's anticancer effects by reducing tumor mass and preventing the growth of blood vessels that make a tumor malignant. It also shows promise in treating Alzheimer's and Parkinson's diseases.

**What has been done**

University of Arizona scientists at the Southwest Center for Natural Products Research and Commercialization (or Natural Products Center), in collaboration with the Whitehead Institute at the Massachusetts Institute of Technology, have discovered a second form of withaferin that has identical functions in a less potent, slower-acting form that might be used as a "prodrug," or drug precursor in the pharmaceutical industry. The UA team used an entirely nontraditional method--aeroponics--to produce bulk amounts of withaferin A needed for biological evaluation. In aeroponics, plants are set over enclosed chambers where their suspended roots are misted with water and nutrients, instead of growing in soil. The UA College of Agriculture and Life Sciences provided funding for the project, along with the USDA.

Similarly, in a collaborative project with Nuvogen Research, a small Tucson-based company, a lead compound isolated from the Natural Products Center's library of extracts from Sonoran Desert plants has shown activity against prostate cancer. A provisional patent application has been filed for this discovery and the compound, called PCa (prostate cancer a), is currently being tested in animal models. The arid land plant containing this compound is rare and difficult to cultivate, however Natural Products Center scientists have been able to grow this plant in the greenhouse using the same innovative aeroponic technology as described for winter cherry. They are obtaining the promising compound in large quantities, toward the goal of yielding enough of the compound required for preclinical and clinical evaluation.

Withaferin A and PCa are just two of hundreds of such compounds the Natural Products Center has isolated, characterized and evaluated since its inception in 1996. The center searches for compounds in desert plants and their associated microorganisms that can improve human health and also be developed as potential industrial products in Arizona. The work focuses on economical methods for producing and structurally diversifying natural products from plants; natural products make up 60 percent of the anticancer agents that are commercially available or are in late stage clinical development.

**Impact**

Using the aeroponic system for cultivation yielded Withania plants with five times the biomass produced in soil-grown plants. The nontraditional method produced more than 20 grams of the active ingredient withaferin A in a single greenhouse operation in Tucson. Withaferin A normally costs about $195 for just 10 milligrams, thus the potential value of the test crop was about $390,000. And although Withania usually takes two to three years to mature to sizeable roots to be commercially viable, it took just six to nine months in this study.

Not only did the aeroponic method yield bigger plants faster, with more withaferin A than usual, it also unexpectedly stimulated the plants to produce large amounts of a new natural product--a water soluble sulfate form of withaferin A. Upon testing, this new form demonstrated the same bioactivity as withaferin A. The researchers found it was able to inhibit the proliferation and survival of tumor cells, disrupt tumor formation and induce the healthy cells' heat-shock response to reduce stress and increase survival. The difference is that the sulfate form of withaferin A is slower acting and water soluble, and can be converted to withaferin A in cell culture media. The researchers, expecting that this withaferin A analog will convert to its active form when metabolized in the body, are pursuing further testing in animal models. The patent will be held by the UA and MIT.

The work on the compound active against prostate cancer focuses on late stage Hormone Refractory Disease (HRD), for which no effective therapies currently exist. This stage kills more than 20,000 men per year in the United States alone. In addition to the potential for saving and/or prolonging thousands of lives, the direct target, a substance called PCa (prostate cancer a), represents a large market--greater than $3 billion--that remains focused on hormone ablation therapy. Many companies are active in this area and will be potential partners for commercial development.

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

Commodity groups, state agencies, pest management advisors, pesticide applicators, youth, ag ventures program.

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

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 17000 | 30000 | 5000 | 1000 |
| **Actual** | 18000 | 28000 | 5500 | 1300 |

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

**Patent Applications Submitted**

Year: 2010
Plan: 2
Actual: 3

**Patents listed**
Proteins and DNA Related to Salt Tolerance in Plants
Geraniol Synthase, Methods of Production and Uses Thereof

Pollen Tube Stimulants from Arabidopsis Pistils

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Plan** | 16 | 90 | |
| **Actual** | 16 | 90 | 106 |

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

**Output Target**

**Output #1**

**Output Measure**

- Number of individuals participating in educational programs

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 17000 | 14500 |

**Output #2**

**Output Measure**

- Number of research projects conducted on all aspects of Plant Sciences

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|

| | | |
|---|---|---|
| 2010 | 60 | 65 |

## V(G). State Defined Outcomes

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Adoption of better management practices for crop production |
| 2 | Adoption of alternative crop technologies |
| 3 | Adoption of more cost effective means for controlling plant diseases and insect damage |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

**Outcome #1**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Adoption of better management practices for crop production

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 200 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

☑ 201 - Plant Genome, Genetics, and Genetic Mechanisms
☑ 205 - Plant Management Systems
☑ 206 - Basic Plant Biology
☑ 211 - Insects, Mites, and Other Arthropods Affecting Plants
☑ 212 - Pathogens and Nematodes Affecting Plants
☑ 215 - Biological Control of Pests Affecting Plants

**Outcome #2**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Adoption of alternative crop technologies

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 150 | 250 |

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

**Issue (Who cares and Why)**

Control of Pink Bollworm in Cotton plants

**What has been done**
Adoption of BT Cotton

**Results**
More than 95% of cotton farmers in AZ have adopted BT cotton. This resulted from the availability of the genetic material and demonstration by the University of AZ that this technology is effective and economical.

**4. Associated Knowledge Areas**

☑ 201 - Plant Genome, Genetics, and Genetic Mechanisms
☑ 205 - Plant Management Systems
☑ 206 - Basic Plant Biology
☑ 211 - Insects, Mites, and Other Arthropods Affecting Plants
☐ 212 - Pathogens and Nematodes Affecting Plants
☑ 215 - Biological Control of Pests Affecting Plants

**Outcome #3**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Adoption of more cost effective means for controlling plant diseases and insect damage

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

◯ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 1000 | 1200 |

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

**Issue (Who cares and Why)**
Major insect damage to crops in Arizona costing significant dollars and utilizing major amounts of pesticides.

**What has been done**
An integrated pest management program (IPM) established in Arizona in 1996, refined in 2006 and continued through today uses insect growth regulators (IGRs?effective against whiteflies), transgenic cotton (with Bt?Bacillus thuringiensis?effective against pink bollworms), and a reduced-risk feeding inhibitor (effective against Lygus bugs.)

**Results**
Statewide averages for cotton insecticide use patterns in Arizona from 1979 through 2010 show that insecticide use on cotton for all insects combined?including whiteflies, pink bollworm, Lygus bug and others reached a 32-year low over the last 5 years, while also reducing costs to all-time lows. The estimated cumulative savings in control costs and yield (from reduced losses to insects) from 1996 through 2010 was more than $223 million.

Growers applied 4.15 pounds of active insecticide ingredient per acre of cotton in 1995. In 2009 and also in 2010 the amount of active ingredient applied per acre was reduced by 3.66 pounds, or 88.3 percent, to just 0.48 pounds per acre. This is the equivalent of applying less than a can of soda on an area the size of a football field just once over the cotton season (March to October).

**4. Associated Knowledge Areas**

- ☐ 201 - Plant Genome, Genetics, and Genetic Mechanisms
- ☑ 205 - Plant Management Systems
- ☐ 206 - Basic Plant Biology
- ☑ 211 - Insects, Mites, and Other Arthropods Affecting Plants
- ☑ 212 - Pathogens and Nematodes Affecting Plants
- ☑ 215 - Biological Control of Pests Affecting Plants

**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.)
- ☐ Other

**Brief Explanation**

There is little that can be done to effect the above external factors.

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

**(OPTIONAL SECTION)**

**1. Evaluation Studies Planned**

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study
- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

## Evaluation Results

## Key Items of Evaluation

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

**Program # 3**

**1. Name of the Planned Program**

ANIMAL SCIENCES

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

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 301 | Reproductive Performance of Animals | 5% | | 2% | |
| 302 | Nutrient Utilization in Animals | 15% | | 9% | |
| 305 | Animal Physiological Processes | 5% | | 19% | |
| 306 | Environmental Stress in Animals | 25% | | 16% | |
| 311 | Animal Diseases | 50% | | 54% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 2.0 | 0.0 | 20.0 | 0.0 |
| Actual | 2.0 | 0.0 | 15.0 | 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** |
| 13506 | 0 | 149828 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 325439 | 0 | 356507 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

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

## 1. Brief description of the Activity

### Issue

Arizona currently leads the country in production per dairy cow, yet heat stress during the warmest months causes decreases in milk yield, increases in disease incidence and also increases in maintenance costs per cow. Research has shown that compared to winder months, dairy cows in Arizona produced 8.8 pounds less milk per cow per day during the summer months. At the same time, on-farm milk production has the greatest opportunity to affect the carbon footprint of a gallon of milk because dairy operations represent 80 to 95 percent of the dairy industry's carbon footprint, and 75 percent of its electricity and fuel use. Studies at the William Parker Agricultural Research Complex, part of the University of Arizona College of Agriculture and Life Sciences, have focused on ways to minimize heat gain and maximize heat loss in dairy cattle to maintain or improve yields, while reducing water and electricity costs.

### What has been done

In contrast to the traditional overhead electric fan systems and water misting systems that have been the norm in Arizona dairies during the hot months, UA scientists are testing a prototype conduction cooling system with an array of heat exchanger 'panels' installed beneath--rather than above--the cows' bedding area in dairy barns. As well water passes through the flexible polymer-based heat exchangers, the colder temperature of the water cools the cows via conduction by transferring heat from a warm source--the cow--to a colder source--the heat exchanger-cooled bedding material installed above the panels with the colder water flowing through them.

Phase one proof-of-concept testing on the heat exchanger cooling system was conducted June 14-23, 2010 at the UA's Agricultural Research Complex in Tucson, under the supervision of the Animal Sciences Department, followed by a commercial scale test at a 3,600-cow dairy located in Tulare, California from September 1-30, 2010. The study was funded by the Tulare Irrigation District, with the construction of the cooling arrays carried out by Ariaire, Inc., of Mesa, Arizona. The veterinary staff of the University of California, Davis and faculty from the UA Department of Animal Sciences supervised the study.

There is an approximate differential of 30 to 35 degrees Fahrenheit between the internal temperature of the cow (about 101.5 degrees F) and the temperature of the well water (about 65 degrees F) flowing through the heat exchanger panels. The target temperature range for the cow is 100 to 103 degrees F, which the test system was able to achieve until the air temperature exceeded 90 degrees Fahrenheit.

### Impact

By using conduction cooling alone to cool cows up to 90 degrees F, this same 3,600-cow dairy using 180 fans at 1.2 kilowatt hours per fan and paying $.09 per kilowatt hour would save a projected $26,500 for the summer in energy costs to cool cows--a savings of over 75 percent in electricity costs. The investigators believe that if the water had been chilled by a commercial chiller the electrical costs savings still would have been substantial, and there would have been additional milk yield benefits. Researchers in the UA Department of Animal Sciences and the Department of Agricultural and Biosystems Engineering are collaborating to develop models of cooling systems that could run successfully with different water and air temperatures. Further studies using conduction cooling systems are underway in Arizona, California and Texas in 2011-2012.

**Issue**

Range livestock production is a significant part of the economic base in southeastern Arizona, which includes Santa Cruz, Cochise, and Graham and Greenlee counties. Approximately 17 percent of the range beef cattle in the state are located in the four-county area (down from 24 in 2008) with a value in 2009 of $128,061,000, which is 50 percent less than the previous year (2009 Arizona Agricultural Statistics Bulletin). The rangelands where these livestock are raised are some of the most productive in the state. They not only support livestock grazing, but a variety of multiple uses. The intermingled ownership of federal, state and private lands creates a need to balance livestock grazing with natural resources. This is especially important as livestock producers have been managing herds in drought conditions for the last 13 years. Three rangeland/livestock focus groups were held for Cochise/Santa Cruz, Graham and Greenlee Counties in 2008. The groups consisted of agency personnel, extension agents, campus specialists, and ranchers who met to prioritize local needs for a three year period. Range monitoring, improvement in agency/rancher relations, Coordinated Resource Management (CRM) and livestock production issues were top priorities in all three meetings. Feedback on needs is also gathered at the end of workshops.

**What has been done**

The range livestock program strategy supports research, education and extension efforts to improve understanding of animal reproduction, nutrition, genetics and physiology for improved efficiency, performance, health and well-being of animals. The program seeks to optimize resource use while delivering environmental benefits. Examples of activities include livestock nutrition workshops, rangeland monitoring, alternative energy for ranchers, grazing trials, estrous synchronization trials, marketing, investigating suspicious livestock losses, talks for small acreage landowners, and others.

During 2010 four educational workshops/trainings were conducted covering rangeland and livestock management topics in southeastern Arizona. The workshop topics and presentations were developed as team efforts with various agencies, university agents and specialists. Topics included Southeast Arizona Rancher Day, 57 participants.; Trich Testing and Body Condition Scoring Workshop, 23 participants; Safford US Forest Service (USFS) and Bureau of Land Management (BLM) Permittee meeting, 21 participants; and Range Livestock Nutrition School, 37 participants. As part of the Rangeland Monitoring & Inventory Program, 50 sites on 21 BLM allotments and 52 sites on 16 USFS allotments were monitored. Monitoring reports were prepared for each allotment and given to agencies and ranchers. Other monitoring was conducted on an additional three allotments. Program updates were provided to the Greenlee and Cochise-Graham Cattlegrowers' Associations at their annual meetings. Two major Coordinated Resource Management efforts continued on two ranches, facilitating interagency meetings and field inventory and monitoring.

**Impact**

The four workshops held in 2010 (mentioned above) averaged a rating of 4.6 (80 evaluations turned in). All workshop ratings are on a scale of 1 being not valuable to 5 being very valuable. Eighty-eight percent of participants were able to list two key concepts taught at the workshop. Seventy-four percent of participants listed at least one specific new management practice that they intend to implement in the next two years. Thirty-three percent of ranchers were actively engaged in the monitoring of their allotment.

**Issue**

Most people are familiar with Salmonella and its potential to make people ill. But few know about Campylobacter jejuni, even though it competes yearly with Salmonella in making people sick.

Campylobacter is one of the main causes of bacterial foodborne disease in the United States and worldwide. Raw chicken is one of the most common carriers of the bacteria. In the U.S. alone, 2.4 million cases are reported annually, with costs exceeding $1 billion. Americans consumed 86 pounds of chicken per person in 2006, the most recent numbers available.

**What has been done**

Funded by the USDA, faculty and graduate students in the UA Department of Veterinary Science and Microbiology have developed a new poultry vaccine using an attenuated strain of Salmonella to express Campylobacter proteins in chick intestines. The vaccine induces the chicks to make antibodies against Campylobacter, resulting in lower Campylobacter carriage in poultry, ultimately less Campylobacter transferred to humans and therefore significantly fewer foodborne illnesses. The vaccination process is simple, easy to produce and protective to the chick. The Salmonella is engineered to live long enough to stimulate antibody production, but dies before the chicks are harvested. Chickens need to be vaccinated early because they become infected at just two to three weeks of age. The goal is to halt the contamination before it spreads and survives on raw chicken sold in stores. The vaccine may be publicly available in two to three years.

The research team is also currently testing other Campylobacter genes in the Salmonella vector strain. They are searching for two or three genes that can be incorporated into the vaccine to express Campylobacter to a degree that will prevent colonization completely.

**Impact**

Ongoing research trials show the vaccine has significantly reduced the pathogen's ability to colonize young chickens' intestines. Preliminary studies indicate that Campylobacter infection was reduced by 99.9 percent compared with a control group: 4.4 million Campylobacter organisms were present in non-vaccinated birds, compared to 5,220 organisms in the vaccinated birds. At least 500 organisms are needed to produce the disease in humans, but the chlorine in the packinghouse chillers usually reduces bacteria by 1,000 to 100,000 organisms. Vaccinated chickens should be free of Campylobacter after processing, according to the researchers who are refining the vaccine. The vaccine's effect could be significant, as the U.S.poultry industry is the world's largest producer of poultry meat: about 8.9 billion broilers go to market annually in the U.S., with a value of $21.5 billion. Europe has similar broiler production figures. The vaccine would serve as an intervention method for Campylobacter when the USDA mandates reduced numbers of food-borne pathogens in chicken, most likely in the next few years.

### 2. Brief description of the target audience

Commodity groups, state agencies, producers, youth.

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

### 1. Standard output measures

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 300 | 100 | 1500 | 200 |
| **Actual** | 375 | 225 | 1800 | 1200 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2010 |
| Plan: | 3 |
| Actual: | 3 |

**Patents listed**
Control of Milk Production and Mammary Involution
Method for Production of Clostridium Difficile
Cj0588 Protein, a Vaccine Candidate for Prevention of Campylobacter in Poultry

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Plan** | 4 | 60 | |
| **Actual** | 8 | 60 | 68 |

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

**Output Target**

**Output #1**

**Output Measure**

- Effectiveness of the research program will be based on publications, external grant support, and integration into existing extension programs

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 22 | 20 |

**Output #2**

**Output Measure**

- Create awareness and increase knowledge

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 1000 | 1100 |

**Output #3**

**Output Measure**

- Expand participation in our Annual Cow College program

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|

| | | |
|---|---|---|
| 2010 | 100 | 110 |

## V(G). State Defined Outcomes

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Number of farmers adopting more sustainable and profitable large scale dairy production practices |
| 2 | Adoption of more profitable breeds of beef cattle for arid land conditions |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

**Outcome #1**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Number of farmers adopting more sustainable and profitable large scale dairy production practices

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 20 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

☑ 301 - Reproductive Performance of Animals
☑ 302 - Nutrient Utilization in Animals
☑ 305 - Animal Physiological Processes
☑ 306 - Environmental Stress in Animals
☑ 311 - Animal Diseases

**Outcome #2**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Adoption of more profitable breeds of beef cattle for arid land conditions

**2. Associated Institution Types**

- ☑ 1862 Extension
- ☑ 1862 Research

**3a. Outcome Type:**

- ○ Change in Knowledge Outcome Measure
- ○ Change in Action Outcome Measure
- ◉ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 50 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

- ☑ 301 - Reproductive Performance of Animals
- ☑ 302 - Nutrient Utilization in Animals
- ☑ 305 - Animal Physiological Processes
- ☑ 306 - Environmental Stress in Animals
- ☑ 311 - Animal Diseases

**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.)
- ☐ Other

**Brief Explanation**

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

**(OPTIONAL SECTION)**

### 1. Evaluation Studies Planned

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study
- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

### Evaluation Results

### Key Items of Evaluation

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

**Program # 4**

**1. Name of the Planned Program**

MARKETING TRADE AND ECONOMICS

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

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 605 | Natural Resource and Environmental Economics | 15% | | 20% | |
| 610 | Domestic Policy Analysis | 85% | | 80% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 1.0 | 0.0 | 4.0 | 0.0 |
| Actual | 2.0 | 0.0 | 3.0 | 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** |
| 149378 | 0 | 35282 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 448167 | 0 | 136292 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

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

**1. Brief description of the Activity**

**Issue**

The financial crisis that hit the United States in 2009 and continued through 2010 has affected numerous sectors of the American economy, including agricultural enterprises. In general, the agricultural industry has always faced price fluctuations, but the rate of change for factors affecting the agricultural economy has accelerated. The market has become more volatile, requiring more skill on the part of agricultural producers in managing for risk. To present critical information to agricultural producers quickly, without requiring speakers or the audience to travel, a webinar was designed and presented through the Western Extension Committee, an organization of extension economists from the 13 western states, Guam and other Pacific Islands, supported by Cooperative Extension directors in the western region.

**What has been done**

In 2009, the pioneering webinar series "Ag in Uncertain Times" was launched as a multi-state effort, covering the following topics: operating in the face of uncertain credit; operating in the face of uncertain markets; families facing uncertainty in agriculture; operating in risky environments; and managing agricultural enterprises in uncertain times. Its sequel in 2010, the four-part webinar "Managing Volatility in Agriculture," featured four live, interactive 90-minute seminars on December 8, 9, 15 and 16, 2010. The sessions included Volatility in American Agriculture; Volatility and the Livestock Industry; Volatility and Grains; and Volatility and Fresh Fruits and Vegetables. Designed for agricultural lenders, producers, producer organizations, not-for-profit organizations, extension specialists and educators, agency personnel, crop insurance industry personnel, policy makers, and agricultural college leaders, the series emphasized management principles and tools that all producers can apply to their farm and ranch businesses to help manage the variety of risks associated with farm product and input price volatility.

The 2009 and 2010 webinar series featured live, interactive 60 to 90-minute seminars that included live audio, PowerPoint presentations, videos and slides, with questions taken using a chat feature during each presentation. Software and hardware were provided through Montana State University. These web seminar series were organized by the Western Extension Committee's "Ag in Uncertain Times Team," with members from land grant institutions in Montana, Wyoming, Arizona, California, Colorado and Washington and the Western Center for Risk Management Education at Washington State University Extension. The entire series of webinars remains available online as a resource for the agricultural industry and for extension educators to download and use as needed.

**Impact**

The "Managing Volatility in Agriculture" webinars offered in 2010 averaged about 75 to 80 people per session. According to post-session surveys, 98.6 percent of the respondents agreed that this webinar was worth their time and 72.7 agreed that they would likely participate in the next webinar. Eighty-two percent agreed their greatest take home message from the webinar was "a better understanding of the current underlying factors causing the new and/or increased market volatility."

A pioneering effort, the "Ag in Uncertain Times" webinar drew widespread interest for each session offered during 2009. Praised as a unique, timely way to reach a wide audience simultaneously with a wealth of practical, expert information, the webinar series was recognized with two awards from the Western Agricultural Economics Association in 2010: the Outstanding Extension Project Group Award, and also the Award of Excellence for Multi-State Programs.

**Issue**

The number of Spanish speaking farm operators in the Western United States is on the

rise. Extension economists of the Western Extension Committee identified a need to target education programs towards this segment of their clientele. Ag in Uncertain Times in Español©, an interactive Spanish language educational webinar series, was developed by a subset of members of the committee to assist agricultural producers and professionals to better understand the important and changing conditions in today's economy. Collaborating institutions included Washington State University, Montana State University, University of Wyoming, University of California, Oregon State University and the University of Arizona. The 2010 series was targeted towards providing farm and risk management information that would help producers and managers, especially those with small operations, make informed business decisions, and improve agricultural professionals' ability to work with their farm and ranch customers and clients.

**What has been done**

This educational program was modeled on a similar English language webinar series, using the web conferencing software Adobe® Connect™. Themes for each of three webinars (March 10, 17, 24, 2010) were selected based on identified needs at the farm level and included: 1. Financial Management and Access to Credit, 2. Business Planning and Market Strategies, and 3. Strategies, Tools, and Resources for Crop or Enterprise Selection and Diversification. For each theme, several speakers presented information on relevant subject matter topics. Speakers were selected based on their academic expertise, professional experience, and work with the Hispanic farming community, as well as their fluency in the Spanish language. The programs were promoted using various media outlets, direct mailings, and personal contacts. Each session was scheduled for 60 to 90 minutes and had opportunities for the participants to interact with the presenters. Polling questions were also used during the programs to determine application and value of the information presented, as well as to identify future webinar topics. All presentations were recorded and made available 'on demand' at http://www.farmmanagement.org/aginuncertaintimesespanol/.

**Impact**

Attendance for this first-ever Spanish language Extension webinar series was 31, 40, 29, for each of the three webinars, respectively. All participants reported that the webinars were valuable for their operations, and indicated that they would integrate the information gained in a variety of ways. This includes planting and marketing a greater diversity of crops than in the past, and using "social media" to promote their products and communicate with customers.

**Issue**

A diverse mix of horticultural crops is grown in Cochise County and a portion of Graham County in southeastern Arizona. Crop acreages include apples-1,200; wine grapes-650; pecans-5,800; pistachios-2,900; stone fruit-160; chiles-3,000; greenhouse crops-280; and mixed vegetables-630 (2009 Arizona Agricultural Statistics Bulletin, Sept. 2010). There are also more than 100 smaller producers who gross less than $10,000 per year. Many use direct farm marketing techniques to sell their products, according to the 2007 USDA Agricultural Census. Outreach programs educate producers about best production practices so they can make informed decisions and remain economically viable. Recommendations from the Cochise County Cooperative Extension (CE) Advisory Board, requests for information from clientele and suggestions from Arizona Cooperative Extension agents and specialists are implemented. Areas of focus include pest management education and recommendations from locally generated research.

**What has been done**

Programs offered for local and regional growers during 2010 included presentations at two Arizona Pistachio Growers Association meetings with attendance of 62 and 68 respectively, including growers from

New Mexico and Texas; a four-hour program for 77 growers at the 31st Southeastern Arizona Ag Day; and an afternoon program on wine-grape production attended by 43 people. Six growers attended a field demonstration on budding peach and pistachio trees. Three direct farm marketing meetings with afternoon tours held across the state in Willcox, Prescott and Tuba City were attended by 68 growers/marketers. Workshops addressing vegetable gardening issues for growers and marketers were presented at a community garden with 27 attendees, and at a local farmers market (after closing), with 35 attendees.

**Impact**

The Cochise County Cooperative Extension workshops and demonstrations held for local growers during 2010 met clientele's needs with the following results and impacts:

· Pistachio producers learned how to properly employ wind machines to avoid spring frosts and also updated their knowledge of current pesticide recommendations, the market outlook and the proposed USDA marketing order. The 32 attendees rated the overall value of the workshop an average of 4.6 (1=not valuable; 5= very valuable).

· A total of 146 Arizona Department of Agriculture CEUs was awarded to 44 Pesticide Applicator License (PAL) holders at Southeastern Arizona Ag Day. PAL holders know how to apply pesticides correctly.

· The 28 grower evaluations returned for the Ag Day Wine Grape Production Workshop averaged 4.25 (1=low and 5=high) on a weighted scale of usefulness to their operations.

· At the budding demonstration, the six growers learned the proper techniques and timing for T-budding peach and pistachio trees and supervised the budding of nearly 10,000 pistachio trees.

· Producers surveyed at the direct farm marketing workshops responded that 86 percent will increase their organic production in the next five years; 83 percent said they increased their knowledge of organic production by attending the workshop; 76 percent said they would implement at least two ideas from the workshop; and 63 percent stated that after the workshop they would create a presence on one of the direct marketing websites presented.

· Thirty-eight evaluations for the community garden and farmers market workshops indicated usefulness of information was 4.9 on a scale of 5. All but one respondent indicated they would use at least two new ideas from the presentations. Comments included: "VERY HELPFUL! Rob answered many of my questions!"; "Very informative!"; "Easy to understand!" and "Appreciate this class! Please bring more!"

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

Commodity groups, state agencies, financial institutions, producers, marketing organizations.

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

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 200 | 300 | 50 | 100 |
| **Actual** | 250 | 400 | 50 | 125 |

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

**Patent Applications Submitted**

Year: 2010
Plan: 1
Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| Plan | 2 | 12 | |
| Actual | 2 | 12 | 14 |

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

**Output Target**

**Output #1**

**Output Measure**

- Develop improved marketing and economic models.

☑ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 1 | 0 |

## V(G). State Defined Outcomes

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Increased financial stability of Arizona's producers |
| 2 | Number of individuals gaining knowledge byparticipating in educational programs |
| 3 | Adoption of management practices that assure a safe food supply |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

**Outcome #1**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Increased financial stability of Arizona's producers

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 500 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

☑ 605 - Natural Resource and Environmental Economics
☑ 610 - Domestic Policy Analysis

**Outcome #2**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Number of individuals gaining knowledge byparticipating in educational programs

**2. Associated Institution Types**

- ☑ 1862 Extension
- ☑ 1862 Research

**3a. Outcome Type:**

- ◯ Change in Knowledge Outcome Measure
- ◉ Change in Action Outcome Measure
- ◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 200 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

- ☑ 605 - Natural Resource and Environmental Economics
- ☑ 610 - Domestic Policy Analysis

**Outcome #3**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Adoption of management practices that assure a safe food supply

**2. Associated Institution Types**

- ☑ 1862 Extension
- ☑ 1862 Research

**3a. Outcome Type:**

- ◯ Change in Knowledge Outcome Measure
- ◯ Change in Action Outcome Measure
- ◉ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|

| | | |
|---|---|---|
| 2010 | 200 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

- ☑ 605 - Natural Resource and Environmental Economics
- ☑ 610 - Domestic Policy Analysis

**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.)
- ☐ Other

**Brief Explanation**

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

**(OPTIONAL SECTION)**

**1. Evaluation Studies Planned**

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study

- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

**Evaluation Results**

**Key Items of Evaluation**

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

**Program # 5**

**1. Name of the Planned Program**

FAMILY, YOUTH, AND COMMUNITY

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

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 802 | Human Development and Family Well-Being | 80% | | 77% | |
| 806 | Youth Development | 20% | | 23% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 22.0 | 0.0 | 5.0 | 0.0 |
| Actual | 20.0 | 0.0 | 5.0 | 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** |
| 56389 | 0 | 18769 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 88764 | 0 | 63337 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 0 | 0 | 0 | 0 |

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

**1. Brief description of the Activity**

**Issue**

Physical inactivity and poor dietary habits have been associated with increased risk of weight gain, diabetes, heart disease and metabolic syndrome. The Arizona Department of Health reports that obesity and overweight affect 60 percent of Arizona's population. Nationwide, 18 million people have full-blown diabetes and another 41 million already have pre-diabetes. Almost 65 percent of adults are either overweight or obese and 20 to 30 percent of children are overweight or at risk for becoming overweight. In light of the links to adverse health outcomes and the continued increase in the prevalence of overweight and obesity in the United States, promoting daily physical activity has emerged as an important strategy for obesity and disease prevention efforts. Walking is a local, inexpensive and convenient way to develop fitness and healthy habits.

**What has been done**

The "Walk Across Arizona" grassroots initiative started in 2001 as a pilot project in an Arizona retirement community. It has since expanded statewide with 14 of the 15 Arizona counties participating at some point. In 2009, the walking program was reorganized and changed to an 8-week walking program designed for teams of 10 people each, administered through Arizona Cooperative Extension and the UA's Community Health Advancement Partnership. Teams of friends, neighbors, co-workers and families include people of all ages, from children to senior citizens. Participants in Walk Across Arizona during 2010 ranged in age from 10 to 92 years, including two 89-year-old twins who also serve on the task force. Each county has a link on the Walk Across Arizona site, where team captains can access forms and record weekly miles, and county coordinators can manage the program and update local activities. Nutrition, energy levels, social interaction and other factors are also tracked. Weekly newsletters provide encouragement to increase physical activity, vegetable and fruit consumption with tips and nutritious recipes.

**Impact**

During 2001, the first year of the Walk Across Arizona campaign, 34 teams with 329 registered participants walked 48,872 miles. By 2010, the number of teams had expanded to 113, with up to 10 individuals per team (973 registered participants in Maricopa, Pima, Pinal and Navajo counties), who walked a total of 223,153 miles. Statewide since its inception, 1,088 teams with 9,529 participants (some repeated) from 14 of Arizona's 15 counties have reported walking over 2 million miles.

Data analyzed from exit surveys of the 2010 participants identified the top three benefits of participation: 1) Increased the exercise they were already doing (52 percent), 2) Increased their energy (38 percent), and 3) Helped them to feel less stressed (36 percent). In Pima County, participants reported walking more miles during the second half of the campaign, from 4.59 (n=420) at entry to 5.00 at wrap-up (n =428). Daily vegetable consumption increased from 1.3 cups at entry to 1.5 cups at wrap-up (n=513) and daily fruit consumption increased from 1.10 cups at entry to 1.14 cups at wrap-up.

There was an 82 percent increase in the number of participants, from pre- to post-testing, who agreed with the statement, "I currently participate in physical activity regularly (5 or more days a week), but have only done so for 1 to 6 months." The goal is for them to be involved in physical activity for 5 days per week and longer than 7 months; the increase shows they are moving in the right direction for behavioral change.

The response rate for Pima County with 570 participants on wrap-up forms was 92 percent, the highest response rate since the program started in 2001.

**Issue**

Leaders of rural communities continue to seek solutions to complex problems such as rural urban interface, the management and use of natural resources, economic development, regional planning, and communicating information on key public policy issues. Now more than ever, it is apparent that rural and agricultural leaders must be more knowledgeable and better trained to meet the growing demands and challenges facing Arizona.

**What has been done**

The Center for Rural Leadership (Project CENTRL) was developed by The University of Arizona Cooperative Extension under a seed grant from the W. K. Kellogg Foundation. Its mission is "To assist highly motivated leaders improve and expand their leadership skills to become more effective and responsive in meeting the needs of rural people in public affairs." Toward this end, Project CENTRL is an intensive two-year educational program focused on developing the leadership and problem-solving skills needed for handling complex contemporary issues. The CENTRL experience includes six highly interactive seminars in Arizona, an international study tour in Sonora, Mexico, and a final national seminar in Washington D. C. An assigned internship project, which is designed to apply the leadership skills learned in Project CENTRL, is also an integral part to the CENTRL experience. The program creates a statewide network with over 500 graduates in communities throughout rural Arizona.

**Impact**

A comprehensive follow-up study to measure the effectiveness of the two year leadership program over the past 25 years served as an internship project for a recent graduate of CENTRL Class XIX. An alumni survey instrument was developed and distributed to 446 graduates of Class 1-18 with a 43.7 percent response rate that included representation from all previous classes.

· Survey results indicated 98 percent of graduates rated their Project CENTRL experience as "Excellent" (77 percent) or "Above Average" (21 percent). More importantly, over 80 percent of graduates indicated their understanding of rural issues "Increased greatly" after completing the two-year program.

· A strong indicator of achieving CENTRL's vision of inspiring a life-long journey of leadership is the number of graduates who are serving in elected and appointed offices. Two graduates were recently re-elected to the Arizona House of Representatives and one into the Arizona Senate. A rancher and graduate of Class I who moved to South Dakota was recently re-elected to that state's House of Representatives and also chairs their Appropriations Committee.

· A request in the 2010 Fall Edition of CENTRL Connections Newsletter to identify CENTRL Alumni serving in elected offices revealed a total of 34 currently serving as state legislators, county supervisors, mayors, city council members, school board members, constables or commissioners in communities throughout rural Arizona.

· In addition to these elected positions, a growing number of graduates are volunteering their time in a variety of other leadership roles. More than 200 alumni attended a CENTRL Regional Connection or "CRC" in 2010, greatly strengthening the Project CENTRL network in rural Arizona. The distinguished list of over 500 alumni and the evidence contained in the published 25-year follow-up study are strong indicators of Project CENTRL's growing level of civic engagement and lifelong legacy of leadership for rural Arizona.

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

Parents, educators, youth, community groups

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

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 6500 | 100000 | 70000 | 45000 |
| **Actual** | 6000 | 9900 | 69000 | 45000 |

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

**Patent Applications Submitted**

Year: 2010
Plan: 0
Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Plan** | 15 | 44 | |
| **Actual** | 15 | 44 | 59 |

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

**Output Target**

**Output #1**

**Output Measure**

- Number of individuals participating in educational programs

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 70000 | 65000 |

**Output #2**

**Output Measure**

- Number of educational events, training workshops and clinics

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 215 | 110 |

## V(G). State Defined Outcomes

# V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Adoption of essential life skills by Arizona's youth that leads to a responsible, productive, and healthy life-style |
| 2 | Adoption of life building skills including self-discipline, responsibility and leadership |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

## Outcome #1

### 1. Outcome Measures

☐ Not Reporting on this Outcome Measure

Adoption of essential life skills by Arizona's youth that leads to a responsible, productive, and healthy life-style

### 2. Associated Institution Types

☑ 1862 Extension
☑ 1862 Research

### 3a. Outcome Type:

○ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
○ Change in Condition Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 7000 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
All who are interested in the well-being of Arizona's youth care about this issue.

**What has been done**
Military 4-H programs were implemented on all military bases in Arizona plus 5 bases in Japan and Korea.

**Results**
The positive aspects of a modern day 4-H program were enjoyed by all youth who participated in the programs.

### 4. Associated Knowledge Areas

☑ 802 - Human Development and Family Well-Being
☑ 806 - Youth Development

## Outcome #2

### 1. Outcome Measures

☐ Not Reporting on this Outcome Measure

Adoption of life building skills including self-discipline, responsibility and leadership

### 2. Associated Institution Types

☑ 1862 Extension
☑ 1862 Research

### 3a. Outcome Type:

◯ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

### 3b. Quantitative Outcome

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 14000 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Utilization of Vista and Americorp personnel

**What has been done**
29 Vista and Americorp individuals were employed/dedicated to county extension offices.

**Results**
Utilization of these individuals greatly increased capacity and outreach of the system.

### 4. Associated Knowledge Areas

☑ 802 - Human Development and Family Well-Being
☑ 806 - Youth Development

## 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.)
- ☐ Other

### Brief Explanation

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

**(OPTIONAL SECTION)**

### 1. Evaluation Studies Planned

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study
- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

### Evaluation Results

Vista program was evaluated by Vista Headquarters in Phoenix, AZ and found to achieve all desired goals.

## Key Items of Evaluation

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

**Program # 6**

**1. Name of the Planned Program**

HUMAN NUTRITION, HEALTH AND FOOD SAFETY

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

1. Program Knowledge Areas and Percentage

| KA Code | Knowledge Area | %1862 Extension | %1890 Extension | %1862 Research | %1890 Research |
|---|---|---|---|---|---|
| 702 | Requirements and Function of Nutrients and Other Food Components | 10% | | 57% | |
| 703 | Nutrition Education and Behavior | 75% | | 8% | |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins | 15% | | 35% | |
| | **Total** | 100% | | 100% | |

**Add knowledge area**

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

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

| Year: 2010 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 9.0 | 0.0 | 9.0 | 0.0 |
| Actual | 9.0 | 0.0 | 7.0 | 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 |
| 76271 | 0 | 19687 | 0 |
| 1862 Matching | 1890 Matching | 1862 Matching | 1890 Matching |
| 460549 | 0 | 139285 | 0 |
| 1862 All Other | 1890 All Other | 1862 All Other | 1890 All Other |
| 0 | 0 | 0 | 0 |

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

## 1. Brief description of the Activity

### Issue

Foodborne diseases are a widespread and growing public health problem, both in developed and developing countries. In the United States, for example, around 76 million cases of foodborne diseases, resulting in 325,000 hospitalizations and 5,000 deaths, are estimated to occur each year. Detecting waterborne and foodborne contaminants usually involves collecting a water or food sample, sending it to a laboratory and waiting for the samples to be filtered, incubated, tested and identified under a microscope. If a critical infection is suspected, say for highly dangerous E. coli O157:H7, the pathogen may already have multiplied and spread before the report arrives days later.

### What has been done

A series of "lab- on-a-chip" (LOC) applications in development at the Biosensors Laboratory at the University of Arizona can identify pathogens in minutes rather than days, using a simple device that delivers results locally. The LOC has microchannels filled with antibody-conjugated submicro- or nanoparticles that grow in size upon the presence of pathogens in a drop of water or food samples. The LOC is encased in a portable system that runs on a 9-V battery with no external computer. Testing pathogens involves minimal liquid handling--no centrifuging, micro-filtering or plating. One of the tests in development can detect pathogens--E. coli, Salmonella and potentially Cryptosporidium--in drinking water networks, irrigation systems, or wastewater recycling facilities and in food samples (lettuce, spinach or ground beef). A prototype handheld device has recently been fabricated that successfully detects near-single-cell E. coli from iceberg lettuce samples, as low as 10 cells per milliliter of "lettuce juice."

### Impact

Laboratory studies show that the LOC test is faster than conventional testing methods, taking an average of less than five minutes to deliver results on location. The degree of accuracy is three orders of magnitude greater than for conventional real-time or rapid tests (close to a single cell level). The method can be used to monitor early spread of pathogens, rather than being used after the outbreaks, thus potentially saving lives and money. The annual cost for foodborne illness in the U.S. is estimated to be $152 billion, according to a new report by Pew Charitable Trusts and Georgetown University.

### Issue

According to the Centers for Disease Control, only 10 percent of all cases of food poisoning are reported. Proper food handling and storage helps prevent food poisoning from Campylobacter, Salmonella, Cryptosporidium, Yersinia, E. coli 0157 and other pathogens. Safe Food 2010 is a multi-year, comprehensive food safety education project coordinated through Arizona Cooperative Extension. The program is a partnership with state and county health departments, local and state organizations, and groups interested in improving the safety of food for Arizona families and consumers. Safe Food 2010 seeks to reduce the number and severity of foodborne illnesses by providing current, accurate information on nutrition and food safety through the media and through classes. Reported cases of foodborne illness in Arizona declined from 5,200 in 1995 to 1,073 cases in 2009. Arizona Cooperative Extension in Maricopa County is one of 25 members of the Arizona Food Safety Task Force that meets periodically to identify critical issues for action statewide.

**What has been done**

Safe Food 2010 encompasses a wide range of programs and resources, including workshops on food preservation and on food safety for occasional quantity cooks; "Germ City" sessions on correct hand washing; a food safety course for high-risk groups; the 8th Safe Food, two-day conference in November 2010 on Food Safety from Farm to Table that attracted 86 food professionals; and continuing statewide food safety listserv with state health department for 132 food professionals. The Master Consumer Advisors program continues the educational outreach of Extension in food safety and consumer issues to clientele who call or email. Many of these programs are offered in other counties in Arizona, in addition to Maricopa County. The Safe Food 2010 website features HACCP classes--Hazard Analysis of Critical Control Points--and information on other downloadable or satellite classes and upcoming events. Faculty consulted with 14 food companies and food professionals by phone, while volunteers and part-time staff answered calls from five other Arizona counties and five states--Illinois, California, Nevada, Colorado and New Mexico.

**Impact**

In 2010, the 85 participants in the food preservation class completed a pre-test with an average of 51.4 percent correct answers and a post-test average of 78.4 percent correct, with a 34 percent increase in knowledge about food safety. Nearly 1,600 people downloaded two or more of the five HACCP lessons from the Safe Food 2010 website in 2010. Safe Food 2010 conference participants rated the conference at 4.6 (5 being excellent). Of the 86 participants, 20 reported they would be training other professionals with the information, 32 with their staff, 6 will be teaching students and 18 will teach consumers.

At one middle school, 208 teachers taught proper hand-washing to 4,000 students in their classrooms as a result of Safe Food 2010 training, hand-washing curricula and student incentives. The Germ City unit was used at schools as part of the Supplemental Nutritional Assistance Program (SNAP-Ed) in Maricopa, Pinal, Pima and Santa Cruz Counties, with more than 740 downloads of online Germ City teaching resources from the website. Ninety percent of the SNAP-Ed teachers at Isaac Middle School said, "My students washed their hands more often," as a result of the program.

During 2010, 32 Master Consumer volunteers gave 916 hours service valued at $19,098 according to the 2009 independent sector data rate of $20.85/hour.

Customer Response Cards were sent to people with publications in 2010. The returned responses rated Cooperative Extension's information and help as 9.6 with 10 being excellent and 1 being poor. Comments included: "We love knowing we have somewhere to go for help." and "Information was just what I needed to know." The Safe Food 2010 website had 128,000 visitors with 4.2 million hits in 2010. Twenty four percent (17,770 sessions) came from Google searches. There were more than 21,800 visitors from 11 foreign countries. More than 10,725 pdf files were downloaded from the Maricopa County Family and Consumer Sciences website.

**Issue**

Osteoporosis -a silent disease that causes porous bones that break easily--is both treatable and preventable. Yet it is the number 1 crippler of women. One in 2 women and one in 5 men will have osteoporosis fractures in their lifetime. The November 2010 report from the Institute of Medicine states adolescents need 1,300 milligrams of calcium per day to support bone growth, women ages 19 through 50 and men up to 71 require on average 800 milligrams daily. Women over 50 and both men and women 71 and older should take in 1,000 milligrams per day on average to ensure they are meeting their daily needs for strong, healthy bones. Yet the 2001 (most recent data) Arizona Behavior Risk Surveillance Survey found over half (51.4 percent) of Arizonans consume less than two of the three recommended) servings of milk or milk products per day. More than half of Arizona's population is in Maricopa County, where there is the highest total number at risk. The U.S. Surgeon General warned in his 2004 report that by 2020, half of

all American citizens older than 50 will be at risk for fractures from osteoporosis and low bone mass if no immediate action is taken.

**What has been done**

The Bone Builders program teaches women of all ages, young adolescent girls, and older men in Arizona how to change their dietary and exercise habits to reduce the risks of osteoporosis and improve bone health. It is a partnership with University of Arizona Cooperative Extension, UA College of Medicine, the Arizona Department of Health Services, Arizona Osteoporosis Coalition and more than 60 partners including county health departments, health providers and interested citizens. The program uses volunteer educators, community classes, the Bone Builders Physical Activity Program, health fairs and a social marketing campaign to spread the message of osteoporosis prevention on Twitter and Facebook.

**Impact**

In 2010, Basic Bone Builders classes were taught for 91 Maricopa County community groups with 918 participants, along with 120 one-on-one sessions. Bone Builders displays and education programs at 18 health and community fairs directly reached about 1,120 women. In one assessment, 347 people attending classes rated their knowledge of osteoporosis risk and prevention an average of 1.12 before the sessions and 4.79 after, out of a 5 point scale with 5 high, a 415 percent increase in knowledge. They rated class quality as 4.95. More than 1,000 'Like Mother, Like Daughter' flyers and 40 posters have been distributed through businesses, doctor offices, day care centers, churches and school districts.

· For pre-teens, a health educator taught "No Bones About It" to 703 students at middle schools, while "Best Bones Forever" materials were distributed for 1,200 students at another. "No Bones About It" students increased their knowledge through an average of 2.5 MORE correct answers out of 15 questions from the pre- to the post-test.

· In 2009 Bone Builders, the Arizona Osteoporosis Coalition and Pinal County Cooperative Extension were selected for a national pilot of the BodyWorks/Best Bones Forever (BBF) program. The partnership did BBF outreach at 14 community events with 4,460 individuals. Many included bone density screening. Thirty-seven parents and daughters completed the 10-week Bodyworks classes. Final Bodyworks/Best Bones Forever evaluations are not available because they are still being compiled by the national funder, but participants did express increased knowledge when questioned verbally and 100 percent of daughters expressed excitement about doing weight-bearing exercise.

· Nine seniors completed at least one fitness assessment for the Bone Builders Physical Activity Program, while six seniors completed the whole series plus the pre-post assessments. All seniors completing the 9 week physical activity class improved in at least 1 out of 6 fitness assessments. Seniors improved from 10 percent to 90 percent on individual tests.

· During the past 6 years, Bone Builders and its partners completed 2,832 ultrasound screenings with education. In 2009, of the 460 women tested, 180 had low bone density, 47 had osteopenia and 16 had osteoporosis. The average age was under 60 years old, when many do not even think about osteoporosis. Of people who completed 386 ultrasound screenings plus education in 2010, 43 had osteopenia and 4 had osteoporosis. If ONE hip fracture can be prevented from early screening/education it would save $81,000 in health costs.

· BoneBuilders.org had 19,000 visitors in 2010, although data are still incomplete. More than 34,000 people visited the page on high calcium foods; the page on weight-bearing exercise had 32,000 visitors. Referral sources included 530 visitors from the Foundation for Osteoporosis Research & Education; website visitors from other countries included Sweden (592 visitors), Russia (469) and Australia (678). The Bone Builders program received requests for materials from four states and the United

Kingdom.

· Over the past twelve years (1998-2010) Bone Builders staff and volunteers have taught 2,192 classes to 45,000 participants and reached 131,375 people at 687 health fairs. More than 680 volunteers have completed a 2-day workshop taught face-to-face or by live videoconference, simultaneously in Phoenix and Tucson over the past 12 years. The Bone Builders program and its Arizona Cooperative Extension team members were recognized with the 2010 Western Extension Directors Association Award of Excellence in 2010.

**Issue**

The SNAP-Ed program is a federal/state partnership supporting nutrition education for people eligible for the Supplemental Nutrition Assistance Program (SNAP--formerly known as Food Stamp Nutrition Education). In Arizona, the USDA-funded program is associated with the Arizona Nutrition Network, which partners with the University of Arizona Cooperative Extension. The program's mission is to shape food consumption in a positive way, to promote health, and to reduce disease among all people living in Arizona. Nutrition messages have been integrated into food safety, obesity and disease prevention, physical activity, and gardening activities.The number of people receiving food stamp benefits increased by 41.5 percent (121,219 people), from October 2008 to October 2009.

**What has been done**

Arizona Cooperative Extension faculty, in partnership with local social service agencies, county health departments and other community organizations in the Arizona Nutrition Network taught a variety of programs to food stamp-eligible families throughout the state. During 2010 all low income people eligible for food stamps were targeted for nutrition education. The theme for the year was "Champions for Change"-healthy eating, eating more fruits and vegetables, using 1% or less fat milk, and increasing daily physical activity.The SNAP-ed program was implemented in eight Arizona counties using matching funds from county faculty and staff, in schools with more than 50 percent free and reduced lunches; with parks and recreation and YMCA partner staff operating in low income areas; and with senior centers and food banks. Nutrition education delivery sites included 3 community centers, 2 emergency food assistance sites, 3 shelters, 1 SNAP office, 2 public housing, 1 Head Start, 4 Parks and Recreation and 185 public schools. Local staff and volunteers distributed educational materials through classes, workshops, health fairs, after school programs, parents' groups, community and wellness centers, food banks and other venues.

**Impact**

In 2010, Arizona Cooperative Extension faculty, staff and volunteers made the following numbers of direct education contacts with SNAP-Ed participants, by age: 5 years and under--13; 5-17 years (grades K-12)--97,948; 18-59 years--675; and ages 60 and older--288, for a grand total of 98,924 for all ages combined. Thousands of educational brochures on various topics were distributed. For instance, food safety publications were distributed to 171,101 people in the SNAP-ed program and at various health fairs.

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

General public, educators, health professionals, extension educators

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

**1. Standard output measures**

| 2010 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Plan** | 25000 | 25000 | 600 | 20000 |
| **Actual** | 22000 | 26000 | 500 | 21000 |

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

**Patent Applications Submitted**

Year: 2010
Plan: 1
Actual: 2

**Patents listed**
Small Molecule Inhibitors of the Pleckstrin Homology Domain and Methods for Using Same
Identification of a Novel Chemical Scaffold Targeting the PH Domain of ECT2

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

**Number of Peer Reviewed Publications**

| 2010 | Extension | Research | Total |
|---|---|---|---|
| **Plan** | 9 | 27 | |
| **Actual** | 9 | 27 | 36 |

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

**Output Target**

**Output #1**

**Output Measure**

- Effectiveness of the research program will be based on publications, external grant support, and integration into existing extension programs

☐ Not reporting on this Output for this Annual Report

| Year | Target | Actual |
|---|---|---|
| 2010 | 1 | 1 |

## V(G). State Defined Outcomes

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Create awareness and increase knowledge |
| 2 | Number of individuals adopting recommendations for nutrition and health |

**Add Cross-cutting Outcome/Impact Statement or Unintended or Previously Unknown Outcome Measure**

**Outcome #1**

**1. Outcome Measures**

☐ Not Reporting on this Outcome Measure

Create awareness and increase knowledge

**2. Associated Institution Types**

☑ 1862 Extension
☐ 1862 Research

**3a. Outcome Type:**

◯ Change in Knowledge Outcome Measure
◉ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 2000 | 0 |

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

**Issue (Who cares and Why)**
Awareness by clientele

**What has been done**
Over 100,000 individuals participated in the SNAP-Ed and EFNEP programs conducted by the University of Arizona

**Results**
80+ percent of all participants indicated changed behavior after participation in these programs. There were changes in food purchasing patterns and adoption of healthier eating habits.

**4. Associated Knowledge Areas**

☑ 702 - Requirements and Function of Nutrients and Other Food Components
☑ 703 - Nutrition Education and Behavior
☑ 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and

**Outcome #2**

**1. Outcome Measures**

☑ Not Reporting on this Outcome Measure

Number of individuals adopting recommendations for nutrition and health

**2. Associated Institution Types**

☑ 1862 Extension
☑ 1862 Research

**3a. Outcome Type:**

◉ Change in Knowledge Outcome Measure
◯ Change in Action Outcome Measure
◯ Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Quantitative Target | Actual |
|---|---|---|
| 2010 | 5000 | 0 |

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

☑ 702 - Requirements and Function of Nutrients and Other Food Components
☑ 703 - Nutrition Education and Behavior
☑ 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and

## 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.)
- ☐ Other

### Brief Explanation

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

### (OPTIONAL SECTION)

### 1. Evaluation Studies Planned

- ☑ After Only (post program)
- ☐ Retrospective (post program)
- ☐ Before-After (before and after program)
- ☐ During (during program)
- ☐ Time series (multiple points before and after program)
- ☐ Case Study
- ☐ Comparisons between program participants (individuals, group, organizations) and non-participants
- ☐ Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- ☐ Comparison between locales where the program operates and sites without program intervention
- ☐ Other

### Evaluation Results

### Key Items of Evaluation