

2011 University of Arizona Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 05/15/2012

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.

All forested communities in the White Mountains Zone of Arizona's Navajo, Apache and Greenlee counties are listed as "at risk communities" in the Federal Register with respect to catastrophic wildfire.

Forest contracts associated with the restoration efforts on public land through this project have generated \$53 million in revenue. The total economic impact in the regional area has been \$97 million over the past six years, with the impact in 2011 of about \$23 million.

The fully implemented, collaborative cotton IPM program has registered significant gains since its inception in 1996. 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 has been expanding, from 150,000 acres in 2009, to 201,000 in 2010, and over 266,000 acres in 2011, 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. During 2011 the Arizona cotton industry supported the state's economy with \$700 million in economic activity and sustained 9,000 jobs.

Arizona consistently ranks in the top five in milk production per dairy cow, yet heat stress during the warmest months causes decreases in milk yield, reproductive efficiency, increases the incidence of disease and also increases the 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 in electricity costs and water usage when used in combination with fans and misters, holding pen cooling and feed line soakers. A new fan and mister system was tested on a commercial dairy and shows promise in reducing core body temperature and increasing resting time. Stabilizing core body temperature is critical if the goal is to improve the efficiency of milk production.

Approximately 12 percent of the range beef cattle in Arizona are located in Cochise, Graham and Greenlee counties, with a value in 2010 of \$90,396,000 (2010 Arizona Agricultural Statistics Bulletin). 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 reducing and managing herds as a result of drought conditions for the past 14 years. The rangelands where these livestock are raised are some of the most productive in the state.

Estrous synchronization trials included groups of 450 cows and 121 cows in 2011. The largest producer reported pregnancy rates of 60-70 percent from a single service. There was an economic impact of fewer "clean-up" bulls. 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. Additionally, the cooperating herd with the majority of mature cows had over 90 percent of his cows calving in a three-week period, resulting in a more uniform, marketable calf crop for the rancher.

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.

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.

The "Ag in Uncertain Times" webinars offered in 2011 averaged about 55-60 people per session. According to post-session surveys, 99 percent of the respondents agreed that this webinar was worth their time, and more than 98 percent would like Extension to offer further seminars. 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.

Water quality and availability in the arid West are issues that affect all Arizonans, including youth. Arizona Project WET trains teachers to utilize the relevant topic of water to teach critical thinking and problem solving skills in K-12 classrooms. 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 teaching support center is available online to supplement lessons, and APW has an active blog and Facebook page.

Results from the STEM focused Water Investigations Program indicate a projected water savings of over 13 million gallons per year 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. 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.

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.

Arizona's EFNEP program is offered in 5 of the state's 15 counties. The national standardized EFNEP curriculum includes six to eight classes on family nutrition and diet for good health, meal planning and food preparation, food storage, comparison shopping and food safety. Food or vouchers for food are not provided to participants. The goal is to help adults and youth change their behavior by learning how to select nutritionally sound diets, thus promoting family health and nutritional well-being. In 2011, EFNEP served 2,506 program families.

Arizona Cooperative Extension faculty, in partnership with local social service agencies, county health departments and other community organizations in the Arizona Nutrition Network teach a variety of programs to food stamp-eligible families throughout the state. During 2011 all very low-income people eligible for food stamps were targeted for nutrition education. The number of people in Arizona receiving food stamp benefits in July 2011 was 470,060 households (558,985 adults and 524,466 children. The total coupon issuance was \$136,793,311). The theme "Champions for Change" encouraged healthy eating by consuming at least half of daily starch foods as whole grains, eating more fruits and vegetables, using 1% or less fat milk, and increasing daily physical activity.

University of Arizona scientists at the Southwest Center for Natural Products Research and Commercialization (or Natural Products Center, NPC), in collaboration with the Whitehead Institute at the Massachusetts Institute of Technology, have recently shown that withaferin A is effective in reducing brain tumor mass in animals at non-toxic doses. The NPC team used an entirely nontraditional method--aeroponics--to produce bulk amounts of withaferin A needed for biological evaluation. Using the aeroponic system for cultivation yielded *Withania* plants with about five times the biomass produced in soil-grown plants. The nontraditional method has produced more than 30 grams of the active compound withaferin A in several greenhouse operations at NPC. Withaferin A normally costs about \$300 for just 5 milligrams, thus the potential value of the test crop was about \$1,800,000. So far, the NPC has provided over 20 g of Withaferin A to collaborators at Whitehead Institute, MIT and Dartmouth College of Medicine. And although *Withania* usually takes two to three years to mature to be commercially viable, it took just six to nine months in this study. The patent for the production of withaferin A by the aeroponic technique was filed in 2011 by 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.

Rural Tax Education is fulfilling its role as a dependable source of information in support of other extension programs and agricultural producers. Producers are already benefiting from the materials generated by the RuralTax.org group. Since going live in October 2010, the website has had 10,672 unique visitors (not including robots or worms), with each visitor viewing an average of 2 pages and making 7.7 hits.

Finally, the College has filed 11 patent applications and 3 patents were issued during the past year.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2011	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
- Combined External and Internal University Panel

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 traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals

Brief explanation.

A major rewrite of the College's Strategic Plan that covers the research, extension and academic programs of the College was completed in 2010. 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 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

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)
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

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 Action Plans
- To Set Priorities

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
1929995	0	2477902	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1054351	0	500012	0
Actual Matching	3441236	0	1881470	0
Actual All Other	0	0	0	0
Total Actual Expended	4495587	0	2381482	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	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 & ECONOMICS
5	FAMILY, YOUTH & COMMUNITY
6	HUMAN NUTRITION, HEALTH & FOOD SAFETY

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%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	21.0	0.0
Actual Paid Professional	10.0	0.0	22.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
543310	0	88462	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1686499	0	587406	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. Arizona Project WET trains teachers to utilize the relevant topic of water to teach critical thinking and problem solving skills in K-16 classrooms. Administered through the University of Arizona's Water Resources Research Center, Project WET assists in building water-related decision making skills in both students and adults. 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 comprises water and education specialists from across the state.

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 teaching support center is available online to supplement lessons, and APW has an active blog and Facebook page.

In 2011, this project developed 34 new workshops and reached 528 educators who report teaching 33,464 students annually. APW staff and facilitators conducted these workshops logging 407 hours of face time. In response to a needs assessment for the Phoenix area, APW teamed with Arizona State University's Global Institute of Sustainability for the 6th year to deliver a 2-day Advanced Water Educators' workshop, themed Water and Public Perception. The workshop engaged 21 educators who report reaching 1,388 students annually. Another workshop involved 40 4th-6th grade teachers as part of the Biosphere 2 STEM (Science, Technology, Engineering and Mathematics) Academy. These teachers will reach 1,917 students annually with locally relevant STEM education. RinseSmart, a pre-rinse spray valve replacement program targeting area restaurants and commercial industrial/institutional kitchens, was funded June 2010-11.

Impact

- Survey data shows that 97 percent of the teachers participating in the statewide workshops strongly agreed or agreed that "the workshop met my expectations and will have an impact on my teaching," 96 percent "intend to become a better water steward as a result of this workshop," 98 percent agreed "the information, strategies and instructional methods presented during the workshop were helpful to me." In the Advanced Educator Workshop on Energy and Water, 90 percent of the participants strongly agreed that "I have a better understanding of the relationship between water conservation and public perception." 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," "the workshop met my expectations and will have an impact on my teaching," and that "it was excellent--the best workshop I've ever attended."

- Results from the STEM focused Water Investigations Program indicate a projected water savings of over 13 million gallons per year from school and home water savings due to installation of water efficient faucet aerators.

- At a workshop in Phoenix, one teacher wrote, "The instructors successfully modeled how to have fun doing science as well as demonstrating critical thinking and questioning strategies. Loved it! After today, I am thinking of starting an after-school science club for students."

- 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.

- Through targeted education and water efficiency programs in the first three years (community, K-12, residential and business) in Pinal County, a cumulative **3,610,182 gallons of water is projected to**

be saved annually due to the installation of water conserving devices through the School Water Audit Program's Spray Valve Replacement and Water Scene Investigators programs.

Volunteers provided **2,658 service hours** delivering Arizona Water Festivals, a contribution **valued at \$55,419** (using Independent Sector value of \$20.85). A teacher survey was conducted to **evaluate the Arizona Water Festivals**. Teachers rate students' overall reaction to the water festivals **excellent 88 percent of the time and good to excellent 100 percent of the time**. Since 2000, the AWF program has engaged **48,156 4th grade students in 22 Arizona communities**. Hundreds of volunteers have also been trained to deliver effective water education transcending the water festival, as members in the community increase their own water literacy as a result of participating in the program.

Issue

All forested communities in the White Mountains Zone of Arizona's Navajo, Apache and Greenlee counties are listed as "at risk communities" in the Federal Register with respect to catastrophic wildfire. The National Institute of Food and Agriculture (NIFA) and the University of Arizona have adopted Firewise USA as an applicable community and property owner education and implementation tool for comprehensively addressing wildland fire community risk. Local governments throughout the area determined that effectively addressing the risk to local communities was a priority and requested Cooperative Extension to provide leadership, on-the-ground development and programming facilitation.

What has been done

As part of an ongoing effort that continued in 2011, Arizona Cooperative Extension in Navajo County increased fire mitigation awareness by conducting a comprehensive program that includes education guides, training, assessments and a highly visible demonstration area in cooperation with local communities. The Navajo County Extension director was a co-author on the NRCD's national publication, NACD Community Wildfire Desk Guide, published in June 2009. The handbook addresses how to prepare for, respond to and recover from a catastrophic wildfire in and around rural communities. The 2009 Sitgreaves Community Wildfire Protection Plan Report was developed and published through the Navajo County Cooperative Extension office.

Vegetation reduction to cut wildfire risk has been carried out on 7,580 acres of private and 64,600 acres of Forest Service administered tracts to date. Included in the mapping and reporting process are 6,373 properties; of these, 2,677 property owners have completed necessary fuels reduction hazard mitigation or forest health treatments on their properties. This has created a mosaic of fuel breaks across local communities that will limit fire behavior and increase the potential for defending populated areas if a major wildfire starts.

Impact

Forest contracts developed through associated with the restoration efforts on public land through this project have generated \$53 million in revenue. Of this, a UA economist determined that with multipliers and improvements to local communities the total economic impact in the regional area has been \$97 million over the past six years, with the impact in 2011 of about \$23 million.

The signal test of all that is being done regarding wildfire risk reduction came in 2011 with the half million acre Wallow fire in the Apache National Forest. It impacted five communities in Apache County. Community Wildfire Protection Planning based on lessons learned from the Rodeo-Chediski Fire in 2002 and the implementation of these plans produced spectacular results. The towns of Alpine, Greer, Nutrioso, Eagar, and Springerville were all evacuated due to the fire and all were impacted with fire on the ground, ember storms, and in some cases losses of residences and structures. However, in comparison the Rodeo-Chediski blaze, where 480 homes were lost, Wallow destroyed 35. The result is a social and cultural shift in attitudes toward forest thinning, fuel reduction, and community forest management

throughout the White Mountains Region. Communities, neighborhoods, and local governments are embracing planning and maintenance of the community wildfire protection plan to reduce risk to communities and property. It is a quintessential validation of the role that Cooperative Extension provided locally in defining issues of community wildfire preparedness and safety while assisting in implementing effective mitigation processes.

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15000	22000	5000	550

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

Patent Applications Submitted

Year: 2011
Actual: 3

Patents listed

Withaferin A Analogs and Uses Thereof
Antimicrobial Efficacy of Treatments Based on Plant Compounds
Targeted Cryptosporidium Biocides

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
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

Year	Actual
2011	3

Output #2

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2011	17500

Output #3

Output Measure

- Number of individuals adopting new technology

Year	Actual
2011	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

Outcome #1

1. Outcome Measures

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources

Outcome #2

1. Outcome Measures

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

3b. Quantitative Outcome

Year	Actual
2011	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

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

Outcome #3

1. Outcome Measures

Volunteers completing Master Gardening training

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Master Gardener program is an important component of our Cooperative Extension program.

What has been done

Over 400 volunteers completed Master Gardener training.

Results

The Master Gardeners provided over 20,000 volunteer hours which is valued [at \$21/hour] of over \$420,000.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Create awareness and increase knowledge

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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 250,000 adults and youth in the state.

Results

75% of the recipients indicated a change in behavior resulting from the programs and materials.

4. Associated Knowledge Areas

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

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State Defined Outcomes.

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%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	30.0	0.0
Actual Paid Professional	8.0	0.0	29.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
224801	0	142302	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
441122	0	589339	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 30 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. A new station was installed in San Simon in 2011. 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 website 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 download. 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.

Users accessed AZMET web pages 1,870,000 times in 2011, and the total number of user sessions equaled 172,000, or 471 per day. The length of user sessions averaged about 15 minutes, while data transferred from AZMET's websites totaled 328 gigabytes.

Of particular importance are the evapotranspiration (ET) data generated for irrigation management and 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 12,656 times in 2011 and the Northern Arizona Turf Water Use Webpage, accessed 4,606 times.

Rural programs using ET include the Southeast Arizona Crop Water Use Report and the Safford Cotton Water Use Report, accessed 840 times and 775 times respectively in 2011; 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 19,980 times during 2011; and the 50,000+ acres of Arizona 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 9,500 times during the summer of 2011.

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. Arizona now produces the highest-yielding cotton in the world, well over 1,500 pounds of fiber per acre, far exceeding the U.S. national average of about 750 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 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 2011 show that insecticide use on cotton for all insects combined--including whiteflies, pink bollworm, Lygus bug and others reached a 33-year low over the last 6 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 2011 was more than \$388 million.
- Growers applied 4.15 pounds of active insecticide ingredient per acre of cotton in 1995. Over the last 6 years, the amount of active ingredient applied per acre was reduced by 26 pounds, or 77 percent, to less than 16 oz 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 6 years have shown the lowest insecticide use in cotton on record (33 years), at just 1.5 sprays season-long, reducing insecticide loads on the environment by more than 90 percent or about 1.6 million pounds of active ingredient annually and saving growers over \$25 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 92 percent reduction in organophosphate use, comparing the last 6 years to an all-time high in 1995; a 97 percent reduction in

pyrethroids; 82 percent reduction in endosulfan; and 97 percent reduction in carbamates; with an 85 percent reduction overall in cotton insecticide use. By 2011, 76 percent of all cotton insecticides used were either fully (55 percent) or partially (21 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 2011. 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 has been expanding, from 150,000 acres in 2009, to 201,000 in 2010, and over 266,000 acres in 2011, 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. During 2011 the Arizona cotton industry supported the state's economy with \$700 million in economic activity and sustained 9,000 jobs.

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	18000	28000	5500	1300

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

Patent Applications Submitted

Year: 2011

Actual: 5

Patents listed

Plant Height Measurement System for Mobile Platforms
 Withaferin A Analogs and Uses Thereof
 Barcodes for DNA Sequencing with Guaranteed Error Correction Capability
 Inactivation of Foodborne Pathogens by Hibicus sabdariffa on Romaine Lettuce and Alfalfa Sprouts
 Antimicrobial Efficacy of Treatments Based on Plant Compounds

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	16	90	106

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2011	14500

Output #2

Output Measure

- Number of research projects conducted on all aspects of Plant Sciences, Animal Sciences, and Agriculture and Resource Economics

Year	Actual
2011	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 and animal production
2	Adoption of alternative crop and animal technologies
3	Adoption of more cost effective means for controlling plant and animal diseases along with insect issues

Outcome #1

1. Outcome Measures

Adoption of better management practices for crop and animal production

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Adoption of alternative crop and animal technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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 UA that this technology is effective and economical.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

Outcome #3

1. Outcome Measures

Adoption of more cost effective means for controlling plant and animal diseases along with insect issues

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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

KA Code	Knowledge Area
205	Plant Management Systems
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

Brief Explanation

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State Defined Outcomes.

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%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890

Actual Paid Professional	2.0	0.0	20.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
11180	0	161247	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
323113	0	358833	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 ranks in the top five in milk production per dairy cow. Yet heat stress during the warmest months causes decreases in milk yield and reproductive efficiency while increasing the incidence of disease and the maintenance costs per cow. Research has shown that compared to winter 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 UA 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

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 in electricity costs and water usage when used in combination with fans and misters, holding pen cooling and feed line soakers. Phase one proof-of-concept testing on the heat exchanger cooling system was conducted in June, 2010 at the UA's Agricultural Research Complex in Tucson, followed by a commercial scale test at a 3,600-cow dairy located in Tulare, California in September 2010. 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.

In 2011 a multi-state research team was formed, led by UA Animal Sciences, with Agricultural and Biosystems engineering faculty from the UA, Biological and Environmental Engineering faculty from Cornell University, and Biological and Agricultural Engineering faculty from Kansas State University. This group is currently in negotiation with GEA, the world's largest dairy equipment supply company to develop a research program to bring a commercially viable conductive cooling system to the world dairy industry. Funding has been obtained from the Water, Environmental and Energy Solutions program to begin mathematical modeling of a functional conductive cooling system and to build a test model to verify the computations.

Impact

The new fan and mister system shows promise in reducing core body temperature and increasing resting time. Stabilizing core body temperature is critical if the goal is to improve the efficiency of milk production. 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. The multi-state research team is 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

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 researchers are also refining the delivery method for the vaccine and are 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, pest management advisors, pesticide applicators, youth, ag ventures program.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	375	225	1800	1200

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

Patent Applications Submitted

Year: 2011
 Actual: 2

Patents listed

Proteins and Genetic Sequences Useful for the Production of Poultry Vaccines
 Shrimp Vaccination for DNA and RNA Viruses

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
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.

Year	Actual
2011	20

Output #2

Output Measure

- Create awareness and increase knowledge

Year	Actual
2011	1100

Output #3

Output Measure

- Expand participation in our annual cow college program

Year	Actual
2011	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 cattle for arid land conditions.

Outcome #1

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

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

Not Reporting on this Outcome Measure

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

Brief Explanation

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

MARKETING, TRADE & 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%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	0.0	2.0
Actual Paid Professional	0.0	0.0	0.0	0.0
Actual Volunteer	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
147052	0	46703	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
445841	0	138618	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

Approximately 12 percent of the range beef cattle in Arizona are located in Cochise, Graham and Greenlee counties, with a value in 2010 of \$90,396,000 (2010 Arizona Agricultural Statistics Bulletin). 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 reducing and managing herds as a result of drought conditions for the past 14 years. 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. Focus groups held in 2008 among agency personnel, extension agents, campus specialists and ranchers identified the following priorities: range monitoring, improvement in agency/rancher relations; Coordinated Resource Management and livestock production issues.

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 2011 three 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 "Rangeland Monitoring with a Tablet PC," 9 participants; "Nogales & Sierra Vista Districts Forest Service Permittee Meeting," 39 participants; and Being a Range Cow is a Hard Way to Make a Living" Workshop, 50 participants. Estrous synchronization trials were conducted in cooperation with three producers in Santa Cruz County.

As part of the Rangeland Monitoring & Inventory Program, 59 sites on 20 BLM allotments and 51 sites on 16 USFS allotments were monitored. Ten riparian areas were monitored on US Forest Service lands. Monitoring reports were prepared for each allotment and given to agencies and ranchers. Other monitoring was conducted on an additional 4 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 three workshops held in 2011 (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.

Comments from participants at the "Rangeland Monitoring with a Tablet PC" included "...We all learned a lot and we accomplished our goal of learning to use the tablet and putting it to work in the field" and "Andrew got us over the fear of the tablet and even got everyone having fun."

Forty-eight percent of the ranchers were actively engaged in the monitoring of their allotment.

Estrous synchronization trials included groups of 450 cows and 121 cows in 2011. The largest producer reported pregnancy rates of 60-70 percent from a single service. There was an economic impact of fewer "clean-up" bulls. 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. Additionally, the cooperating herd with the majority of mature cows had over 90 percent of his cows calving in a three-week period, resulting in a more uniform, marketable calf crop for the rancher.

Issue

The financial crisis that hit the United States in 2009 continues to affect 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 series of webinars have been 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, featuring a series of interactive 90-minute seminars. Its sequel in 2010 focused on "Managing Volatility in Agriculture." In 2011, topics included "Ag and the Tax Relief Act of 2010--Key Changes for Farmers and Ranchers," "Regional Perspectives on Economic Forces Shaping Land Asset Values" and "Farmers Dealing with Commercialization of Cellulosic Biofuels."

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 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 "Ag in Uncertain Times" webinars offered in 2011 averaged about 55-60 people per session. According to post-session surveys, 99 percent of the respondents agreed that this webinar was worth their time, and more than 98 percent would like Extension to offer further seminars. 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

While a lot of information is available on income taxes, relatively little of it is focused on agricultural issues and the specialized tax treatment(s) afforded those issues. Very little help was available for producers to cope with income variability and tax implications, and the information available has been difficult for producers to access in a low-cost or easily accessible manner. Because of the complex nature of tax law and the fluidity of changes, many extension programming efforts in individual states do not include income tax education for agricultural producers. The goal of Rural Tax Education is to provide a source for agriculturally related income and self-employment tax information that is current, uncomplicated and straight forward, enabling both agricultural producers and extension educators to understand this information and incorporate it into their programs.

What Has Been Done

Rural Tax Education is a joint project of extension specialists from 15 land grant universities, led by Utah State University and including the University of Arizona. Recognizing the need for federal tax management educational materials that are accessible to both producers and extension educators, the individuals involved obtained a \$50,000 grant from USDA-RMA and created RuralTax.org. A website at RuralTax.org was created in the fall of 2010, featuring more than 20 fact sheets, a complete sample federal farm tax return with all the schedules and accompanying line-by-line explanations for each form, and links to other materials. All of the materials on the website were reviewed for technical accuracy and comprehension by the target audience. The site is regularly updated to reflect changes in current tax laws. Extension programs can highlight selected issues and direct the audience to the website for a more thorough treatment of the topic. In an era of deep budget cuts, having a resource that combines the expertise from multiple universities helps to continue to provide quality education to the public using limited resources.

Impacts

Rural Tax Education is fulfilling its role as a dependable source of information in support of other extension programs and agricultural producers. Producers are already benefiting from the materials generated by the RuralTax.org group. For example, the website content was used in 9 presentations to Native American audiences, which face unique issues. Materials have been used in programming in each of the 15 states involved as well as additional states. Many extension groups have reported that now that materials are available they are including tax issues in their programming.

Since going live in October 2010, the website has had 10,672 unique visitors (not including robots or worms), with each visitor viewing an average of 2 pages and making 7.7 hits. One web visitor commented, "I went to this website following a press release referring farmers to this website to learn more about IRS reporting of weather-related disasters here in NYS. This is a great web site! Congratulations to the committee for putting it together. As an Extension educator I hope to use some of the materials for a beginning farmers class."

In January 2011 the USDA's "Know Your Farmer, Know Your Food Blog" promoted the website to a nationwide audience, and the program was awarded the 2011 Western Agricultural Extension Association's program award for project.

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	250	400	50	125

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

Patent Applications Submitted

Year: 2011
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	2	12	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- School districts, youth, and adults will address obesity issues

Year	Actual
2011	0

Output #2

Output Measure

- Develop improved marketing and economic models.
 Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Reduce childhood obesity
2	Increased financial stability of Arizona's producers
3	Number of individuals gaining knowledge by participating in educational programs
4	Adoption of management practices that assure a safe food supply

Outcome #1

1. Outcome Measures

Reduce childhood obesity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

Increased financial stability of Arizona's producers

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of individuals gaining knowledge by participating in educational programs

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Adoption of management practices that assure a safe food supply

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State Defined Outcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

FAMILY, YOUTH & 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%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	0.0	5.0	0.0
Actual Paid Professional	20.0	0.0	5.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
54063	0	30190	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
86438	0	65663	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

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 to 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 graduates in communities throughout rural Arizona.

Impact

In October 2011 CENTRL's largest class on record--33 members--successfully completed their 2-year leadership program. The program creates a statewide network with more than 550 graduates who are making a difference in communities throughout rural Arizona. Eight members of class XX have been elected to public office or appointed to serve in a leadership position at the local, county or state level.

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.

Issue

EFNEP, the federally funded Extension Food and Nutrition Education Program, addresses the needs of low-income, minority families and youth nationwide. The goal is to teach families with children how to stretch their limited food dollars, plan and prepare nutritious foods and make informed choices about food and other lifestyle issues that support family health and well-being. Funded nationally by the USDA, EFNEP is staffed locally in each state and the U.S. territories by Extension-trained nutrition educators.

What has been done?

Arizona's EFNEP program is offered in 5 of the state's 15 counties--Cochise, Maricopa, Pima, Pinal and Santa Cruz. The national standardized EFNEP curriculum includes six to eight classes on family nutrition and diet for good health, meal planning and food preparation, food storage, comparison shopping and food safety. Food or vouchers for food are not provided to participants. The goal is to help adults and youth change their behavior by learning how to select nutritionally sound diets, thus promoting family health and nutritional well-being. In 2011, EFNEP served 2,506 program families. Adult participants were 84 percent female and 16 percent male. Breakdown by race included: 28 percent white, 7 percent African American, 6 percent American Indian and 58 percent Hispanic. Youth participants numbered 6,827, with 50 percent male and 50 percent female; 82 percent of the youth participants were as young, or younger than fourth graders. About 420 volunteers assisted with family nutrition education.

Impact

Ninety-seven percent of the participants completed their classes in 2011, and 98 percent attended group classes. Post-participation dietary surveys from 2,420 persons showed that overall 61 percent improved one or more food resource management skills; 72 percent showed improvement in one or more of their nutrition practices and 59 percent now follow recommended food safety practices; and 1200 now participate in some type of daily physical activity.

2. Brief description of the target audience

Parents, educators, youth, community groups

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6000	9900	69000	45000

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	15	44	59

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2011	65000

Output #2

Output Measure

- Number of educational events, training workshops and clinics

Year	Actual
2011	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

Outcome #1

1. Outcome Measures

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 Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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

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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State Defined Outcomes.

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 & 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	15%		35%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	75%		8%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	9.0	0.0
Actual Paid Professional	8.0	0.0	7.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
73945	0	31108	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
458223	0	141611	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

Plants of the family Solanaceae are used as food and in traditional medicines all over the world. The powdered roots and/or extracts derived from roots of the winter cherry plant--*Withania somnifera* (L.) Dunal (family: Solanaceae)-- 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" or Indian ginseng 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, NPC), in collaboration with the Whitehead Institute at the Massachusetts Institute of Technology, have recently shown that withaferin A is effective in reducing brain tumor mass in animals at non-toxic doses. The NPC 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.

Similarly, in a collaborative project with Nuvogen Research, a small Tucson-based company, a lead compound isolated from the NPC's library of extracts from Sonoran Desert plants has shown activity against prostate cancer. This lead compound derived from an arid land plant has been structurally modified to improve its stability. Invention Disclosures have been filed for this discovery and the activity of the synthetically modified compound. This compound is currently being tested in animal models. The arid land plant containing this compound is rare and difficult to cultivate, however NPC 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 synthetically modified compound required for preclinical evaluation.

These are just two examples of hundreds of such compounds the NPC 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 value-added natural products from plants and associated microorganisms; 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 about five times the biomass produced in soil-grown plants. The nontraditional method has produced more than 30 grams of the active compound withaferin A in several greenhouse operations at NPC. Withaferin A normally costs about \$300 for just 5 milligrams, thus the potential value of the test crop was about \$1,800,000. So far, the NPC has provided over 20 g of Withaferin A to collaborators at Whitehead Institute, MIT and Dartmouth College of Medicine. And although *Withania* usually takes two to three years to mature to be commercially viable, it took just six to nine months in this study. The patent for the production of withaferin A by the aeroponic technique was filed in 2011 by 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.

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.

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 teach a variety of programs to food stamp-eligible families throughout the state. During 2011 all very low-income people eligible for food stamps were targeted for nutrition education. The number of people in Arizona receiving food stamp benefits in July 2011 was 470,060 households (558,985 adults and 524,466 children. The total coupon issuance was \$136,793,311). The theme "Champions for Change" encouraged healthy eating by consuming at least half of daily starch foods as whole grains, eating more fruits and vegetables, using 1% or less fat milk, and increasing daily physical activity.

The SNAP-Ed program was implemented in 8 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 was delivered in 419 sites which included community centers, emergency food assistance sites, shelters, SNAP offices, public housing, Head Start, Parks and Recreation and 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 2011, Arizona Cooperative Extension faculty, staff and volunteers made the following numbers of direct education contacts with SNAP-Ed participants by gender: 90,832 females and 95,148 males for a grand total of 185,980 for all ages combined. Thousands of educational brochures on various topics were distributed. For instance, food safety publications were distributed to 133,640 people in the SNAP-Ed program and at various health fairs.

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.

2. Brief description of the target audience

General public, educators, health professionals, extension educators

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22000	26000	500	21000

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

Patent Applications Submitted

Year: 2011

Actual: 1

Patents listed

Small Molecule Inhibitors of the Pleckstrin Homology Domain and Methods for Using Same

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
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

Year	Actual
2011	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

Outcome #1

1. Outcome Measures

Create awareness and increase knowledge

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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

KA Code	Knowledge Area
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 Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Number of individuals adopting recommendations for nutrition and health

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We will seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist. See State Defined Outcomes.

Key Items of Evaluation