

# 2012 University of Arizona Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

We continue to do more with less. Despite dwindling financial support, we continue to make a difference. However, we are working to better balance our program areas with support.

- Arizona Cooperative Extension engages with people through applied research and education to improve lives, families, communities, environment, and economies in Arizona and beyond.
- The Arizona Agricultural Experiment Station stimulates learning through exploration and discovery to enhance agriculture, the environment, our natural resource base, family and youth well-being and the development of local communities. We accomplish this mission by the integration, dissemination, and application of knowledge in the agricultural and life sciences.

#### Environment, Water, Land and Natural Resources

##### **ForestHealth and Wildfire Risk Reduction and Education**

A total of 6,373 properties have been included in a mapping and reporting process in local communities, and 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.

About \$53,000,000.00 in natural resource revenue (new money) has been developed through forest contracts associated with the restoration efforts on public land in 2011-12. An economist determined that 315 jobs added in 2011 and 411 in 2012 added \$23 million to \$26 million annually to local economies in Navajo and Apache Counties.

In 2012, Cooperative Extension trained and certified 14 property assessment personnel for local community associations. One community, with an assessed valuation of \$927 million, developed with Extension training and assistance a seven member Environmental Council to evaluate properties; assist in treatment options; develop rules and regulations for property management; and enforce those rules.

In Apache County two communities have adopted a similar approach resulting in 329 properties that are now survivable in the event a wildfire occurs. On the 56,000 acres treated in the forest to date, annual utilizable forage, forb and browse production has increased from an average of **less than one hundred pounds to an average of over 1,250 pounds per acre**. There is now an excess of feed for both the wildlife populations and domestic livestock.

##### **Water Wise: Water Conservation in Cochise County**

The Water Wise program continues to receive wide support from the public, the press and sponsors. The success of the Water Wise program has led to strong support by the Board of Supervisors and other partners. The City of Sierra Vista conservatively estimates that the Water Wise program saves the Sierra Vista Subwatershed 270 acre feet of water a year due to encouraging water conserving practices. Estimated annual water savings from ICI audits is 112,000 gallons. Water Wise personnel conducted 54

follow up calls at least 6 months after a visit for information on recommendation implementation. On average: 33% of contacts implemented some or all recommendations.

### **"Reading the Range"--Facilitating Range Monitoring in Arizona**

From the original six participants enrolled in Reading the Range in 2001 on 100,000 acres, the program has expanded exponentially to now include 50 ranches on 1.23 million acres. On the Tonto National Forest, 48 percent of grazing allotments are now enrolled in Reading the Range and USFS officials recommend involvement in the program for new ranch owners. Data are being collected from 225 key areas and the results are being incorporated into NEPA (National Environmental Policy Act) documents on the Tonto National Forest.

### **Plant Systems**

#### **Cotton IPM: A Quiet Revolution Reduces Costs, Losses and Risks for Arizona's Cotton Growers**

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 3.26 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 1.6 million pounds of active ingredient annually, although 2012 was challenged by more pest pressures from Lygus, whiteflies and a new outbreak of Brown Stink Bug (the first in Arizona since 1963) resulting in a statewide average of 3.35 sprays.

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 2012. 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 2011 was 29.3 percent, the highest level

ever measured. Overall, cotton acreage in Arizona expanded 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. However, Arizona cotton acreage dropped 20 percent in 2012 due to reduced market prices.

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.

A one-year cotton IPM program in the Mexicali and San Luis Valleys in Mexico directly caused over \$1 million of a safer, selective Lygus feeding inhibitor to be used in Mexico for the first time by cotton growers in 2011, replacing multiple sprays of broadly toxic, older insecticides. The EPA solicited and funded a proposal for further work in their "Border 2012" program to help shift Mexican cotton growers to practices and strategies modeled on those used in this Arizona program.

The entire cotton industry of Mexicali Valley and San Luis Valley has participated in the UA's exported Extension program. Arizona Cooperative Extension worked directly with 11 different cooperatives that account for more than 95 percent of the cotton acreage in the area: 93,500 acres. The largest cotton cooperative in Mexico now uses the UA Cotton IPM program's specific evidence-based recommendations for Lygus and whitefly management. Numbers for that cooperative show that compared to 2010, insecticide sprays were reduced by about 33 percent in 2012. At least 75 percent of those sprays were reduced risk-insecticides, safe to beneficial insects and to workers. This represents a reduction of more than 60 percent in the use of broadly toxic insecticides. Yields from this cooperative were higher than in 2010 or 2011. This cooperative will increase their acreage by about 500 acres in 2013, despite market conditions and overall reductions in the remainder of the Mexicali/San Luis Valleys (decreasing by almost 20,000 acres). See [http://cals.arizona.edu/apmc/Mexicali\\_cotton.html](http://cals.arizona.edu/apmc/Mexicali_cotton.html)

### **Human Nutrition, Health and Food Safety**

**Tucson Village Farm** has continued to grow since ground breaking in 2010. During 2012, TVF served 7,060 youth and adults through a variety of programs and has garnered rising attendance, sponsorship, and extensive print and broadcast coverage. Research conducted by a UA Master of Public Health student showed that 2nd-5th grade students who came to Tucson Village Farm's "Growing Forward" program showed a statistically significant increase in fruit and vegetable consumption after their educational experience on the farm:

The most dramatic increases were in students' knowledge about whole grains. Almost 70% (n=118) were able to identify that there are three parts to a whole grain, as opposed to less than 20% before the intervention. Over 80% of students were able to remember that at least half of daily servings of grain should be whole grains after the intervention, whereas only slightly more than 50% were aware of this before their visit to the farm. Additionally, students showed a remarkable change in terms of knowledge of necessary daily fruit and vegetable servings (5 or more are recommended), with a 26% increase from pre- to post-test. Students also showed impressive knowledge regarding the specific beneficial elements in milk products and meat and beans, with over 85% being able to identify calcium and protein respectively. In terms of attitudes and behavior, analysis of the data produced some equally positive results. Over 90% of students surveyed agreed or strongly agreed in their post-test responses that eating vegetables made them feel healthy. After tasting the fresh produce they picked on the farm, over 75% of children surveyed agreed or strongly agreed that they liked tasting new vegetables, an increase of almost 15% from pre-test results. This change was mirrored by agreement or strong agreement in appeal of taste of fruits and whole grain products. Perhaps the most interesting statistic was the change in behavior regarding food choice. Of the students surveyed after their visit to Tucson Village Farm, almost 19% reported eating three or more whole grain products the day before, and over 43% reported eating three or more vegetables the day before. This represents an increase of 72% and 136% respectively. While exhibiting a less substantial change, it is notable that 38% of participating children reported eating three or more fruits as well in their post-tests. (Pollock, 2012)

Community volunteers at TVF in 2012 provided 4,394 hours valued at a monetary equivalent of \$93,855.84 (4394 x \$21.36).

### **Smartphone Diagnostics & Fast PCR Assay for Food Safety & Animal Diseases**

The smartphone-based paper microfluidics technology is even easier to carry and operate, and extremely cheap. Salmonella detection has successfully been demonstrated from its bacterial culture and from ground beef, at the same impressive detection limit of 10 cells per milliliter sample, in less than 5 minutes of assay time.

With the fast droplet PCR technology, a spin-off company has been established, Fast PCR Diagnostics, with the support from Arizona Commerce Authority (AZ Furnace program) and Tech Launch Arizona (Proof-of-Concept program), to further commercialize this technology. The device is being tested for animal diseases (swine flu and foot-and-mouth disease; the latter will be tested in South Korea using its facility at Animal, Plant & Fisheries Quarantine & Inspection Agency) as well as sepsis detection for humans.

### **SNAP-Ed**

During 2012 all very low-income people eligible for food stamps were targeted for nutrition education. Indicating the reach of the SNAP-Ed program, the number of people in Arizona receiving food stamp benefits in June 2012 was 470,060 households (558,985 adults and 524,466 children. The total coupon issuance was \$136,793,311).

In 2012, Arizona Cooperative Extension faculty, staff and volunteers made the following numbers of direct education contacts with SNAP-Ed participants by age: under 5 years: 1,586; 5-17years: 93,756; 18-59 years: 12,162; 60 and over: 5,537, for a grand total of 113,041 for all ages combined. The total number of nutrition and exercise lessons taught was 985,959. Thousands of educational brochures on various topics were distributed. For instance, food safety publications were distributed to 178,143 people in the SNAP-Ed program and at various health fairs.

### **Family, Youth and Community**

#### **Project CENTRL (Center for Rural Leadership)**

In October of 2011, twenty highly motivated leaders from communities throughout rural Arizona attended their first Project CENTRL seminar. After completing an assigned internship project and attending their capstone national seminar in Washington D.C., these 20 members will have successfully completed the requirements of Project CENTRL as graduates on June 21, 2013. CENTRL inspires a lifelong journey of leadership and these new crop of leaders will join a network of more than 550 leaders who are making a difference in communities throughout rural Arizona. A few highlights of the impacts made in Project CENTRL are:

- + As Mayor of San Luis when starting Project CENTRL in 2011, a current Class XXI member submitted his resignation to run for the AZ House of Representatives. After running a successful campaign and being elected to this position, he cited his many CENTRL leadership experiences as an inspiration and major assistance to his accomplishments.

- + A total of four CENTRL Alumni are currently serving elected terms in the AZ Legislature, three in the House of Representatives and one Senator. In addition, a growing number of graduates are currently serving elected terms as County Board of Supervisors, Mayors, City Council Members, and on local School Boards.

- + All 33 graduates of Class XXI successfully completed a CENTRL internship project. A summary of their accomplishments were published in a "Putting Emotion to Motion: The Power of the CENTRL Internship" document. Projects included leadership activities and accomplishments in community service, agriculture, natural resources, and shaping public policy.

+ A significant 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 2012-13. Among many serving on boards and commissions that impact rural Arizona is a recent appointment by our Governor of a CENTRL Alumni to serve on the AZ Department of Transportation Board.

### **First Smiles Oral Health Program in Cochise County**

According to the National Institute of Health, on average Americans spend \$31,341.32 on dental work over a lifetime. According to the Centers for Disease Control and Prevention the amount can be reduced by 40 percent with preventive care before the age of one, lowering this amount to \$18,804 spent on dental work over a lifetime. Cochise County children report receiving services (1,493) or have dental care after our program which equates to the potential savings of \$28,074,372 for those 1,493 children over a lifetime.

### **Better Nutrition through EFNEP**

Eighty-five percent of the participants completed their classes in 2012, and 100 percent attended group classes. Post-participation dietary surveys from 1,688 persons showed that 78 percent choose healthier foods than before, 49 percent now read labels, 46 percent thaw food according to directions, 37 percent used a grocery list to shop, 39 percent planned meals in advance, 35 percent ran out of food less often, 31 percent don't let food sit out for more than 2 hours and 30 percent of the children ate breakfast more often. Overall, 69 percent improved one or more food resource management skills; 78 percent showed improvement in one or more of their nutrition practices and 55 percent now follow recommended food safety practices (97 percent of 2,033 adult EFNEP participants completed a class in food safety) , and 1200 now participate in some type of daily physical activity.

### **Marketing, Trade and Economics**

#### **Improving Desert Agricultural Production and Produce Safety**

**Increased Wheat Production Efficiency:** In 2012, over 50,000 acres were planted to wheat in Yuma County, all following a winter vegetable crop. As an outcome of this program, 19 percent of Yuma area wheat producers have now incorporated a form of minimum tillage practices in their production schemes and benefit from a 65 percent reduction in fuel consumption, up to 50 percent lower labor costs and over 55 percent savings in time, with no apparent reduction in Durum wheat yield or quality. No wheat producers were conducting minimum tillage practices in 2005.

**Greater Lettuce Production Productivity:** Field studies conducted during the 2008-2010 winter growing seasons to evaluate bed size and three irrigation methods for romaine and iceberg lettuce resulted in enhanced production efficiency and water conservation. Relative to furrow irrigated lettuce, the efficiency of sprinkler applied irrigation water was roughly two times more efficient than water applied using furrow irrigation methods. In particular, the production of romaine lettuce using wide beds exhibited a 25 percent yield increase without a reduction in quality. During the 2012 produce season, approximately 40 percent of romaine and 5 percent of iceberg lettuce is now grown using the condensed growing strategies.

**Strengthened Melon Virus Control Strategies:** As part of the Cucurbit Yellow Stunting Disorder Virus management efforts, a Yuma-based task force, spearheaded by the agent, has recommended a volunteer cucurbit-free period during the summers since 2007. Although the virus continues to be a problem in fall-grown Arizona melons, the host-free period assisted in a 10 percent reduction in the severity of the disease in the fall 2012 melon crop, a savings of approximately \$400 per acre.

**Greater Adoption of Advanced Agricultural Technologies:** In 2005, only about 20,000 acres of agricultural production utilized advanced agricultural technologies in the Yuma area, and producers desired a greater understanding of on-farm GIS mapping and data conversion training. As an outcome of the program, producers now have greater proficiency in precision agriculture

technologies resulting in a 5-fold increase in precision crop acres within the region since 2005.

The **Southwest Ag Summit** is a collaborative effort among Extension, research and agricultural producers with more than 1,200 attendees. An exit survey (n=548) showed that 96 percent of the participants found the information relevant to their production practice and 69 percent would incorporate the knowledge into their production practices.

The **IPM Insect Losses** series of workshops which covered lettuce, melons and cotton had a combined total of 67 participants. Of the attendees, over 96 percent reported in exit surveys that the presented information increased their knowledge level of pest control use tendencies within the county and 98 percent of the respondents would manage insect pest populations in accordance to the recommendations given during the workshops.

More than 65 producers and pest control advisors attended the **Preseason Vegetable Workshop** and 92 percent participated in the exit survey; 98 percent found the information useful, particularly in the new control strategies for fusarium in fall lettuce and 97 percent would incorporate what was learned at the workshop into their daily decision-making.

**USDA-Certification for Good Agriculture and Handling Practices:** Arizona leafy green producers adopted a new collection of production standards, the Arizona Leafy Greens Shipper Marketing Agreement (AZLGMA), in spring 2008. The agreement is a 100 percent commitment among Arizona growers to produce leafy greens within a strict set of unprecedented compliance guidelines developed in collaboration with university and industry scientists, Yuma County Cooperative Extension, food safety experts, producers, processors and shippers. In Yuma County, 100 percent of fresh produce growers are AZLGMA compliant. In 2011, a series of USDA Good Ag and Handling Practices (GHP/GAP) workshops were initiated in Arizona. The food safety protocols include all fresh produce and not just leafy greens as outlined by the AZLGMA. As a result of the GHP/GAP workshops in Arizona, there has been a 5-fold increase in number--7 in 2010 to 40 in 2012--of USDA-certified Arizona GHP/GAP growers.

### **Risk Management Education for Agricultural Producers**

Similar to prior years, we solicited questionnaire feedback from RME program participants. When workshop participants were solicited on the odds that they would incorporate any of the information covered into future decisions that would favorably impact the profitability of their operation, 35 percent indicated there was an excellent chance this would occur and 59 percent gave a good chance of this occurring. Over 98 percent of the participants indicated that these RME trainings were worth their time to attend. When asked how participants rate the relevance of topics presented at RME trainings for their operation, 41 percent said the topics were excellent and 44 percent said good; 96 percent indicated that the trainings enhanced their level of knowledge on the topics addressed.

Some examples of comments received after workshops and from email are as follows:

- + please add me to your email list for the Livestock Monitor--useful information
- + I greatly appreciate your information emphasizing up-to-date livestock markets
- + risk assessment is extremely valuable and great to see different areas of evaluation
- + This is very informative (especially for the small producer)
- + very good presentation and explanation of organic vs. natural vs. conventional
- + workshop will alter how I track changes on livestock records, financial assets and liability

### **Animal Systems**

#### **Conduction Cooling Systems: Improving Production in Dairy Cattle**

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 working to develop models of cooling systems that can run successfully with different water and air temperatures.

### **Campylobacter Vaccine for Poultry Targets Human Foodborne Illness**

Ongoing research trials show the vaccine has significantly reduced the pathogen's ability to colonize young chickens' intestines. Risk assessment indicates that a 2-log, or 99 percent reduction of the Campylobacter load on chickens, such as that supplied by the vaccine in development at the University of Arizona, would reduce the incidence of campylobacteriosis associated with chicken meals by a factor of 30, or a reduced incidence of 300 cases per 100,000 population down to 10 per 100,000 population. A patent application for the UA vaccine was submitted in February 2013. The goal is to produce a vaccine for eventual commercial scale, cost-effective use within a few years.

The vaccine's effect could be significant, as the U.S. has the largest broiler chicken industry in the world, producing approximately 8.41 billion broiler chickens in 2012. Europe has similar broiler production figures. The 8.6 billion broilers produced in 2011 (49.7 billion pounds) had a farm receipt value of \$23.2 billion, according to USDA figures. The retail equivalent would be about \$45 billion, according to USDA figures for 2010.

Successful vaccination of chickens would lead to compliance with the new USDA performance standards for Campylobacter in chickens by improving the safety of poultry, allowing processors to maintain their operations and significantly reduce human illness.

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

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	46.0	0.0	100.0	0.0
Actual	238.8	0.0	377.2	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)

#### **Brief explanation.**

This is normally done by faculty meeting with the stakeholder groups and 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 is requested from a variety of sources and 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 support and continued lack of state support for agricultural research and extension programs.

IV. Expenditure Summary

<b>1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)</b>			
<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
1946935	0	2473317	0

<b>2. Totaled Actual dollars from Planned Programs Inputs</b>				
<b>Extension</b>			<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	973467	0	1236657	0
<b>Actual Matching</b>	973467	0	1236657	0
<b>Actual All Other</b>	0	0	0	0
<b>Total Actual Expended</b>	1946934	0	2473314	0

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

**V. Planned Program Table of Content**

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

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

**Program # 1**

**1. Name of the Planned Program**

ENVIRONMENT, WATER, LAND AND NATURAL RESOURCES

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	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%	
	<b>Total</b>	100%		100%	

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	21.0	0.0
Actual Paid Professional	9.4	0.0	1.6	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
230261	0	105161	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
230261	0	105161	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

### **ForestHealth and Wildfire Risk Reduction and Education**

#### **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. Working cooperatively, to provide intensive educational programming for local governments and community property associations, a Community Forest Health and Wildfire action team was initiated formed and trained by Cooperative Extension. Their mandate is to evaluate risk within the entire area on a landscape basis. After the evaluation they make recommendations on where to best focus resources that will most effectively mitigate risk.

#### **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. Five property associations and three local governments provided 27 individuals for a year-long training cycle in 2012.

#### **Impacts reported in Report Overview**

### **"Reading the Range"--Facilitating Range Monitoring in Arizona**

#### **Issue**

Before 2000, range monitoring workshops had been offered for several years by the University of Arizona, yet range monitoring as a standard operating procedure on Arizona ranches had been sporadically adopted. In 2000, a USDA grant "Reading the Range" was obtained and demonstration ranches for range monitoring were established with technical assistance provided. It was hoped that this practice would encourage neighboring ranches to consider implementing similar practices on their ranches. With continued funding and agency collaboration on workshops, equipment and other needs, the practice of range monitoring has steadily gained more active participants within the ranching community over the past 12 years.

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

In an effort organized through the Gila County Extension director, Reading the Range monitoring data was collected collaboratively by the NRCS, US Forest Service, ranchers and their employees and family members, private consultants, and other interested parties from August to December of 2012 on 152 key areas from 43 grazing allotments on the Tonto National Forest. Twenty Extension reports (9,402 pages total) were completed in 2012 for monitoring conducted in 2009 to 2012. A series of talks on various critical aspects of range management were presented at conferences and workshops for ranchers across the state in 2012, and a NEPA (National Environmental Policy Act) for Ranchers handbook was completed and published with input and sponsorship from industry commodity groups.

#### **Impacts reported in Report Overview**

## **Water Wise: Water Conservation in Cochise County**

### **Issue**

Arizona's increasing population has an enormous impact on vast tracts of public and private land. Between 2000 and 2010, Arizona's population increased by just under 25 percent (US Census Bureau). This rapid urbanization permanently alters natural watershed characteristics. According to the United States Geological Survey (2005), the average American uses between 80 and 100 gallons of water daily. Nationally, residential outdoor water use is about 30 percent, but in Arizona due to high temperatures and evaporation rates it is estimated that on average, outdoor water use in Arizona accounts for over 50 percent of a residence's total water consumption. One of the most significant perennial desert river reaches in the United States is the San Pedro River which lies within the Sierra Vista sub-watershed of Cochise County. Balancing the needs of the San Pedro River with the water needs of current and future residents is a top priority for the Cochise County Board of Supervisors, City of Sierra Vista officials, and numerous other government entities and residents.

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

Cochise County, the City of Sierra Vista, and Fort Huachuca have funded the Water Wise Youth, Water Wise Community Education (Sierra Vista Sub-watershed) and Water Wise & Energy Smart (Ft. Huachuca) programs since 1999. These extensive and comprehensive programs are developed and implemented as a team effort, with Cochise County Cooperative Extension responsible for overall program direction, curriculum, and communication with funding partners. Additional funding is provided by the Upper San Pedro Partnership.

Highlights: Water Wise Youth classroom presentations and after school programming activities reached 2,943 students during 2012. The Water Wise Community Education residential program included 45 on-site visits, 22 information racks, 36 workshops/events with 1,025 direct contacts, two xeriscape tours in cooperation with Master Gardeners (140 attendees), and two rainwater harvesting tours (84 attendees). The commercial program conducted eight Industrial, Commercial and Institutional (ICI) building audits. All Cochise County building permit applicants and Sierra Vista newcomers receive Water Wise materials. The Water Wise & Energy Smart program supports U.S. Army Fort Huachuca's water and energy conservation efforts through outreach and education to military personnel, their families, and all who work on post. In 2012, 43 energy audits were conducted, encompassing 432,472 square feet, and 49 school classes reached 1,105 students. The program's website had over 300 visitors from 33 states and 23 foreign countries, reflecting in part the wide geographical territory of its military customers.

### **Impacts reported in Report Overview**

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

Natural resource managers, Governor's Office and state agencies, municipal organizations and leaders, households, consumers, youth, master gardener 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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	25742	30000	4376	5000

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

Year: 2012  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	50	227	277

**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
2012	3

**Output #2**

**Output Measure**

- Number of individuals participating in educational programs

Year	Actual
2012	25742

**Output #3**

**Output Measure**

- Number of individuals adopting new technology

Year	Actual
------	--------

2012

2731

**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 Knowledge Outcome Measure

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

<b>Year</b>	<b>Actual</b>
2012	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 \$1.5 million dollars in non USDA grants were obtained to support this program.

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

<b>KA Code</b>	<b>Knowledge Area</b>
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**

<b>Year</b>	<b>Actual</b>
2012	25000

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

**Issue (Who cares and Why)**

**What has been done**

**Results**

**4. Associated Knowledge Areas**

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

**Outcome #3**

**1. Outcome Measures**

Volunteers completing Master Gardening training

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	952

**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**

952 volunteers donated their time teaching others.

**Results**

Volunteers donated over 29,000 hours in 2012, which @\$21/hr is valued at over \$630,000

**4. Associated Knowledge Areas**

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

**Outcome #4**

**1. Outcome Measures**

Create awareness and increase knowledge

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2012	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**

The majority [est 75%] of the recipients indicated a change in behavior resulting from our 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
121	Management of Range Resources

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

**External factors which affected outcomes**

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

**Brief Explanation**

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

### **Evaluation Results**

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

### **Key Items of Evaluation**

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

**Program # 2**

**1. Name of the Planned Program**

PLANT SCIENCES

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
	<b>Total</b>	100%		100%	

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	30.0	0.0
Actual Paid Professional	8.5	0.0	11.9	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
323034	0	278983	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
323034	0	278983	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**

**Cotton IPM: A Quiet Revolution Reduces Costs, Losses and Risks for Arizona's Cotton Growers**

**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 2012 uses insect growth regulators (IGRs--effective against whiteflies), transgenic cotton (with Bt--Bacillus thuringiensis--effective against pink bollworms), and a reduced-risk feeding inhibitor (effective against Lygus bugs.) Safe for humans, these tools kill only their target pests, allowing natural processes to play a larger role in the management of all other pest insects. Growers have been taught to deploy fully selective materials first and whenever possible. The UA College of Agriculture and Life Sciences initiated the program in collaboration with growers, USDA, Arizona Department of Agriculture, Arizona Cotton Growers' Association, Cotton Incorporated, Arizona Cotton Research & Protection Council, industry and others.

**Impacts are reported in Report Overview**

**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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	24863	25000	1343	15000

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

**Patent Applications Submitted**

Year: 2012

Actual: 1

**Patents listed**

A Potential Vaccine against Coccidioidomycosis and a Drug Target for Treatment of Fungal Disease

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

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	33	194	227

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

**Output Target**

**Output #1**

**Output Measure**

- Number of individuals participating in educational programs

Year	Actual
2012	24863

**Output #2**

**Output Measure**

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

Year	Actual
2012	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
4	Adoption of alternative crop technologies

**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

Not Reporting on this Outcome Measure

**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**

<b>Year</b>	<b>Actual</b>
2012	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**

**UPDATE**

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**

<b>KA Code</b>	<b>Knowledge Area</b>
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

**Outcome #4**

**1. Outcome Measures**

Adoption of alternative crop technologies

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**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

## 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

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

### Evaluation Results

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

### Key Items of Evaluation

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

**Program # 3**

**1. Name of the Planned Program**

FAMILY, YOUTH, AND COMMUNITY

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

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

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	0.0	5.0	0.0
Actual Paid Professional	7.8	0.0	1.0	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
199593	0	102390	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
199593	0	102390	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

### **Project CENTRL (Center for Rural Leadership)**

#### **Issue**

More than ever, rural Arizona is seeking solutions to complex challenges such as: the management and use of our natural resources; food supply, safety, and security; rural urban interface; and building consensus on key public and policy issues such as immigration and health care reform. A pressing question of our time is not "Where will the future lead?", but "Who will lead our future?" Project CENTRL is hard at work in answering this call by preparing highly motivated leaders to be more informed, responsive and effective in meeting the growing challenges facing agriculture and rural 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 in the early 1980's. The first class started in 1983 and with the graduation of Class XXI in June, over 550 have successfully completed the leadership program. After a 30 year tradition of delivering a two year program, the CENTRL Board has adopted a new one year curriculum for Class XXII, which will start in June of 2013. The accelerated program is designed to be more accessible for today's active leaders. The accelerated program consists of seven seminars held in one calendar year. The first two seminars provide growth and development of personal leadership and communication skills. The next series of three seminars develop knowledge on emerging issues facing agriculture and rural Arizona. The final two seminars focus on putting all of the knowledge and skills gained from the program into action at our state and national capitols. The CENTRL Board also adopted a new mission statement: "To equip and empower leaders to meet the needs of rural Arizona".

#### **Impacts reported in Report Overview**

### **First Smiles Oral Health Program in Cochise County**

#### **Issue**

The Arizona Department of Health Services (2013) recommends that all childcare facilities implement oral health care education in their curriculum on a monthly basis and/or age appropriate tooth brushing programs as a requirement for reduced license fees. According to the 2003 Arizona School dental survey 64 percent of six- to eight-year-old children in Cochise County have untreated tooth decay and 16 percent need urgent treatment for dental problems. Nationally children lose 51 million school hours per year due to dental related issues (ADHA 2007). Tooth decaying bacteria may easily be transferred to the infant before the teeth erupt and is the most common chronic disease of childhood. According to the American Academy of Pediatrics (2007), only 1.8 percent of one-year-old children had visited the dentist. The Association of State and Territorial Dental Directors (2011) states that "Intervention programs, early childhood education and child care programs...have proven to be an effective method for connecting children to oral healthcare in a timely manner."

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

First Smiles Oral Health Program, implemented March 2011, provides preventive dental health education, tooth brushing programs and fluoride varnishing to children birth to age five. This program provides education and prevention services to childcare providers/educators on the importance of preventive oral health care and how to recognize and understand oral diseases and conditions. The program also conducts outreach to dentists and other oral health professionals encouraging them to address the oral health needs of children birth through age five. This program has conducted a statewide train-the-trainer workshop to replicate this program in other counties in Arizona (Extension-Yuma, Graham and Greenlee). This program works with Pima County Dental Health and well as other statewide leaders and associations in this field in other counties. Since its inception First Smiles has provided: 1) trainings for 63 professionals and program participants (including 12 centers); 2) 6,089 children with toothbrushes, toothpaste, instruction; 3) 302 trainings on preventing dental cavities; 4) 1,493 oral screenings and fluoride varnish applied to 1,401 children (parental permission was acquired) and 5) referrals for dental needs. Other individuals reached (fairs, meetings, etc.) 400.

#### **Impacts are reported in Report Overview**

**Better Nutrition through EFNEP  
Issue**

EFNEP, the federally funded Extension Food and Nutrition Education Program, addresses the needs of low-income, minority families and youth nationwide. EFNEP improves the health and well-being of participants by teaching them how to stretch food dollars and how to prepare nutritious foods. 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. Participants do not receive food or vouchers for food. 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 2012, EFNEP served 2,033 program families (86 percent female and 14 percent male). Breakdown by race included: 24 percent white, 6 percent African American, 10 percent American Indian, 1 percent Asian and 59 percent Hispanic. Youth participants numbered 5,604 youth (50 percent male and 50 percent female); 82 percent were as young, or younger than, fourth graders. Fifteen FTE paraprofessional nutrition educators delivered the program with assistance from 691 volunteers.

**Impacts reported in Report Overview**

**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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	54981	60000	115382	200000

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	4	20	24

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

**Output Target**

**Output #1**

**Output Measure**

- Number of individuals participating in educational programs

<b>Year</b>	<b>Actual</b>
2012	115382

**Output #2**

**Output Measure**

- Number of educational events, training workshops and clinics

<b>Year</b>	<b>Actual</b>
2012	125

**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 Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	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**

<b>KA Code</b>	<b>Knowledge Area</b>
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 Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

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

**Issue (Who cares and Why)**

Utilization of Vista, AmeriCorps personnel.

**What has been done**

Partnering with US Military, e.g., Operation Military Kids. A 4-H camp and outdoor learning center has been purchased for youth.

**Results**

Utilization of Vista, AmeriCorps and Military individuals greatly increased capacity and outreach of the system. A coordinator for the 4-H camp has been employed.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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 still in the process of being evaluated internally for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are planning to seek further input from stakeholders, advisory committees, and focus groups utilizing needs assessments with the assistance and expertise of an Evaluation Specialist [to be hired]. See State DefinedOutcomes.

The 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 # 4**

**1. Name of the Planned Program**

HUMAN NUTRITION, HEALTH & FOOD SAFETY

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
	<b>Total</b>	100%		100%	

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	9.0	0.0
Actual Paid Professional	4.3	0.0	1.0	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
129665	0	127172	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
129665	0	127172	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

### **Tucson Village Farm: Promoting a Healthy Lifestyle**

#### **Issue**

According to 2011 statistics from the Arizona Department of Health Services, Arizona has the 15th highest rate of obese youth, ages 10 to 17, in the nation. The Center for Disease Control and Prevention reported in 2011 that among high school students in AZ 28% were either overweight (15%) or obese (13%). It also reported that 30% of children ages 2 to 4 participating in the WIC program were obese. Childhood obesity is considered a major health problem in the United States and prevention is a key public health strategy (CDC 2011). The 2011 US Census Bureau statistics show Tucson as the 6th poorest city among the nation's large metropolitan areas with a poverty rate of 20.4% as compared with the national average of 15.9%. Getting kids engaged in physical activity and developing healthier eating habits are strategies for combating obesity. Exposure to and availability of fresh food can lead to healthier eating habits. Research conducted by Canaris (1995) showed that children who grow their own food are more likely to eat fresh fruits and vegetables and to express a preference for these foods. Additionally, studies have shown that children who garden experience increased self-esteem (Cammack, et al., 2002), score significantly higher on science achievement tests (Klemmer, et al., 2005), and show a significant increase in self-understanding and the ability to work in groups (Robinson & Zajicek, 2005).

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

Tucson Village Farm is an innovative program that fosters healthy living and lifestyle choices. TVF works closely with local interest groups including community gardens, youth serving organizations, campus faculty and stakeholders to determine programs (hands-on classes, camps, workshops, field days, etc.) and create events that meet community needs and interests. TVF works with the Family Consumer and Health Science agent to decide best practices for nutrition component. TVF targets low-income at-risk youth, as defined according to US census data. Offering programs and activities which allow direct access to healthy food is one of TVF's goals. TVF modifies and changes programming based on evaluations conducted. The facility includes an acre of food production, four covered outdoor learning areas, irrigation, fencing, two barns (one used as a classroom and one for storage) and a newly donated shade structure. In addition to Extension staff (agent, part-time program coordinator, instructional specialists, Americorps volunteers, VISTA members, UA students serving as externs and community volunteers. TVF activities reach a variety of ages, from toddlers, preschoolers and K-12 through college and adult, including school groups, families and community organizations.

**Impacts are detailed in the Report Overview**

### **SNAP-Ed (Supplemental Nutrition Assistance Program-Education)**

#### **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 help low income people buy the food they need for good 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. The theme "Champions for Change--MyPlate" encourages healthy eating by consuming more fresh fruits and vegetables, more whole grains, using healthy recipes 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.

**Impacts are detailed in the Report Overview**

### **Smartphone Diagnostics & Fast PCR Assay for Food Safety & Animal Diseases**

#### **Issue**

Foodborne diseases and animal diseases are widespread and growing public health problems, both in developed and developing countries. Detecting foodborne contaminants or animal pathogens usually involves collecting a food or animal sample, sending it to a laboratory and waiting for the samples to be filtered, incubated/amplified, tested and identified under a microscope or gel-doc device. If a critical infection is suspected, say for highly dangerous E. coli O157:H7 or foot-and-mouth disease, the pathogen may already have multiplied and spread before the report arrives days later.

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

1. Previously, a series of "lab- on-a-chip" (LOC) devices was developed at the Biosensors Laboratory in the College of Agriculture at the University of Arizona. The silicon-based LOC has been replaced with paper platform, called paper microfluidics, and subsequent optical detection has been made with the use of a smartphone, utilizing its white LED flash as a light source, its digital camera as a light detector, and a software application for data processing.

2. Another new method of conducting polymerase chain reaction (PCR) in much faster assay time, called wire-guided droplet PCR device, has been invented by the Biosensors Laboratory at the University of Arizona. The device is potentially handheld, very fast (down to 3 min for thermocycling and <15 min of total assay time), and can detect the presence of pathogens directly from whole blood (not possible with conventional PCR techniques).

**Impacts are detailed in the Report Overview**

#### **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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	166115	200000	22753	50000

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 2

**Patents listed**

VIBE Pedometer

Plant Antimicrobial Washes for Use on Organic Leafy Greens

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

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	8	114	122

**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
2012	0

**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
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

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

**Issue (Who cares and Why)**

{No Data Entered}

**What has been done**

{No Data Entered}

**Results**

{No Data Entered}

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
702	Requirements and Function of Nutrients and Other Food Components
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

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

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

**Issue (Who cares and Why)**

{No Data Entered}

**What has been done**

{No Data Entered}

**Results**

{No Data Entered}

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
702	Requirements and Function of Nutrients and Other Food Components
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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

**External factors which affected outcomes**

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

**Brief Explanation**

{No Data Entered}

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

**Evaluation Results**

{No Data Entered}

**Key Items of Evaluation**

{No Data Entered}

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

**Program # 5**

**1. Name of the Planned Program**

MARKETING, TRADE & ECONOMICS

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
605	Natural Resource and Environmental Economics	15%		20%	
610	Domestic Policy Analysis	85%		80%	
	<b>Total</b>	100%		100%	

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	0.0	0.0
Actual Paid Professional	1.4	0.0	3.1	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
39089	0	334467	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
39089	0	334467	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

## **Improving Desert Agricultural Production and Produce Safety**

### **Issue**

Commercial agricultural production within Western Arizona (Yuma County) represents over 1/3 of Arizona's output with revenues from approximately 250,000 producing acres exceeding \$3.9 billion in 2010 (Arizona Department of Agriculture, 2011). Since 2005, the specific needs of agricultural producers in the region have been assessed on an annual basis. In 2011, this countywide appraisal, in collaboration with the Arizona Department of Agriculture, was extended statewide resulting in a statewide Extension and outreach effort whose focus covers all field production and handling aspects of fresh produce safety. In 2012, less comprehensive program assessments were evaluated at the conclusion of field day events, meetings, workshops and interaction with grower groups.

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

The "Enhancing Desert Crop Production and Produce Safety" program identifies current problems and issues facing agricultural producers in the region, and develops new and appropriate technologies, tools and cropping schemes for greater crop uniformity, quality and production. It coordinates Extension efforts with departmental collaboration in the UA College of Agriculture and Life Sciences, state regulatory agencies and industry representatives to deliver information through various avenues to benefit Arizona producers. The 2012 proposed short term outcome goals were to disseminate university-, extension- and agent-developed curricula, publications and other information to more than 1,200 clients within the state via meetings/workshops and one-on-one contacts. By adopting innovative agricultural schemes and technologies into current management practices, growers will be better prepared for a future of changing agricultural landscapes with improved farm profitability and minimized adverse effects to the environment.

### **Impacted reported in Report Overview**

## **Risk Management Education for Agricultural Producers**

### **Issue**

The Risk Management Education (RME) program provides U.S. agricultural producers with the knowledge, skills and tools needed to make informed risk management decisions for their operations, with the goal of enhancing farm profitability.

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

During 2012, Risk Management Education (RME) was delivered through Arizona Cooperative Extension to an estimated 1,050 producers and govt. agency personnel through 37 oral conference presentations and hands-on computer workshop trainings across Arizona and outside the state. Topics ranged from Beginning Farmer curricula, including "Direct Farm Marketing for Specialty Crops: Implementing a Plan" and "Recordkeeping and Cash Flow" to presentations for ranchers on "Outlook for Livestock and Feed Markets and Tools to Mitigate Risks," for cotton growers on "Economic History and Outlook for Cotton Production," and to producers in Hawaii on "Marketing, Adding Value, and Agritourism."

### **Impacts reported in Report Overview**

## **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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	47508	75000	35371	50000

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

**Patent Applications Submitted**

Year: 2012

Actual: 1

**Patents listed**

Aquaculture Raceway Integrated Design

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

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	7	11	18

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

**Output Target**

**Output #1**

**Output Measure**

- School districts, youth, and adults will address obesity issues  
Not reporting on this Output for this Annual Report

**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

Not Reporting on this Outcome Measure

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

**Key Items of Evaluation**

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

**Program # 6**

**1. Name of the Planned Program**

ANIMAL SCIENCES

Reporting on this Program

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	10%		2%	
302	Nutrient Utilization in Animals	15%		9%	
305	Animal Physiological Processes	5%		19%	
306	Environmental Stress in Animals	20%		16%	
311	Animal Diseases	50%		54%	
	<b>Total</b>	100%		100%	

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

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890

Actual Paid Professional	1.6	0.0	2.5	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
51825	0	288484	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
51825	0	288484	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**

#### **Conduction Cooling Systems: Improving Production in Dairy Cattle**

##### **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. Further studies using conduction cooling systems were held in Arizona, California and Texas in 2012. Currently, the test model is being run in the controlled environmental rooms in the William Parker Agricultural Research Complex at the Campbell Research Farms. Once these are completed a full study will be run at a commercial dairy in summer, 2013.

##### **Impacts reported in Report Overview**

#### **Campylobacter Vaccine for Poultry Targets Human Foodborne Illness**

##### **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, Campylobacter is the second most common cause of foodborne diarrheal illness, causing an estimated 1.3 million cases annually, resulting in health care costs between \$0.8 billion and \$5.6 billion per year. Per capita consumption of chicken in 2011 was a substantial 84.2 pounds, according to statistics reported by the National Chicken Council, indicating consumers' frequent exposure. New performance standards adopted in July 2011 for chicken processing establishments allow no more than 8 positive Campylobacter

samples out of a 51-sample set on chicken. These strict standards will be difficult to meet with current intervention strategies and plants risk being shut down with significant economic effect.

**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 reduces the number of Campylobacter cells within the intestine, so ultimately less Campylobacter is transferred to humans and therefore significantly fewer foodborne illnesses will occur. The vaccination process is simple; it is easy to produce and safe. The Salmonella is engineered to live long enough to stimulate antibody production, is attenuated so it cannot produce disease in chicks or humans, and dies before the chicks are harvested. 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, which together may express Campylobacter to a degree that will prevent colonization completely.

**Impacts reported in Report Overview**

**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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	4939	5000	4684	5000

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

**Patent Applications Submitted**

Year: 2012

Actual: 4

**Patents listed**

- Development of Protein Therapeutics for Cancer Treatment
- Synergistic Vaccine to Reduce Campylobacter jejuni in Chickens
- A Vaccine to Prevent Swine Dysentery in Pigs
- Control of Milk Production and Mammary Involution

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

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	1	77	78

**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.

<b>Year</b>	<b>Actual</b>
2012	20

**Output #2**

**Output Measure**

- Number of individuals gaining knowledge by participating in educational programs, such as range livestock nutrition workshops.

<b>Year</b>	<b>Actual</b>
2012	89

**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 affect the above external factors.

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

#### **Evaluation Results**

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

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