2013 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, and 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. With offices in all 15 counties and on five tribal reservations, we bring knowledge to people every day to enhance their work and enrich their lives.

• 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.

Research is conducted in the various departments and schools on campus, as well as at Agricultural Centers throughout the state. Research generated through the Experiment Station underlies and supports the academic and extension programs.

The College of Agriculture and Life Sciences has six programmatic focus areas:

- Environment, Water, Land, Energy and Natural Resources
- Children, Youth, Family and Community
- Human Nutrition, Health and Food Safety
- Marketing, Trade and Economics
- Animal Systems
- Plant Systems

Environment, Water, Land, Energy and Natural Resources

Forest Health and Wildfire Risk Reduction and Education

In 2013, the number of properties included in a mapping and reporting process in local communities increased to 6,373, and 2,723 property owners have now 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.

Natural resource revenue (new money) totaling $26.5 million was developed through forest contracts associated with the restoration efforts on public land. 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.

On the 82,000 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.** Within restored areas the elk/livestock competition for feed has ended.

Children, Youth, Family and Community

First Smiles Oral Health Program

According to the National Institute of Health, on average Americans spend $31,341.32 on dental work over a lifetime. And according to the Centers for Disease Control and Prevention the amount can be reduced by 40% with preventive care before the age of one, lowering this amount to $12,573 spent on dental work over a lifetime. The potential combined savings for those receiving fluoride applications or having dental care after the program in Cochise, Graham, Greenlee, La Paz, Mohave and Yuma counties during 2013, equates to $83,170,395 for 6,615 children over a lifetime.

School IPM in Arizona

Practicing IPM in schools reduces pest incidence by an average of 78% and pesticide use by 71%. In Arizona, pest incident reports have dropped by 85% for all School IPM programs combined. School districts partnering with the School IPM program during 2013 reported reduced pesticide inventories. An analysis of pest control products used in schools showed that all products labeled "Warning" and "Danger" were eliminated from 75% of districts partnering on the Indoor and Out program (which expands the initial IPM program to include landscape and grounds areas.) Mesa Unified School District now trains 100% of its custodial and maintenance staff annually on school IPM.

Metro Tech High School has improved its overall IPM score for consecutive years dating back to 2004, with another improvement of over 15% for 2013. Over the past year the school reduced bedbug incidence by more than 75% as a result of adopting a bedbug IPM policy. Additionally they host trainings for local school district staff and share their policy and experience. Phoenix Union High School District, which includes Metro Tech, is one of the largest high school districts in the country, with 16 high schools, over 27,000 students, and approximately 3,000 employees. Phoenix Union covers 220-square miles of Arizona's capital city. The district's quality assurance and sustainability specialist, in partnership with School IPM program faculty are expanding the bedbug policy to the K-8 students in the 13 elementary partner schools, which will eventually impact over 110,000 students.

Human Nutrition, Health, and Food Safety

Tucson Village Farm: Promoting a Healthy Lifestyle

During 2013 Tucson Village Farm served more than 22,300 children and adults from Tucson and across the Arizona through a variety of programs and garnered rising attendance, sponsorship, and extensive print and broadcast coverage. Community volunteers provided 3,227 hours of volunteer time valued at a monetary equivalent of $68,928.72 (3227 x $21.36). In the Lil' Sprouts program for preschoolers and their parents, 98% of the parents reported that their child learned something new and 78% reported their child expressed an interest in eating new fruits and vegetables as a result of the program. Of the 112 youth who completed Farm Camp, 92% reported they learned something they could use at home, 93% said they would eat more grains, 96% intended to add more fruits and vegetables to their diet and 98% had tried a new food. A survey conducted among high school students participating in Teens Advocating for Sustainable Change indicated an average change in fruit and vegetable consumption from 1-3 times per week to 4-6 times per week (n=50).

Smartphone Biosensors for Food Safety, Animal Diseases and Human Health

The smartphone-based paper microfluidics technology is even easier to carry and operate, and extremely cheap. E. coli and Salmonella detection have successfully been demonstrated from their bacterial culture, from field water samples, and from ground beef at the same impressive detection limit of 10 cells per milliliter sample, in less than 2 minutes of assay time. By comparison, other "fast" microfluidic assays are typically very insensitive (with a detection limit of >1,000 cells), while "sensitive" microfluidic assays require a long assay time of more than 4 hours.

Commercialization of the fast droplet PCR technology is being sought with support from Tech Launch Arizona (Proof-of-Concept program) and a research grant from the Animal and Plant Quarantine Agency.

A smartphone is again used to quantify and monitor the PCR process, as well as a primary user interface for the "portable" WDM PCR device. Additionally, the device is made "all-in-one," where the sample preparation, amplification and product identification are all performed in a single WDM PCR device. In this manner, the total assay time can be reduced from 3-6 hours in a laboratory (with substantial manual labor by skilled personnel) to less than 30 minutes in the field (with fully automated operation, from sample to answer).

Better Nutrition through EFNEP

89% of the participants completed their classes in 2013, and 100% attended group classes. Post-participation dietary surveys from the 1,922 program families statewide, based on 1,463 persons responding, showed that 73% showed improvement in one or more nutrition practices (plans meals, makes healthy choices, reads labels, children eat breakfast); 69% showed improvement in one or more food resource management practices (plan meals, compare prices use grocery list or doesn't run out of food); 47% always followed food safety recommendations, 44% thought about healthy choices when deciding to feed their families and 43% planned meals in advance more often.

Marketing, Trade and Economics

Improving Desert Agricultural Production and Produce Safety

Increased Wheat Production Efficiency: In 2013, over 40,000 acres were planted to wheat in Yuma County, all following a winter vegetable crop. As an outcome of this program, 20% of Yuma area wheat producers have now incorporated a form of minimum tillage practices in their production schemes with significant savings on fuel, labor and 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. During the 2013 produce season, approximately 50% of romaine and 10% of iceberg lettuce was 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. The host-free period assisted in a 10%

reduction in the severity of the disease in the fall 2013 melon crop.

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.

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% 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% 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 45 in 2013--of USDA-certified Arizona GHP/GAP growers.

Sustainable Economic Development: Solar Energy

· Evaluations of the Renewable Energy Opportunities workshop in Willcox indicated an overall average rating of 4.0 out of 5 where 5 is Very Valuable for overall presentation. Respondents noted their intent to pursue solar installations for their home or to look into other residential applications for solar energy.

· The data and maps from the Renewable Energy Opportunity Analysis (REOA) for southern and central Arizona are now being incorporated into city and county Geographic Information Systems (GIS) so that planners and decision-makers will have immediate access to maps showing areas of low, moderate or high opportunity for the construction of utility-scale solar facilities throughout their jurisdiction.

· Specifically, the City of Bisbee used outputs for the area south of Bisbee where the wastewater treatment plant is located to justify to Arizona Public Service (APS) their request to power that facility with a solar array and save on the city's electric bills. The Mayor of Bisbee noted in a letter regarding the data "For several years, employees of the City of Bisbee have talked extensively about the feasibility of installing solar panels at the City's wastewater treatment plant to provide a portion of the necessary power to operate the installation...The solar analysis that you provided me several months ago was very useful and helped us make the decision to move forward. I also shared the analysis with members of the Arizona Corporation Commission and the Governor's Office of Energy Policy when we discussed other possible solar energy opportunities in Cochise County."

· The GIS data was provided to and incorporated by the planners for the Hualapai Tribe in north-central Arizona and shared with solar developers, the TAWA Power Partners, interested in developing solar facilities around Peach Springs.

· The REOA methodology was shared by a consultant with the North Carolina Sustainable Energy Association and various University of NC research bodies across the state. These entities are interested in replicating our methodology using their own, local data.

· In Maricopa County, our data and results are being used by the Solar Planning Program Manager who writes "One of the initiatives I have on my plate is to create development standards for PV solar that would allow utility-scale PV as a Conditional Use given certain constraints. Your spatial data will help me in that effort as I analyze the potential for solar energy. This data will also help the other planners as they process other types of land use cases as they will be able to assess the potential proximity to future solar projects."

Animal Systems

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 99% reduction of the Campylobacter load on chickens, such as that supplied by the vaccine in development at the UA, would reduce the incidence of campylobacteriosis associated with chicken meals by a factor of 30 (e.g., reduced incidence of 300 cases in humans down to 10 per 100,000 population). 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, thereby resulting in significantly reducing the number of human illnesses.

Cooling Cows to Increase Milk Production

Cows cooled by FlipFan spent more time lying down compared with those cooled by the traditional system (stationery fans) as the control. Cows under FlipFan had more frequent lying bouts than did those under control. Lower core body temperature and decreased standing time are consistent with the findings of other studies when ambient heat load was reduced. In the second experiment, the FlipFan system achieved a lower temperature humidity index in the morning and evening (5.9% and 1.7%, respectively), and the temperature humidity index also tended to be 0.8% lower in the afternoon compared with that of control. Results indicate that FlipFan is more effective than a stationary fan and mister system at decreasing core body temperature, increasing lying time and bouts, and providing a more desirable microenvironment for cows throughout the day in a semiarid environment.

Plant Systems

Cotton Integrated Pest Management for Arizona

- The fully implemented, collaborative cotton IPM program has registered significant gains since its inception in 1996. Growers used to spray 100% of their acreage multiple times for insect pests. Now on average, about 25% of all cotton acres are never sprayed for insects.
- Reductions in control costs and yield losses to arthropods have saved cotton growers more than $388 million since 1996.
- All-time record gains: Growers reduced their need to spray by 88%, down to only 1.5 times per season; their costs by 81%, and the amount of insecticides used by 77%, equivalent to applying less than a can of soda on an entire football field in one year.
- The Arizona cotton IPM program, including adoption of Bt cotton and whitefly-specific insect growth regulators since 1996 and a selective Lygus feeding inhibitor since 2006, has reduced risks to human health and the environment by eliminating over 1.6 million pounds of insecticide active ingredient annually, down 90% compared to 1995.
- The cotton IPM plans developed in Arizona have been exported for use in California, Texas, Australia, Latin America and northern Mexico.

Arizona Cotton IPM in Mexico

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 40% in 2012. At least 75% of those sprays were reduced-risk insecticides, safe to beneficial insects and to workers. This represents a reduction of more than 60% for the cooperative, and 51% for Mexicali-San Luis region in the use of broadly toxic insecticides. Yields from this cooperative were higher than in 2010 or 2011. This cooperative increased their acreage by about 500 acres in 2013, despite market conditions and overall reductions in the remainder of the Mexicali Valley and San Luis Valley (decreasing by almost 20,000 acres). For the region, all insecticides combined were reduced by 30-40%, saving more than $1.6 million in 2012 alone, the most recent figures available. Link: http://cals.arizona.edu/apmc/Mexicali_cotton.html

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	46.0	0.0	100.0	0.0
Actual	75.0	0.0	140.7	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 Dean oversees this process and ensures that any suggested changes are made to the satisfaction of the reviewers and the Associate Dean. 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.

Future plan for additional input pending:
Our County Extension Director's Visioning Group will be sending out a broad reaching survey to audiences that may not know what Cooperative Extension is, or have only some small idea. We are in the process of finalizing the survey instrument, and identifying how we will collect the data. It is part of the stakeholder input process and will help CE program directions in the future.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

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

Future plans for additional input:
Our County Extension Director's Visioning Group will be sending out a broad reaching survey to audiences that may not know what Cooperative Extension is, or have only some small idea. We are in the process of finalizing the survey instrument, and identifying how we will collect the data. It is part of the stakeholder input process and will help CE program directions in the future.

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 faculty meeting with the stakeholder groups throughout the year and providing them with written materials for their review and input. This may be expanded to a web-based survey available to all interested.

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. We are currently in the process of reassessing all our programs.

Brief Explanation of what you learned from your Stakeholders

Stakeholders are very concerned about the federal debt, the national and world economy, and the lack of federal support and continued lack of 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
1771411	0	2279877	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1771411	0	2279877	0
Actual Matching	1771411	0	2279877	0
Actual All Other	0	0	0	0
Total Actual Expended	3542822	0	4559754	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

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	21.0	0.0
Actual Paid Professional	3.8	0.0	3.5	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
514595	0	636998	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
514595	0	636998	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

Forest Health 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 2013, 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. Five property associations and three local governments provided 27 individuals for seasonal training cycles in 2012 and 2013.

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% (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%, 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% 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 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.

Highlights:Water Wise Youth classroom presentations and after school programming activities reached 1,695 students during 2013; an additional 1,015 students participated in out of classroom teaching events. The Water Wise Community Education residential program included 68 on-site visits, 26 information racks, 23 workshops/events with 416 direct contacts, one xeriscape tour in cooperation with Master Gardeners (130 attendees), and two rainwater harvesting tours (35 attendees). The commercial program conducted 11 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 2013, 61 energy audits were conducted, encompassing 2,767,756 square feet, and 61 school classes reached 1,510 students.

Impacts reported in Report Overview

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	35000	40000	307	2000

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

Patent Applications Submitted

Year:	2013
Actual:	1

Patents listed

Curable Composition, Paste, and Oxidatively Carbonated Composition

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	139	168	307

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Effectiveness of the research program will be used to reach direct and indirect contacts
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2013	35307

Output #3

Output Measure

- Number of individuals adopting new technology

Year	Actual
2013	1500

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

Year	Actual
2013	307

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

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
2013	35307

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

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 #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

Year	Actual
2013	637

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
2,216 volunteers donated their time teaching others.

Results
Master Gardener Volunteers donated over 91,000 hours in 2013, which @$21/hr is valued at $2M.

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 #4

1. Outcome Measures

Create awareness and increase knowledge

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	29510

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
2,216 Master Gardener volunteers shared information directly with 29,510 program participants.

Results
The majority of the recipients consistently indicate a change in knowledge 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 in the process of being evaluated for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. 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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	30.0	0.0
Actual Paid Professional	4.5	0.0	3.8	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**
535143	0	699922	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
535143	0	699922	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 Integrated Pest Management for Arizona

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% 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 the 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 2013 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 reported in Report Overview

Arizona Cotton IPM for Mexico

Issue

In the border region of Mexico (population 1 million), 30,000 hectares (74,132 acres) of cotton has often been subject to broadly toxic pesticide use, affecting more than 15,000 agricultural workers. An integrated pest management program (IPM) established in Arizona in 1996, refined in 2006 and continued through 2013 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. The cotton IPM plans developed in Arizona have been exported for use in California, Texas, northern Mexico, Australia and Latin America.

What has been done?

The entire cotton industry of Mexicali Valley and San Luis Valley in Baja Mexico has participated in the UA's exported Cotton IPM Extension program. Arizona Cooperative Extension has worked directly with 11 different cooperatives that account for more than 95% of the cotton acreage in the area: 93,500 acres. 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.

Impacts are reported in the Report Overview

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	28000	50000	249	25000

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

Patent Applications Submitted

Year:	2013
Actual:	2

Patents listed

Method for Increasing Stress Tolerance in Plants
Pollen Tube Stimulants from Arabidopsis Pistils

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	141	143	284

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2013	28249

Output #2

Output Measure

- Number of research projects conducted on all aspects of Plant Sciences, Animal Sciences, and Agriculture and Resource Economics
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

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

Year	Actual
2013	137

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

Year	Actual
2013	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
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants

Outcome #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

Year	Actual
2013	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
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 in the process of being evaluated for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	9.0	0.0
Actual Paid Professional	1.6	0.0	0.8	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
167753	0	160731	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
167753	0	160731	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 Arizona 28% were either overweight (15%) or obese (13%). It also reported that

30% of children ages 2 - 4 participating in the WIC [women, infants, & children] 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% 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.

What has been done?

Tucson Village Farm is a 4-H youth gardening program that fosters healthy living and lifestyle choices by offering programs and activities that allow direct access to healthy food. Designed for low-income at-risk youth, TVF works closely with local interest groups including community gardens, youth serving organizations, campus faculty, staff, volunteers,and stakeholders to determine programs (hands-on classes, camps, workshops, field days, etc.) and create events that meet community needs and interests. The facility includes an acre of food production, four covered outdoor learning areas, irrigation, fencing, two barns, a wood-burning oven, a mushroom shed and a handicap-accessible ramp. The program is delivered by Extension staff (agent, part-time program coordinator and instructional specialists), Americorps volunteers, and VISTA members, and UA students serving as externs and community volunteers. TVF activities reach a variety of ages, from toddlers, preschoolers, and K-12 through college, and adults; from school groups, families, and community organizations, and the general public.

Impacts reported in Report Overview

Smartphone Biosensors for Food Safety, Animal Diseases and Human Health

Issue

Infectious pathogens from food, animals and humans are widespread and growing public health problems, both in developed and developing countries. Detecting such pathogens usually involves collecting a food/water sample or a blood/urine specimen, 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, avian flu or malaria, the pathogen may already have multiplied and spread before the report arrives days later.

What has been done?

• 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.

• Another new method of conducting polymerase chain reaction (PCR) in much faster assay time, called wire-guided droplet manipulation (WDM) PCR device, has been invented by the Biosensors Laboratory at the University of Arizona. The device is potentially handheld, very fast (down to 5 min for thermocycling and less than 30 min of total assay time), and can detect the presence of pathogens directly from whole blood or a tissue sample (not possible with conventional PCR techniques).

Impacts 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 6 to 8 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 2013, EFNEP served 1,922 program families (86% female/14% male). Breakdown by race included:

24% white, 6% African American, 10% American Indian, 1% Asian and 59% Hispanic. Youth participants numbered 3,986 (50% male/50% female); 82% were as young as, or younger than, 4th graders and 63% were enrolled in more than one food assistance program. 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

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

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	130000	200000	90439	150000

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

Patent Applications Submitted

Year: 2013

Actual: 1

Patents listed

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

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	36	1	37

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
2013	37

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

Not Reporting on this Outcome Measure

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 for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	0.0	5.0	0.0
Actual Paid Professional	3.5	0.0	0.5	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
352865	0	81392	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
352865	0	81392	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

First Smiles Oral Health Program

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% of 6- to 8-year-old children in Cochise County have untreated tooth decay and 16% 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% 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, an initiative of First Things First implemented through UA Cooperative Extension in March 2011, provides preventive dental health education, tooth brushing programs and fluoride varnish application for children birth to age five. The 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. Train-the-trainer workshops have replicated this program in several counties in Arizona. During 2013, First Smiles programs in Cochise, Graham, Greenlee, LaPaz, Mohave and Yuma counties provided the following services: taught 10,730 children and 7,767 parents; trained 121 professionals; applied fluoride varnish on 6,615 children; and gave out 15,060 toothbrushes.

Impacts reported in Report Overview

School IPM in Arizona

Issue

The Western Region School IPM Implementation and Assessment Work Group was established to encourage collaboration among university, state and federal agencies, industry, and advocacy groups working to encourage and enhance successful implementation of IPM in schools in the western region (98 representatives from 13 states, 3 countries and 4 Tribes). The National School IPM 2015 steering committee is made up of regional working group leads, and focuses on networking community IPM advocates and leveraging funds for IPM implementation in schools and child-care facilities (EPA PRIA II, IPM Center funds, CDC funds). Representatives from all 50 states are actively involved.

What has been done?

The University of Arizona Community IPM Leadership Team, part of Cooperative Extension in the College of Agriculture and Life Sciences, provides multidisciplinary expertise to help schools implement safe and effective Integrated Pest Management (IPM) programs that reduce risks from pests (insects, rodents and weeds) and pesticide use in schools, landscapes and playing fields. IPM is an economically viable and environmentally sound strategy that is the safest and most cost-effective way to reduce pest problems in schools. School personnel are trained to inspect and maintain sanitary conditions in classrooms to prevent pest infestations from occurring in the first place. Only the safest of pest control

techniques including judicious use of the safest pesticides are included in sustainable IPM strategies.

The Community IPM Team interfaces with every public school district in Arizona on a regular basis. The team serves as a resource for independent IPM advice for all who request assistance. The Team provided 10 training events (with post-test scores showing improvements in knowledge of 21-47%), 10 newsletters on hot topics, 2 extension publications in response to stakeholder requests, and 8 site inspections and evaluations involving 7 school districts.

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

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	142936	500000	109405	750000

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	42	60	102

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of individuals participating in educational programs

Year	Actual
2013	142936

Output #2

Output Measure

- Number of educational events, training workshops and clinics

Year	Actual
2013	500

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

Year	Actual
2013	2771

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 youth development 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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	850

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Utilization of Vista, AmeriCorps personnel.

What has been done
We are 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

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 for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

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	25%		15%	
302	Nutrient Utilization in Animals	20%		10%	
305	Animal Physiological Processes	15%		20%	
306	Environmental Stress in Animals	15%		20%	
311	Animal Diseases	25%		35%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Actual Paid Professional	0.5	0.0	1.5	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**
72096	0	305732	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
72096	0	305732	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

Campylobacter Vaccine for Poultry Targets Human Foodborne Illness

Issue

Campylobacter is the second most common cause of human foodborne diarrheal illness in the United States, causing an estimated 1.3 million cases annually and resulting in health care costs of somewhere between $800 million to $5.6 billion per year. The handling and consumption of poultry is considered to be the most significant risk factor in transmission of the bacteria to humans. The U.S. has the largest broiler chicken industry in the world, producing approximately 8.41 billion broiler chickens in 2012. Chicken consumption surpasses both beef and pork consumption. In 2011, the USDA implemented new performance standards for Campylobacter on chicken carcasses at processing establishments. These standards allow no more than eight positive Campylobacter samples in a 51-sample set. To date, there is no vaccine available to industry to reduce the numbers of Campylobacter in poultry and intervention strategies remain insufficient.

What has been done?

Funded by the USDA, faculty and graduate students in the UA School of Comparative and Biomedical Sciences, along with Dr. Roy Curtiss' team at ASU, 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 researchers are working with the UA's Tech Launch Arizona to partner with industry to further develop the vaccine to meet the needs of industry. Poultry vaccine studies are continuing to align with these goals.

Impacts are reported in Report Overview

Cooling Cows to Increase Milk Production

Issue

Heat stress during the warmest months causes decreases in milk yield, increases in disease incidence and also increases in maintenance costs per cow. Research has shown that compared to 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% of the dairy industry's carbon footprint, and 75% of its electricity and fuel use. Cows readily seek shade to reduce solar heat load during periods of high ambient temperature. Typically, auxiliary cooling systems are oriented to maximize cooling for shaded cows. However, when a shade structure is oriented north-south, stationary fan and mister cooling systems are unable to track shade as the sun's angle shifts throughout the day, and thus can become ineffective.

What has been done?

The FlipFan Dairy Cooling System (Schaefer Ventilation Equipment, Sauk Rapids, MN) employs fans and misters that follow shade and compensate for wind speed by rotating on a horizontal axis. A study involving 144 lactating Holstein cows on a commercial dairy in Arizona were cooled by a fixed system comprised of stationary fans and misters acting as control or the adjustable FlipFan operated for 16.5

hours per day. Core body temperatures of 64 cows (4 pens/treatment; 8 cows/pen; 6 d) and lying behavior of 144 cows (4 pens/treatment; 18 cows/pen; 5 d) were collected. In a second experiment, isothermal maps were developed using a fixed system of thermal data loggers arranged in the shaded areas of the pens at different times of day and were analyzed for differences in the temperature-humidity index (THI) achieved by each cooling treatment.

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. Plans are underway to attempt to include non-traditional audiences.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1300	3000	559	1500

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

Patent Applications Submitted

Year:	2013
Actual:	1

Patents listed
Targeted Cryptosporidium Biocides

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	22	25	47

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
2013	0

Output #2

Output Measure

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

Year	Actual
2013	254

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.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	432

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
311	Animal Diseases

Outcome #2

1. Outcome Measures

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

fg

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

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	40%		60%	
608	Community Resource Planning and Development	20%		10%	
610	Domestic Policy Analysis	40%		30%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Actual Paid Professional	0.8	0.0	2.1	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
128959	0	395102	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
128959	0	395102	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 multi-cropped acres exceeding $3.2 billion in 2012 (Arizona Department of Agriculture, 2012). Since 2005, the specific needs of agricultural producers in the region have been assessed on an annual basis. In 2012, 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 2013, 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.

Impacts reported in Report Overview

Sustainable Economic Development: Solar Energy

Issue

Residential construction and development are not driving Arizona's in the way it did in 2008. There is a glut of vacant housing, due to foreclosures, because of over entitlements granted in the mid-2000s. The future of economic development and community resiliency in Arizona will depend on a diverse economy that isn't reliant on just one sector such as housing or resource extraction--both vulnerable to boom-bust cycles. Enhancing local food systems and renewable energy are two areas that this program is assisting with to build more resilient communities that will be better prepared to weather future economic downturns.

What has been done?

Started in 2011, Renewable Energy Opportunity Analysis (REOA) was completed in 2013 to include all counties, cities and lands throughout the state. This analysis was conducted to provide decision-makers, solar developers and communities with maps and GIS shapefiles that identify the areas within their communities that are best suited for the siting of utility-scale solar facilities. The analysis used fundamental land use criteria such as the location of roads, transmission lines, substations, slope and aspect as weighted determinants of suitability. An agent with the UA College of Agriculture and Life Sciences Cooperative Extension and a professor from the UA College of Social and Behavioral Sciences (formerly of CAPLA), supervised the GIS modeling process as well as the creation of the maps for each

region of the state. The maps are accessible online. While the aim of this effort has been to publicize the availability of these maps and data as widely as possible, the maps have also been provided to cities, counties and individuals upon request, tailored to their specific area.

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

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4700	7500	16	2500

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	6	61	67

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased financial stability of Arizona's producers
2	Number of individuals gaining knowledge by participating in educational programs

Outcome #1

1. Outcome Measures

Increased financial stability of Arizona's producers

Not Reporting on this Outcome Measure

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
2013	4716

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
608	Community Resource Planning and Development
610	Domestic Policy Analysis

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

All programs are currently in the process of being evaluated for existing areas to preserve, protect, or enhance, as well as areas to discontinue or modify. We are beginning the process 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]. Plans are also underway to seek input from non-traditional audiences. See State DefinedOutcomes.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Childhood Obesity

☐ Reporting on this Program

Reason for not reporting

We do not have the resources to sustain this as a separate program. The information will be incorporated into our Human Nutrition, Health & Food Safety State-Defined program.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	2.0	0.0
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct workshops, research, meetings, school enrichment, and information delivery.

2. Brief description of the target audience

Special focus on youth/adult interaction.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	6	4	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Reduce childhood obesity

Outcome #1

1. Outcome Measures

Reduce childhood obesity

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}