


**UNIVERSITY OF ARIZONA**  
**COLLEGE OF AGRICULTURE AND LIFE SCIENCES**  
**AGRICULTURAL EXPERIMENT STATION**  
**&**  
**COOPERATIVE EXTENSION**

**Annual Report of Accomplishments and Results**

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## **PROGRAMS**

### **Overview:**

Integration and collaboration are the cornerstones of the College of Agriculture and Life Sciences programs at the University of Arizona. Research and Extension programs are integrated in the scholarship of discovery, integration and application. Extension specialists carry a joint research appointment and many research faculty carry a joint extension appointment. In addition, where appropriate in our distributed educational system, many of our joint extension/research faculty have a formal teaching appointment. Our approach is to provide an integrated and multi-functional approach as we address the diversity of needs across the State of Arizona. We provide these select impacts as they reflect unique benefits to a diversity of clientele and stakeholders. Finally we provide our own assessment of accomplishments based on the 5-year Plan of Work for the appropriate report period.

### **Goal 1: Competitive agricultural systems in a global economy**

#### **Arizona Meteorological Network (AZMET) Assists Crop Decisions**

##### ***Impact Nugget***

The Arizona Meteorological Network (AZMET) is now widely accepted as an important (and often the only) source of meteorological information pertaining to the production of agricultural and horticultural crops in Arizona; users accessed AZMET web pages more than 173,000 times in 2004, the turf web page was accessed more than 10,000 times, and in conjunction with personnel affiliated with the Ft. Mohave Indian Reservation, AZMET evapotranspiration information is now used to schedule irrigations on more than 20,000 acres of cotton and alfalfa in western Arizona.

##### ***Issue***

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

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

A network of 28 automated weather stations was established in Arizona to supply meteorological data from important agricultural production areas and selected urban locations. Meteorological data obtained by the stations are transferred to a Tucson-based data processing center each night where computers process the data into a variety of informational formats. AZMET data and reports are made available to the public free of charge via three Internet web pages.

AZMET expanded the turf water management program to three northern Arizona cities in 2003. Weather stations were installed in Flagstaff, Prescott and Payson, and a new site was developed to disseminate information on landscape irrigation to residents of northern Arizona.

### ***Impact***

AZMET is now widely accepted as an important (and often the only) source of meteorological information pertaining to the production of agricultural and horticultural crops in Arizona. Use of AZMET information continues at a high rate; users accessed AZMET web pages in excess of 173,000 times in 2004.

**Crop Production:** Perhaps the most important impact of AZMET in production agriculture has been its ability to provide reliable information on heat units which are used to 1) time planting and harvest dates of horticultural crops such as melons and sweet corn; 2) predict pest development; and 3) monitor general crop development. AZMET plays an integral role in the success of the Arizona Cotton Advisory Program by providing weekly updates on heat unit accumulation, crop water use, and current and projected weather condition; AZMET also provides daily updates on the potential for heat stress, which can significantly reduce fruit retention and yield of cotton.

**Water Use/Irrigation Management:** AZMET provides data on evapotranspiration (ET) which can be used to estimate the water use of vegetation. Working in conjunction with personnel affiliated with the Ft. Mohave Indian Reservation, AZMET ET information is now used to schedule irrigations on more than 20,000 acres of cotton and alfalfa in western Arizona. AZMET generates daily turf water use reports for the Phoenix area and distributes this information to the public via a turf water management web page, email and automated fax transfer system. Sixteen large turf facilities (with more than 10 acres in turf; mostly golf courses and parks) receive this information via email or fax daily. The turf web page was accessed in excess of 10,000 times in 2004. AZMET also generates a lawn watering guide which is published daily in major newspapers in the Phoenix metropolitan area.

### ***Funding***

Arizona Cotton Research and Protection Council

Arizona Grain Research & Promotion Council

Arizona Department of Water Resources

City of Phoenix

United States Bureau of Reclamation

Station sponsors: irrigation districts, NRCs, power districts, commodity organizations, etc.

## **Natural Compounds with Anticancer Activity and Agricultural Possibilities in Desert Plants and Associated Microorganisms**

### ***Impact Nugget***

Scientists at the University of Arizona's Southwestern Center for Natural Products Research and Commercialization (SCNPRC) have discovered two compounds in desert plants that can inhibit the growth of tumors and that are associated with traditional Chinese medicine and Indian Ayurvedic medicine, and also a natural compound occurring in a plant-associated microorganism that has been shown to make the model plant, *Arabidopsis thaliana* able to withstand high temperatures up to 45 degrees Celsius, or 113 degrees Fahrenheit, with implications for desert agriculture.

### ***Issue***

Scientists at the Office of Arid Lands Studies' Southwestern Center for Natural Products Research and Commercialization (SCNPRC) are working with universities in and outside the United States,

with agrochemical and pharmaceutical companies, and with other commercial entities to develop new biological and industrial products. The SCNPRC is part of the University of Arizona College of Agriculture and Life Sciences. The ultimate goal of this collaborative research program is to discover 1) specialty chemicals in indigenous desert plants that can be grown as industrial cash crops and 2) plant-associated microorganisms that can be used to produce pharmaceuticals and natural products with agricultural implications. Natural product-based anti-cancer drugs and agrochemicals are in particular demand.

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

The SCNPRC team selects plants and plant-associated microorganisms and in collaboration with other scientists, evaluates them for useful biological activities. If active, the scientists separate and characterize the natural compounds responsible for the activity, and determine how to cultivate and process these organisms on a commercial scale. In the case of anti-cancer agents, those showing promise will proceed into animal testing for efficacy. The SCNPRC group, in collaboration with the UA Division of Plant Pathology, the Departments of Biochemistry and Biophysics, Pediatric Oncology and Surgery, the Arizona Cancer Center, Arizona State University, Josephine Ford Cancer Center, Harvard University, Whitehead Institute, China Pharmaceutical University, and DuPont Crop Protection Division is currently pursuing some plant and microorganism-derived compounds for their in-vitro and in-vivo anticancer activity and also their utility in improving agricultural production in arid lands.

### ***Impact***

A natural compound occurring in a plant-associated microorganism has been shown to make the model plant, *Arabidopsis thaliana* thermotolerant—able to withstand high temperatures up to 45 degrees Celsius, or 113 degrees Fahrenheit. Intellectual property protection for this unusual activity has been sought and further work to evaluate its implications in arid land agriculture is currently being pursued in collaboration with Harvard University and the Whitehead Institute.

Animal studies of anti-cancer compounds isolated from two medicinal plants, one used in traditional Chinese medicine and the other in Indian Ayurvedic medicine, have shown encouraging anti-angiogenic activity—the ability to halt cancerous growths by inhibiting the spread of blood vessels that nourish tumors and enable them to spread into vital organs of the body. Intellectual property protection for this novel activity of these compounds will be sought. This is part of an ongoing effort to find natural products with unique applications from arid lands organisms, allowing conservation and maintenance of the delicate desert ecosystem.

### ***Funding***

Arizona Agricultural Experiment Station—Natural Products Center  
Arizona Disease Control Research Commission  
CAPCURE  
Public Health Funding from NIH and NCI  
Department of Defense Prostate Cancer Program  
American Institute for Cancer Research

# **Maize Microarray Project: A Tool for Crop Research and Improvement**

## ***Impact Nugget***

A maize expression array containing 57,000 genes has been developed and is being distributed to the worldwide maize research community; so far 935 arrays have been sent to 27 research groups around the world, where they are currently used in researching nitrogen utilization, root growth underwater stress, seed development, photosynthesis, aluminum stress in roots, maize ear and tassel development, and hybrid vigor.

## ***Issue***

Maize is one of the most economically important cereal crops and is grown worldwide with cultivars that are adapted to a wide variety of growing conditions and climates. Considerable interest exists in developing optimal tools and technologies for global analysis of gene expression in maize. These measurements can provide the basis not only for understanding the ways in which regulation of gene expression controls plant development, and responses of the plant to biotic and abiotic stimuli, but also for the rational design of strategies to improve crop yield and quality.

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

In 2003 plant scientists from the University of Arizona and two other research institutions won a three-year, \$3.6 million grant to develop a gene expression microarray for maize and develop an online relational database (Zeamage) for curation and dissemination of all gene expression data associated with the gene expression microarray. A maize expression array containing 57,000 genes has been developed and is being distributed to the worldwide maize research community using a cost-recovery model. A project website ([www.maizearray.org](http://www.maizearray.org)) has been developed that contains all associated project information and serves to house the Zeamage relational database, and allows access to array data which has been deposited by array users. Additional tools have been or will be developed that will assist array users in experimental design and data analysis. Two workshops to train array users have been held and a third is planned for May 8-13, 2005.

## ***Impact***

In the six months that maize expression arrays have been available to the research community, a total of 935 arrays (in the form of slide sets) have been sent to 27 research groups in the United States, England, Mexico, Italy, China, and Switzerland. Maize expression arrays are being used to study gene expression in a diverse group of research areas including nitrogen utilization, root growth underwater stress, seed development, photosynthesis, aluminum stress in roots, maize ear and tassel development, and hybrid vigor. Data generated from these expression profiling, experiments will be available to all interested researchers immediately upon deposit into the Zeamage database. Insights gained from this approach to understanding gene expression will provide deeper insights to understanding maize growth and development and may eventually lead to improvements in crop productivity.

## ***Funding***

National Science Foundation Plant Genome Research Program

## **Functional Genomics of Maize Chromatin Proteins**

### ***Impact Nugget***

Researchers at the University of Arizona and other collaborating universities have identified more than 300 chromatin-related genes in maize that are responsible for certain types of gene expression; information about each gene has been made available to the public in a web-based database that is readily accessible and has the potential to be utilized by thousands of researchers.

### ***Issue***

Gene regulation is critical to plant growth and development. One important regulator of gene expression is chromatin structure, which refers to the manner in which the DNA is packaged in the nucleus of the cell. Little is known about the genes responsible for creating and maintaining chromatin structure in maize, or how alterations to this structure can alter gene expression and other biological phenomena.

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

In 2005 plant scientists from the UA and five other universities won a 4-year, multi-million dollar grant from the NSF to identify and study the function of all chromatin related proteins in corn, the nation's most important economic crop. The scientists are developing and characterizing mutants which will allow them to analyze features of plants that lack the proteins involved in chromatin structure and modification. The mutants are then studied to determine how chromatin structure, gene expression, and important genetically regulated processes are altered. This project is expected to provide researchers with a deeper understanding of an important crop plant, and also to increase the understanding of chromatin level regulation of gene expression, which is a critical component of disease, growth, development, and silencing of introduced transgenes in plants, humans and other organisms.

### ***Impact***

In collaboration with scientists at other universities, researchers at the University of Arizona are generating 300 mutant lines for scientists around the world to use in their own research. Many of these lines are already available and in use in labs around the world. Over 300 chromatin related genes have been identified in maize, and information about each gene has been made available to the public in a web-based database. This information is readily accessible and has the potential to be utilized by thousands of researchers.

### ***Funding***

National Science Foundation (NSF)

## **Cotton IPM: Nine Years of Reduced Insecticide Use**

### ***Impact Nugget***

A comprehensive integrated pest management program (IPM) implemented in Arizona cotton for the past nine years has resulted in a combined 58 percent reduction overall in pesticide sprays for whiteflies, pink bollworm and Lygus bug, and a corresponding cumulative savings of more than \$130 million in reduced pesticide costs; two of the past six years represented the lowest annual insecticide usage in Arizona cotton in 25 years.

### ***Issue***

Insecticide applications in cotton typically account for about half of all insecticide use in the United States. New materials on the market are now enabling cotton growers to reduce their spray applications while maintaining competitive yields. These technologies also help growers implement more ecologically-based IPM programs and become less dependent on broadly toxic insecticides.

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

An integrated pest management program in Arizona implemented two new tools in 1996 and continued their use through 2004: insect growth regulators (IGRs, effective against whiteflies) and transgenic cotton (containing Bt effective against pink bollworms). The University of Arizona College of Agriculture and Life Sciences collaborated with growers, the USDA, the Arizona Department of Agriculture, the Arizona Cotton Growers' Association, Cotton Incorporated, industry and others. Both of these tools are highly effective against pests, but safe to humans and the environment. Based on insect hormones, growth regulators disrupt the growth and development of insects. Transgenic cotton is genetically engineered to carry its own biological insecticide, targeting lepidopterous pests, within the plant tissues. Both technologies kill their target pests while allowing natural processes to play a larger role in the control of all other insects.

### ***Impact***

Nearly 100 percent of the cotton acreage in Arizona was sprayed multiple times for pink bollworm and silverleaf whitefly in 1995; however, from 1999 through 2001 the majority of acres were never sprayed even once for these two pests. Comparing averages for 1990-1995, a period before the IPM education and technologies were introduced in cotton production, with averages for 1996-2004, the following reductions in spray applications were realized:

For silverleaf whitefly, the average number of chemical sprays dropped from 3.58 sprays per season in 1990-1995 to 1.15 sprays in 1996-2004, representing a 68 percent reduction and over \$88 million in cumulative control savings, or about \$10 million annually. For pink bollworm, the average number of sprays per season decreased from 2.72 sprays per season to 0.64 sprays, a 76 percent reduction, representing \$50 million in cumulative savings. For Lygus bug, sprays have remained static, from 1.57 sprays to 1.49 sprays, a 5 percent increase; however, due to inflation and other increases in costs of insecticides, there has been a \$27 million increase in cumulative control costs. Yet the total for all three pests, and other minor pests, reduced from 9.03 sprays to 3.75 sprays, or a 58 percent reduction overall and a cumulative control savings of \$130.4 million over the nine-year period of 1996-2004. Two of the past six years represented the lowest annual insecticide usage in Arizona cotton in 25 years. Annual cotton acreage in Arizona is usually around 250,000 acres.

Along with resistance management, these IPM efforts reduced insecticide use, conserved biological control agents, and enhanced sustainability and profitability. The availability of these selected

technologies, which are harmless to predaceous insects, has provided growers the opportunity to employ IPM practices that enhance the population levels of beneficial insects in the field and created area-wide benefits for all producers. Furthermore, these plans have been exported for use in California, northern Mexico, and Australia. Australia experienced similarly dramatic reductions in broadly-toxic insecticide use one year (2002-2003) after the introduction of the IGRs and the IPM plan for their use in controlling whiteflies.

### ***Funding***

Hatch Act

Smith-Lever 3(b) & 3(c)

Smith-Lever 3(d) (e.g., IPM)

Western Region IPM; Pest Management Alternatives Program

Cotton Incorporated

Arizona Cotton Growers Association

Agrochemical industry

## **Bull Fertility Tests: An Industry Collaboration**

### ***Impact Nugget***

A new test determining bull fertility has been developed through collaborative University of Arizona and industry research; it gives results on-site in 20 minutes (compared to two days for the previous standard method) and costs \$45 per test, with a potential net return of \$140 per bull tested.

### ***Issue***

Fertility in a livestock enterprise is 5 to 10 times more important economically than any other production measure. Cows bred to high-fertility bulls bear more calves earlier in the season, resulting in more beef weaned and marketed per cow, which is a direct measure of profit. Bulls with identical semen quality in terms of physical assessment vary in actual fertility. Means to identify bulls on the basis of fertility potential could result in higher pregnancy rates, leading to larger calf crops.

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

During the 1990's University of Arizona animal scientists assisted in developing a color-based diagnostic test to identify a protein on bull sperm. An antibody is used to detect presence or absence of that protein which is referred to as fertility associated antigen (FAA). Bulls with FAA in their sperm are 17 percent more fertile than herd mates lacking FAA over a 60-day breeding season. Heifers inseminated once to bulls with sperm-associated FAA had a 16 percent higher pregnancy rate than herd mates inseminated to bulls without FAA in their sperm. The original diagnostic test,

released for commercial use in 1998, was licensed for any rancher or veterinarian in the world to use. Since then it has been adopted by breeders across the U.S., and in at least a dozen countries worldwide, in the Pacific Rim, South America, Canada, and Europe.

In January 2004, the next generation of that test, a lateral-flow cassette containing reagents to detect FAA, entered the market after University of Arizona scientists conducted extensive research on it. It takes 20 minutes to run and works just like a pregnancy test that can be conducted at home: a purple line in the cassette window indicates the presence of FAA. More than 900 bulls from 19 herds were screened with the new test by UA Department of Animal Sciences researchers who traveled to six states during spring, 2003. Of the bulls tested, 25 percent were found to be FAA-negative. In comparison trials employing artificial insemination, bulls determined to be FAA-positive were 18 percent higher in fertility than herd mates deemed to be FAA-negative. Thus, the fertility differences are the same as the original test.

This work was sponsored by a USDA Small Business Innovative Research grant to ReproTec, Inc., the company in Tucson that markets the test. They hold an exclusive license to offer this test worldwide; the UA holds a subcontract on the project. UA scientists are now screening for mutations in the FAA gene that may serve as a DNA-based diagnostic test. TMI Laboratories International, LLC in Tucson is funding the research with the technology licensed to them from the UA's Office of Technology Transfer.

### ***Impact***

Detecting high fertility bulls is the key to increasing livestock production and thus profitability. The new bull fertility test is not only accurate, it's also user-friendly, faster than the previous two-day laboratory method, and cost-effective. Housed in a small plastic cassette about the size of a stick of chewing gum, it has a three-year shelf life, requires no special storage, and can be used chute-side with results in about 20 minutes. If a few tests are purchased at \$45, at a \$50 profit per calf, and if a bull remains in a herd for four years breeding 25 heifers per year, the return on investment is 13-fold per each cow bred. For bulls, a \$45 test yields a net return of \$140 per bull tested. If the kits are ordered in large batches to cut the cost to \$30 per test, using the same inputs stated above, then the return on investment becomes 22-fold per cow.

A 1 percent increase in fertility in the U.S. beef industry would return a net profit of \$55-60 million to U.S. producers. Obviously, on a global scale, billions of dollars of income could result from identifying higher fertility bulls and males of other livestock species. On a local scale, an Arizona rancher who bred FAA-positive bulls to heifers in a higher ratio than usual—one bull to 20 heifers instead of the industry standard rate of one bull to 15 heifers—found that he got the same 92-95 percent pregnancy rate during the first 45 days while using a third fewer bulls and no additional feed.

### ***Funding***

Hatch Act, National Research Initiative  
Sire Power, Inc. and King Ranch  
USDA Small Business Innovative Research grant  
TMI Laboratories International, LLC

## **Goal 2: Safe and secure food and fiber systems**

### **Livestock Biosecurity in Arizona**

#### ***Impact Nugget***

As a result of education efforts through the Arizona Veterinary Diagnostic Laboratory (AzVDL) and other agencies in the Homeland Security-based pilot program for bioterrorism surveillance, several major ranches in southern and central Arizona have introduced enhanced biosecurity programs. These include testing for BVDV and bovine trichomoniasis. In the dairy area there has been expanded testing for BVDV (bovine viral diarrhea virus) and Johne's Disease. Efforts with Arizona Cattlemen's and Arizona Department of Agriculture resulted in the formation of the Arizona Livestock Incident Response Team (ALIRT) and a completely new and innovative way to respond to livestock loss.

#### ***Issue***

Bioterrorism—defined as the intentional use of biological agents such as bacteria, viruses or toxins to cause illness—includes agroterrorism, the deliberate use of biological or chemical agents on crops or livestock to disrupt the food supply or agricultural industry. Some diseases of animals are also human pathogens and must be tracked when they occur.

Since September 11, 2001, the AzVDL in Tucson has expanded its role beyond diagnosing and treating animal diseases to include surveillance for bioterrorism. This entails a constant vigilance in diagnosing and detecting all foreign pathogens that affect animals in the state.

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

The AzVDL, in the College of Agriculture and Life Sciences at the University of Arizona, is one of 12 state diagnostic laboratories participating in a Homeland Security-based pilot program as part of a network of laboratories testing for foreign animal diseases/agroterrorism on a state level. The network sends reports of foreign animal diseases directly to the USDA for state and federal bioterrorism assistance. Faculty and staff at the laboratory have been working on improving laboratory biosecurity, on quality assurance, and on electronic networking capabilities as part of their Homeland Security grant. The laboratory has the capability to monitor many pathogens, including some that have human health significance such as anthrax, botulism, tularemia, or plague. The emphasis is on both naturally occurring diseases and on intentional introductions. Wildlife diseases are also included in the laboratory's surveillance, and so are diseases that can be brought in through the Mexican border just an hour and a half south of campus. The laboratory functions cooperatively with state and federal regulatory officials in diagnosing animals brought in from Mexico.

In 2002 the AzVDL began bioterrorism surveillance and reporting efforts, and also launched outreach and education programs to educate local ranchers and the public on the handling and prevention of West Nile Virus, foot and mouth disease, and others. Clientele continue to be reached through a listserv, website and regular seminars, publications and workshops. Five major workshops were held, attended by 200 ranchers and agricultural industry personnel.

### ***Impact***

Several major ranches in southern and central Arizona have introduced enhanced biosecurity programs. These include testing for BVDV and bovine Trichomansis. In the dairy area there has been expanded testing for BVDV and Johne's Disease. Efforts with Arizona Cattlemen's Association and Arizona Department of Agriculture resulted in the formation of the Arizona Livestock Incident Response Team (ALIRT) and a completely new and innovative way to respond to livestock loss that may include foreign animal diseases or agrobioterrorism.

### ***Funding***

U.S. Department of Homeland Security  
State of Arizona  
Merrial Drug  
CompanyUpjohn

## **Goal 3: Healthy, well-nourished population**

### **"Dining With Diabetes" Program for Older Adults**

#### ***Impact Nugget***

Food choice is critical in treating diabetes; of 57 older adults who attended a 2004 nutrition and recipe preparation program, 81 percent reported that they tried one or more of the recipes at home, and 60 percent reported making dietary changes: reading labels, reducing portion sizes, reducing fat content in meals, and eating out less.

#### ***Issue***

One of the themes for the initiative Healthy Arizona 2010 is to “promote good health and quality of life for all older adults in Arizona.” This is a challenge because obesity and diabetes are epidemics according to the American Medical Association (2001). Although Arizona's rate for obesity is average compared to other states, its diabetes rate falls in the second-highest category established by the Centers for Disease Control and Prevention. Diabetes is currently the 7th leading cause of death in Arizona, according to the state health department. In rural areas, people diagnosed with diabetes have access to few resources to help them manage this chronic disease. Patients are told to “lose weight and eat healthy,” but few of them receive sufficient instructions to implement these changes. Increasing requests for diabetes information have been noted.

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

The “Dining with Diabetes” program, offered for the first time in the state through Arizona Cooperative Extension, provides education and hands-on demonstrations that show easy ways to make dietary and lifestyle changes. The goal is to help adults (primarily over age 65) improve their health by better managing their blood glucose levels, thereby decreasing the risk of diabetes-related complications. The curriculum “Dining with Diabetes” was originally from West Virginia. The program consists of three weekly 2-hour sessions where participants are educated in basic nutrition principles related to diabetes, with demonstrations and tasting of healthy recipes.

Following a successful pilot program in Fall 2002, a Healthy Aging 2010 mini-grant was funded to conduct the program in the rural areas of Lake Havasu City, Bullhead City and Kingman, Arizona. The grant partnership included the county health department and the county seniors program. Three complete sessions of “Dining with Diabetes” were conducted in the three cities during 2004. A total of 104 participants attended at least one session of the program. Of those, 79 attended two sessions and 60 completed all three.

### ***Impact***

Participants rated the program overall at 9.42 on a scale of 1-10 where 10 = High. A pre/post test measured an overall knowledge gain of 22 percent. Participants expressed an increased confidence in their ability to select and prepare healthy meals for the diabetic person: on a pre-survey only 14 participants said they were “very sure” they could do this, but at the end of the sessions, this number had increased to 38.

A six-week followup survey was conducted to determine if any changes in eating habits or lifestyle had been made. Of the 60 participants who completed all three sessions of the program, 57 surveys were returned. Of these, 81 percent reported that they had tried one or more of the recipes demonstrated at home. Sixty percent reported making dietary changes – reading labels, reducing portion sizes, reducing fat consumption and eating out less – and exercising more. This project filled a demonstrated need. Participants were eager and enthusiastic learners. Based on the feedback, it seems apparent that once they learned which changes needed to be made, they were willing to make them. Several reported decreased blood glucose levels and weight loss since attending the program. Testimonials from participants:

“I’ve been able to use the info to adjust my diet and bring my glucose reading from over 200 down to almost 130 by reading labels and limiting my carbs.”

“Changed diet completely. Don’t eat out as often as before. Diabetes under control by watching diet and getting more exercise.”

“I did not know about counting carbohydrates before the Dining with Diabetes [class]. I have shared information learned with my diabetic sons.”

“I have changed my eating habits and the doctors are happy with the results.”

“I do the cooking for my diabetic husband and all the information from the classes was very helpful. He has even lost some weight since watching the amount of carbohydrates he eats.”

### ***Funding***

Arizona Department of Health—Office of Healthy Aging 2010  
Arizona Cooperative Extension

## **Border Health ¡SI! Diabetes Education in Yuma County**

### ***Impact Nugget***

Through Border Health ¡SI!, 2,000 elementary school students learned what Type 2 diabetes is and how to prevent or delay it; as a result of school nutritional education efforts, foods on snack bars identified as non-nutritious were changed; and one school now prohibits the use of non-nutritious food as a reward.

### ***Issue***

The prevalence of Type 2 diabetes in Mexican-Americans is at least twice as high as in non-Hispanic whites. Diabetes mortality rates in the border region is nearly 50 percent higher than in the rest of the country. Research has show that the onset of Type 2 diabetes can be prevented or delayed with good nutrition and physical activity. For the diabetic, nutrition and physical activity combined can help to maintain blood-sugar levels as close to normal as possible. Type 2 diabetes accounts for more than 90 percent of all diabetes cases. It occurs when the body cannot properly utilize insulin when getting nutrients to the cells. This results in high levels of sugar in your blood. Serious diabetes-related complications can occur such as heart disease, blindness, lower-limb amputation and kidney failure. Studies indicate that more than 16 million Americans have some form of diabetes. Type 2 diabetes used to be considered a disease of the old, but it is becoming much more prevalent in younger people. It is believed that educational programs involving youth, adults and communities can help reduce the prevalence of diabetes.

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

Border Health ¡SI! (BHSI) is a collaborative effort with the UA College of Public Health, begun in October, 2000. Cooperative Extension provides coordination and leadership with 5 other health outreach groups for Yuma County's collaborative efforts to promote strategies to reduce the prevalence of diabetes and other chronic diseases in border communities.

In addition to Yuma County Cooperative Extension, community partners include Western Arizona Area Health Education Center (WAHEC) which implements a walking club component, Puentes de Amistad (PdA) implements a patient component, Sunset Community Health Center (SCHC) works with provider component, and Campesinos Sin Fronteras (CSF) implements a family component.

A Special Action Group (SAG) consisting of representatives from the partner agencies, community leaders, school, city and county personnel, was developed to focus on policy change and continued support within the community. Sub-committees were formed. One committee identified and discussed ways to collaborate on funding to develop more parks and open space to facilitate physical

activity. A grassroots community meeting was held to identify resources and processes for obtaining grants, coordinate efforts and identify barriers. Eighty-five people attended the community forum including state, county and city officials and as a result obtained time on the Somerton City Council agenda. A nutrition action plan was developed to work with grocery stores to promote healthy foods. Cooperative Extension provided coordination of information booths and Extension personnel staffed them. Nine promotions took place.

### ***Impact***

Through Border Health ;SI!, 2,000 elementary school students learned what Type 2 diabetes is and how to prevent or delay it. As a result of school nutritional education efforts, foods on snack bars identified as non-nutritious were changed. One school prohibits non-nutritious food as a reward. Another school started an after-school walking club and conducted a day-long fun day to promote physical activity.

Yuma County Parks Commission is working on developing a tax district option for county subdivisions to be used for park maintenance and two groups received Community Development Block Grant funds for parks. Better park facilities will provide attractive spaces to implement the exercise programs. The four grassroot group members met each other at the forum and networking between groups was established. The Grocery Store Promotion/College of Public Health group is working on a process to determine sales of promoted foods.

### ***Funding***

University of Arizona, Yuma County Cooperative Extension  
University of Arizona College of Public Health  
Western Arizona Area Health Education Center (WAHEC)  
Puentes de Amistad (PdA)  
Sunset Community Health Center (SCHC)  
Campesinos Sin Fronteras (CSF)

## **Goal 4: *Greater harmony between agriculture and the environment***

### **Operation Cool Shade**

#### ***Impact Nugget***

By planting shade trees around their homes, 504 homeowners in Pima County, Arizona, saved a projected \$69,788 in electrical costs during the peak summer months in 2004.

### ***Issue***

Studies show that proper shading of the home can reduce energy consumption by as much as 20 percent. In 2000 the University of Arizona Cooperative Extension in Pima County joined with Tri-Co Electric Cooperative to distribute shade trees to residents for energy conservation.

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

Tri-Co Electric Cooperative and Pima County Extension provided trees and training, respectively, to interested residents. A requirement of the program was that trees be planted in locations around the house to ensure maximum shading. The residents received training from Cooperative Extension on correct placement, planting, and care of trees. Master Gardeners were trained to conduct training for program participants on the correct selection, placement, planting, and care of shade trees. Since the program began, eight Master Gardener volunteers have conducted four annual programs attended by more than 200 participants. An additional four Master Gardeners have staffed a tree planting and care answer booth at the tree distribution day conducted by Tri-Co Electric Cooperative's headquarters in Marana, Arizona. Tri-Co employees conducted follow-up inspections to ensure that trees were planted in the pre-determined locations and that the trees remained in good health. (Follow-up information and assistance with tree care is provided by Pima County Cooperative Extension).

### ***Impact***

As a result of Operation Cool Shade in 2004, 1,493 trees were distributed to 504 electric cooperative customers. Since 2000, 7,944 trees have been distributed to 2,769 customers in Pima County, Arizona.

Studies have shown that proper shading can reduce home energy consumption by as much as 20 percent. Thus given the average peak household consumption (July, August and September) of 7,263 kilowatt hours and the current rate of \$0.0953 per kwh, the average projected savings for individual households participating in Operation Cool Shade for the three-month period is 1,453 kwh, with a dollar savings of \$138.47 during that time. In terms of all 504 participating households for 2004, the projected savings is 732,312 kwh or \$69,788 for the peak three-month summer period.

### ***Funding***

Tri-Co Electric Cooperative

## **Weed Control With Less Herbicide in Arizona Tree Crops**

### ***Impact Nugget***

A weed-detecting automatic spot sprayer system reduced the amount of herbicide by 67 percent in an orchard irrigated with microsprinklers (i.e., only part of the orchard floor is irrigated), and about 50 percent in flood-irrigated lemon and pecan orchards. If the automatic spot spray system were adopted on 50 percent of the lemon and pecan acreage in Arizona, with a 50 percent reduction in the amount of herbicide applied (currently about 2 gallons of glyphosate per acre annually at a cost

of \$14 per gallon), the annual savings would be about \$14 per acre at the cost of current weed control programs, resulting in a statewide savings of about \$252,000 per year.

### ***Issue***

Weeds covering an orchard floor compete with the trees for water and nutrients, reducing fruit or nut yield at harvest. Growers at different times have tried mowing, disking and cover crops for weed control. Mowing causes a weed shift to grass and nutsedge species that can be difficult to control and disking can prune roots and damage tree branches and trunks. Although leguminous cover crops suppress weeds they also compete with trees for water and may reduce yields. Weed populations occur in patches across fields and are usually controlled with chemical herbicides. Most growers currently broadcast spray post-emergence herbicides on the entire orchard floor, regardless of where weed patches are located. A few growers spot-spray weed patches where they exist and thereby reduce the amount of chemical used to control weeds.

Broadcast spraying the orchard floor wastes chemical and increases the herbicide load in the environment. Spot spraying reduces the amount of herbicide wasted but is labor-intensive, slow and costs more than broadcast spraying herbicides despite reducing the amount of herbicide sprayed. University of Arizona researchers are investigating how growers can reduce herbicide use and save money by automatically spot spraying herbicides only where weeds exist in Arizona tree crops.

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

A comprehensive series of weed management studies in lemons have been conducted by faculty in the University of Arizona College of Agriculture and Life Sciences at multiple sites since 1993. These studies have proven that clean culture, where the orchard floor is kept completely free of weeds using herbicides, still provides the best environment for lemon growth and maximizes yield, both for the first harvest and for the cumulative yield of all harvests in a season. Similar studies in pecans were conducted in two locations in southern Arizona where the orchard floor along the tree row is free of vegetation but a grass strip is grown in the middle between the rows.

An optical chlorophyll-detecting spray system currently on the market detects weeds on the orchard floor and automatically triggers spot applications of herbicide directly to them without spraying bare ground. Called the NTech WeedSeeker, this boom-mounted system is used in some commercial orchards in California, where it was developed, but it has not caught on in Arizona. The barriers to the adoption of this technology include its high cost and its untested performance under Arizona conditions. UA researchers have conducted tests of the automatic spot sprayer technology in commercial lemon orchards in Yuma and Hyder, Arizona and in pecan orchards in Sahuarita and Bowie, Arizona.

### ***Impact***

Study results show that conventional broadcast sprayers and the weed-detecting automatic spot sprayer system result in comparable weed control in lemon and pecan orchards with both types of systems providing good or commercially acceptable weed control. The type of irrigation used in an orchard makes a difference in the distribution of weeds and the amount of herbicide used. The weed-detecting automatic spot sprayer system reduced the amount of herbicide by 67 percent in an orchard

irrigated with microsprinklers (i.e., only part of the orchard floor is irrigated), and about 50 percent in flood-irrigated lemon and pecan orchards.

*Potential impact:* The combined acreage for both crops in Arizona is about 36,000 acres. If the automatic spot spray system were adopted on 50 percent of the lemon and pecan acreage in Arizona, with a 50 percent reduction in the amount of herbicide applied (currently about 2 gallons of glyphosate per acre annually at a cost of \$14 per gallon), the annual savings would be about \$14 per acre at the cost of current weed control programs, resulting in a statewide savings of about \$252,000 per year. Costs savings increase as the cost of the herbicide program used for weed management increases.

In addition, there would be additional savings due to reductions in the amount of time workers spend mixing and loading herbicide sprayers, and health benefits for workers who have less exposure to herbicides. Environmental benefits would accrue as well, with 50 percent less herbicide released into the environment compared to conventional spray methods.

### ***Funding***

Arizona Citrus Research Council

Yuma Mesa Pest Abatement District

Arizona Department of Agriculture—specialty crop grant program

Hatch Act

USDA regional pecan grant

## **Reducing Air Pollution: Conservation Tillage in Arizona Cotton**

### ***Impact Nugget***

Where a no-till grain drill was used to plant wheat, barley or oats on existing cotton beds (as a cotton to small grain transition), PM-10 dust emissions from tillage (soil disturbing) operations were reduced about 80 percent in the fall (November/December). During the transition from the cotton harvest to the planting of a small grain crop, the number of tractor passes across the field went from 5 for conventional tillage to one pass for conservation tillage, with concomitant savings in fuel, labor and equipment costs.

### ***Issue***

Cotton growers typically prepare and maintain fields by performing tillage operations that include landplaning; leveling; several disking operations; chisel plowing; and cultivation for weed control and maintenance of irrigation furrows. Historically cotton growers had to follow Arizona statutes related to pink bollworm (*Pectinophora gossypiella*, Sanders) control which required tillage following cotton harvest. Recent regulatory changes have allowed for a reduction in tillage when a small grain crop is planted following cotton and irrigated in December. Researchers at the University of Arizona are looking at ways to reduce the number of times a farmer has to pass through his fields with a tractor and tillage implement, thereby saving money on fuel and labor without reducing economic returns to growers.

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

Conservation tillage is defined as a production system that eliminates or reduces tillage operations to the minimum required to produce a crop, and in which 30 percent of the previous crop residue remains on the surface after planting. Advantages in other parts of the country have included an increase in the overall productivity of the soil by increasing the soil's organic material and moisture-holding capacity, and reducing erosion. The Arizona research is looking at whether these advantages will hold true in desert soils. While it has been adopted in other parts of the United States, conservation tillage did not catch on with Arizona growers until recently when the cost of diesel fuel increased.

Field experiments were conducted at two College of Agriculture and Life Sciences agricultural centers (3 years at Marana and 2 years at Maricopa with the third year underway) and also with commercial farmers in central Arizona. These trials compared conventionally tilled cotton and reduced tillage double cropping of cotton and small grains where oats or barley were planted without tillage, following cotton harvest and shredding of the cotton stalks. About 236,000 acres of cotton were grown in Arizona during the last season.

### ***Impact***

Reduced tillage operations cut back on the amount of dust raised as tractors pass over the field. The conventional cotton tillage regime includes five operations at the end of the season: shred, disk, rip, disk again, and list. In a conservation tillage system there is only the shredding operation at the end of the cotton season. Where a no-till grain drill was used to plant wheat, barley or oats on existing cotton beds (as a cotton to small grain transition), PM-10 dust emissions from tillage operations were reduced about 80 percent in the fall (November/December). During the transition from the cotton harvest to the planting of a small grain crop, the number of tractor passes across the field went from five for conventional tillage to one pass for conservation tillage, with concomitant savings in fuel, labor and equipment costs.

Overall, conservation tillage practices and the cotton-small grain double-crop system increases economic returns to the growers, reduces their labor costs and the number of tractors they need to farm, and saves money in controlling pink bollworm.

### ***Funding***

Hatch Act

USDA Western Region Sustainable Agriculture Research and Education grant

Arizona Grain Research and Promotion Council

## **Goal 5: Economic development and quality of life for people and communities**

### **Life and Job Skills Training: "The Extension Connection"**

#### ***Impact Nugget***

Over the past four years more than 500 high-risk adults from a low-income Phoenix community (more than 80 percent of those enrolled) have graduated from “The Extension Connection” workforce development program; 200 have been employed for more than a year, and many of the participants have overcome drug addictions and gang affiliations.

#### ***Issue***

There is a need in the Phoenix metropolitan area for “welfare-to-work” type programs. Extension Connection was developed when a local Cooperative Extension agent recognized a dire need for the addition of life management skills along with nutrition education in programs for families. The Extension Connection components added a special touch to an already existing program called Successful Training Resource Individual Development or otherwise known as Project S.T.R.I.D.E. at Keys Community Center. This program promotes workforce development in a South Phoenix high-crime, at-risk area.

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

The Extension Connection program enhances life skills and promotes workforce development of low-income families by providing a series of educational experiences that promote self-sufficiency. Families learn job development skills, nutrition, and money management. The program uses a variety of Cooperative Extension programs such as Money Management, Life Skills and Nutrition and a series of educational experiences called Challenge to enhance the skills and abilities of families towards self-sufficiency.

Participants in the program have ranged from former gang members to newly arrived immigrants to the United States whose lack of English and American job skills caused significant barriers to employment. Ninety-five percent of the program graduates are members of racial or ethnic minorities, 40 percent have had less than a high school education; many have criminal records.

#### ***Impact***

During the past four years more than 500 high-risk adults from a low-income community (80 percent of those enrolled) have graduated from the Extension Connection program. More than 200 have been employed for over a year. Many participants have returned to the site to help as volunteers and mentors, and some are now employed at the site as staff. For some participants, this was the first time they were free of drugs, free of gang affiliations and showed up daily for classes. In 2004, of the 25 people who completed the program, 100 percent showed improvement in working with others positively; more than 90 percent learned at least two skills that boosted their self-esteem and completed the goals they set at the beginning of the session.

One STRIDE/Extension Connection graduate became a counselor at a drug rehab home helping other women get off the street. “STRIDE put pride in my eyes,” she says. Another graduate credits the Connection program with helping her focus on goals, setting reachable steps and believing she could succeed. She connected with a local small business development center after her training, and now owns and operates her own neighborhood beauty salon.

Regarding dietary changes, upon graduation, 74 percent of the participants in 2002 reported that they ate a more balanced and nutritious diet, including increased amounts of fruits and vegetables and fewer foods high in fat and sugar. In 2003, 49 percent of participants planned meals ahead of time more often.

“The Extension Connection helped me to bridge the gap in society for me, to make the transition to a new life smoother.” —former prison inmate who wanted to improve his life with skills for living and get a decent job.

### ***Funding***

Extension Food and Nutrition Education Program  
Southwest Leadership Foundation

## **Project LEAP: A 4-H Leadership Education Adventure for Pre-Teens**

### ***Impact Nugget***

A 4-H youth development program for pre-teens aged 11-13 involved more than 40 youth in activities designed to give them a sense of belonging and build their leadership and decision making skills: more than 84 percent showed gains in these areas according to pre-program and post-program surveys.

### ***Issue***

Because adolescents are often testing boundaries and their role in the adult world, they may leave behind the groups in which they were previously involved. If they don't find a suitable replacement niche, they may succumb to the temptations of gangs and drug and alcohol abuse. Arizona 4-H camping activities have typically been limited to teens over the age of 14. Providing alternative opportunities not only give pre-teens a sense of belonging (thus promoting 4-H youth development and helping to ensure membership as an older teen) but also offers valuable life skills development.

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

Project LEAP (Leadership Education Adventure for Pre-teens) was created for southern Arizona youth aged 11-13 to give them the chance to take part in activities that enhance leadership skills, boost self-esteem and improve their decision-making skills. Workshops, activities and demonstrations that were held for this age group in 2004 under the name “Tweeners Camp” included horse care, GPS training, archery, hiking, and arts and crafts. Outside demonstrations included experiences with Army dogs, challenge games, and an Army simulated “boot camp.” In addition, more than 40 4-H youth performed community service projects, including preparing holiday baskets for needy families, rebuilding an archery site, and refurbishing trash cans at a local facility rented for LEAP activities.

Overall, youth participants were taught numerous physical activities to encourage productive, healthy lifestyles, and were trained to identify current activities and skills needed to avoid risky behaviors. They had opportunities to interact with people of diverse cultures, to make new friends, and to learn safe camping practices in preparation for the time when they are old enough to attend 4-H teen and leadership camps.

### ***Impact***

The first LEAP Camp utilized the new Arizona Life Skills Evaluation tool available online. Forty-four participants were surveyed with 100 percent responding; 14 questions were asked and were scored on a 4 point scale (1 = no, 2 = sometimes, 3 = usually, 4 = yes). Life skills that were tested included wise use of resources, communication, accepting differences, useful/marketable skills, and self-responsibility. Average for all indicators showed a pre-test total of 3.28 and a post-test total of 3.75. Overall, the percent of participants who made gains from pre-program to post-program was more than 84 percent.

As a result, middle schooler (pre-teen) involvement in 4-H activities has expanded to include nearly 50 percent of all Cochise County Teen/Pre-Teen Council events within the past 6 months of implementation. Previously, these youth were not allowed to become a part of this group. During this past year, some events would have been cancelled because of a lack of interest had it not been for the involvement of this population of young pre-teens. Teen Council typically presents all of the Achievement Night awards, but this year two pre-teens also spoke to the nearly 200 attendees. The addition of a dessert auction allowed more than 30 pre-teens and younger youth to participate in the program.

“We've never had anything for us [pre-teens] before. You have always had to be 13 to do anything fun in 4-H. Tweeners Camp was the greatest weekend of my life. Now I get to do all the stuff the teens get to!” —pre-teen participant

“The best part of LEAP Camp was that I made friends with younger kids. I'm a better role model, now!” —11-year-old participant

“This program is very [much] needed for this age of children. The kids were willing to help, participate and enjoy each other. There were no cliques, no ‘problem children’, and great enthusiasm. Counselors were educated in every way. LEAP was planned out great. Hope to see you next year and many years to come!” —adult chaperone for LEAP program

### ***Funding***

Arizona Cooperative Extension

## **Arizona 4-H Military Partnership**

### ***Impact Nugget***

With the completion of the first year of the Arizona 4-H Military Partnership grant in 2003-04, 13 Military 4-H Clubs were started and 246 youth enrolled in 4-H clubs in Arizona. A total of 40 staff members were trained. In Cochise County, the Arizona 4-H Military Partnership resulted in 150 new 4-H club members, which is an increase in Cochise County traditional club membership of 30 percent in one year. This project provides predictable services for Army and Air Force as well as Reserve and National Guard youth as they transition either from one installation to another or have a parent deployed.

### ***Issue***

The strain to family life caused when military personnel are separated from loved ones, as well as moving often with reassignment, has been well documented. In the past few years those strains have also been felt by members of military reserve and national guard units as increasing numbers of US soldiers are deployed to the Middle East.

Young people in these service families often take on increased responsibilities at home. They also may suddenly feel isolated and alone. Because of this, their mental health, grades, and social lives may be affected, especially those who have been sent away from their familiar community to live with a relative or friend until their parent returns.

The U.S. Army, Community & Family Support Center (CFSC) and the USDA Cooperative State Research Education and Extension Service (CSREES) share the goal of providing positive youth development programs to build the skills and competencies youth need to live productive, healthy and self-sufficient lives. These two federal agencies have created a partnership, the USDA/Army Youth Development Project (USDA/AYDP), to accomplish their common goal and make efficient use of public resources by providing predictable, consistent youth programs on Army installations worldwide. A similar partnership has been forged with the Air Force. With the recent deployment of National Guard and Reserve units, Operation Military Kids has been introduced, as now nearly every neighborhood has been impacted.

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

Networks of support are being built for these youth and families. A three-year Military 4-H Club Grant from USDA via the partnership with the Army and the Air Force allows Cooperative Extension personnel in Arizona to reach out to youth and military personnel from Luke and Davis-Monthan Air Force Bases, Yuma Proving Grounds, Ft. Huachuca, and now overseas bases in Osan, Korea and Kadena, Misawa, and Yukota, Japan as well. Partnerships are being developed with the Air and Army National Guard as well as with the Reserve units.

Two key components of the project are increased communication between the military and local community and staff training. A team training that paired Extension faculty with representatives from the military installation helped facilitate the two-way communication on the needs of families and especially young people. County extension agents also trained members of the military families in workforce preparation, community service, and 4-H leadership.

Integration into present county programming is the key. Youth from Yuma Proving Ground, as members of the Desert Scorpions 4-H club, participated in the Yuma County Fair and sent teens to J.O.L.T., a statewide 4-H teen leadership camp. A Plan and Play@ teen planning session was held for Southern Arizona counties (Cochise, Pima, Santa Cruz, and Graham counties) that included youth from Ft. Huachuca. Luke and Davis-Monthan incorporated the 2003-04 project clubs opportunities into exhibits at the 2004 Maricopa and Pima county fairs. One of the objectives of the program is to invite young people from military installations to be a part of the local 4-H program. Youth from Ft. Huachuca 4-H have become a part of Cochise County 4-H programs by participating in the L.E.A.P., "Tweeners" camp (for young people aged 11-13), a statewide teen event, and exhibits at the county fair and representation on the Youth-Adult Council.

At Ft. Huachuca, the middle school 4-H club made news when teens participated in a statewide 4-H ski trip---the first military 4-H group to attend a statewide 4-H event. Cochise County has sent an adult representative from the Ft. Huachuca 4-H Club to the newly formed Arizona 4-H Youth-Adult

Council (YAC) as part of their county's youth-adult team. At Luke Air Force Base, youth participated in Maricopa County and state fair exhibits. In Yuma, the youth from the Desert Scorpions club also exhibited at the county fair and attended statewide teen events. Three teams from Ft. Huachuca, Davis Monthan and Osan, Korea attended the "Health Rocks!" training and are delivering programming in youth-adult partnerships. The adult members of the team will showcase their programs at CYFAR (Children, Youth and Families at Risk) in 2005. One youth from Osan, Korea was selected to participate as a cartoonist for the 4HCCS computer curriculum.

Consistency is the key word for the Arizona 4-H Military Program Proposal. Trained teams of military youth staff representing different branches of the military, offer consistent application and implementation. Working together as partners provides a forum to provide quality training and professional development for staff. The partnership allows us to expand training beyond management staff to the front line. Enhanced programming has evolved through the communication and staff development training opportunities. Efforts are underway to expand this AZ 4-H Military partnership with the National Guard and the Army Reserve creating communication linkages and develop and expand programming to reach those youth and families. In addition, there are plans to establish contacts with various agencies and organization in Arizona such as the Arizona Department of Veteran Services, Veterans of Foreign Wars, and the American Legion, as well as with the Accession Command. It's recognized on and off the installations in the present world situation that family life has been disrupted due to deployment.

A key benefit is that soldiers can focus on their mission, knowing that their children are in safe, supervised environments with caring adults. The Arizona 4-H Youth Development programs put together "Hero Packs" designed to boost the morale of families of deployed soldiers, and distributed by 4-H offices in Arizona counties where Army and Air Force bases are located. To support the families of those who serve with the Army Reserve, National Guard, or Accessions Command, the packs contain items such as an E-camera, 4-H backpack, assorted toys and other 4-H items, and a handwritten letter to the service member of their family. Nearly 500 packs have been distributed by all fifteen counties in Arizona.

### ***Impact***

With the completion of the first year of the grant in 2003-04, 13 Military 4-H Clubs were started and 246 youth enrolled in 4-H clubs in Arizona. A total of 40 staff members were trained. In Cochise County, the Arizona 4-H Military partnership resulted in 150 new 4-H club members, which is an increase in Cochise County traditional club membership of 30 percent in one year. At Luke AFB, 4-H clubs have been incorporated into this weekly "School Age Program", and monthly 4-H club meetings have been initiated for youth who do not attend the After School Program. Two "skillathons" have been conducted to introduce 4-H activities to parents, children and volunteers. Nineteen staff members have been trained as volunteer leaders with 65 4-H members. The evidence of a functioning collaboration between the 4-H program and military installations is the support and attendance of the Luke staff at the two face to face trainings held this past year. The Arizona 4-H Military partnership presented a workshop at CYFAR, "The Olive, the Blue, and the Green" with representation from county 4-H faculty, Luke AFB, and the state 4-H office.

This 4-H Military partnership lays the foundation for sustainable consistency. The Arizona 4-H Military Partnership is recognized nationally as a strong collaboration and integrated program. This project provides predictable services for the Army and the Air Force as well as the Reserve and National Guard youth as they transition either from one installation to another or have a parent

deployed. It also provides youth with an opportunity to create a positive relationship with caring adults, which is a hallmark of the 4-H program for the last hundred-plus years. During times of parental deployment, this consistent presence of 4-H leaders and the feelings of belonging that come with 4-H membership promise to be crucial elements of the overall support system needed to serve youth . . . whether they wear olive drab, bright blue or 4-H clover green.

### ***Funding***

Arizona Cooperative Extension  
4-H USDA Military Grants

## **Arizona 4-H Teen Road Trip**

### ***Impact Nugget***

An annual “road trip” activity sponsored by Arizona 4-H and modeled after the popular MTV series includes teens aged 13-18 who go on the road throughout a chosen region of Arizona, with activities that promote trust-building, exploration, personal responsibility, interpersonal skills and problem solving: the program is so popular that in 2004, 80 percent of the participants had already taken part in previous trips.

### ***Issue***

Retention and recruitment of teen members in 4-H is a problem nationwide. When asked what would help recruit new teens and keep current members in 4-H, the Maricopa County 4-H Teen Association suggested a road trip like the one on MTV. The rationale was that with multiple parents in the workforce, many families cannot afford the cost or time to take family vacations. Youth have become accustomed to being able to attend affordable 4-H events where they have made friends, learned valuable skills and had fun.

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

Arizona 4-H Road Trip is an invitational opportunity for teens aged 13-18, sponsored by the Maricopa County 4-H teen program and UA Cooperative Extension. Begun in 2001, the trip takes place “on the road” throughout a chosen region of Arizona and surrounding states in July. Activities promote communal living, trust-building, exploration, personal responsibility, interactive and interpersonal skill development, and problem solving. Teenagers of various backgrounds gather from five Arizona counties to engage in the five components of the Road Trip: interactive geography/history lessons; service learning; work force/career exploration; cultural/diversity awareness and appreciation; and technology in action. Participants develop a strong sense of teamwork and community, learn to adapt to new situations, learn how to live and work with others, participate in new activities, and function as a working youth/adult partnership team. Conflict resolution, relationship building and trust skills create the “road trip community”, promoting and strengthening participants’ abilities to thrive in various situations and environments.

Participants photograph sites during the trip and work with a 4-H agent to download them to the website and in the form of electronic postcards. It is possible to follow the trip via the Internet, and interact through e-mails to ask questions of the group. At least two hours per night are spent creating a traveling camp so other teens and interested parties can experience a “virtual” Arizona road trip. See [www.arizona.edu/4-H/roadtrip/](http://www.arizona.edu/4-H/roadtrip/).

In the fourth Road Trip experience, the size of the camp was reduced from 34 participants to 17 - at the request of the returning participants. In their evaluations and as a result of the planning group, the teens stated “the large group undermined the success of the camp in our opinion. It became so large, we no longer had the commitment of every participant to make camp run smoothly and everyone didn’t have to accept personal responsibility for camp stuff getting done.” The intensive experience created by road travel of over 1000 miles is one that is determined by the participants’ buy-in and commitment, so the group was limited in size.

### ***Impact***

The program is so popular that 80 percent of the 2004 participants were returning from previous Road Trips to take part in Road Trip IV. Comments from participants regarding what they learned about communal living and working with others, making new friends, trusting others, accepting responsibilities, trying new things, problem-solving, and leadership skills:

“It's fun and tough at the same time trying to get along at first, but then it's like you become a family and just instinctively help each other out.” —Road Trip III participant

“When living with 35 people, independence doesn't work. Everyone has to work together and make an effort. Thinking about others before yourself is the key.” —Road Trip III participant

“Ground rules are necessary. The more that is expected of each other, the greater the response toward a civilized community you will have.” —Road Trip III participant

"It's 4-H - it's all about making friends. And on the road trip, even though some people didn't like each other in the beginning, they finally realized, ‘Hey, I'm stuck with them for the rest of the trip!’ And eventually, everyone was best friends.” — Road Trip II participant

### ***Funding***

University of Arizona Cooperative Extension

Private registrations

Arizona 4-H Youth Foundation

## STAKEHOLDER INPUT PROCESS

### 1) Advisory Boards

#### a) *Cooperative Extension.*

The Legislature of the State of Arizona accepted the provisions of the Smith-Lever Act in 1915. It authorized the Board of Regents of the University of Arizona, the original Land-Grant University in Arizona, to “organize and conduct agricultural Extension work which shall be carried on in connection with the College of Agriculture and Life Sciences of the UA in accordance with the terms and conditions expressed in the Act of Congress aforesaid”. This State legislation also empowered county governments to appropriate funds for the county Extension program.

Currently, according to Arizona State Law *ARS 3-124-127*, each County Extension Board consists of seven persons, who are residents of the county, four of whom have as their principal business the production of agricultural commodities, and the other three of whom are representative of organizations or persons who utilize the county Cooperative Extension offices. Extension faculty are sensitive to including membership representative of their county regardless of racial or ethnic background. Names of Advisory Boards for each Arizona county are available at the Cooperative Extension web site (<http://ag.arizona.edu/extension/>). The County Extension Boards have three responsibilities. First, in order to build educational program priorities that are based on needs of local people, the Extension Board must approve the Annual County Plan of Work. The county Extension faculty present a prioritized list of potential programs and the Board may suggest others. In setting priorities, Cooperative Extension is interested in involving a broad-based, representative county group that may include commodity groups, 4-H councils, family consumer groups and community development groups.

Another role of the County Extension Board is to annually approve the county Extension budget, submitted to the Extension Board by the County Extension Director. This budget covers all funds expended for Extension work in the county. According to the legislation, the Board of Supervisors of each county must provide reasonable rent-free office space for the conduct of extension work in that county.

Finally, the Extension Board approves the Annual Report of Extension work in the county. County reports are available at the Cooperative Extension web site.

#### b) *Experiment Station*

Individual Advisory Boards have been established for each of the following Agricultural Centers: Maricopa and Citrus, Safford, Yuma, Oracle, Santa Rita Experimental Range and the V-V Ranch. The boards have representatives from the agricultural community, the agri-business community and include consumer representatives who are appointed on a rotational basis. These boards meet from two to four times per year to review ongoing programs and make recommendations for change. In addition, the State 4-H Youth Development program, the Departments of Agricultural and Biosystems Engineering, Animal Science, and the Schools of Natural Resources and Norton Family and Consumer Studies have separate advisory committees that provide input to the programs of these units.

## 2) State Program Evaluation

Accountability is increasingly important to secure new resources, maintain visibility, and market effectiveness. Every faculty member in the College of Agriculture and Life Sciences (CALs) provides an Annual Performance Report (APR) of accomplishments and impacts for the previous year, and a plan of major commitments for the coming year. This information is entered into a searchable database of programs and their impacts. Key components of the database are: (1) college-wide reporting, linking extension, research and teaching; (2) agricultural experiment station reporting of federal project data; (3) Cooperative Extension reporting of federal clientele contact data and outreach activities. This database is accessible at <http://ag.arizona.edu/APROL>. Public impact statements are available under the "Arizona Delivers" label, a new attempt at branding for CALs.

In the past year Cooperative Extension sponsored several program retreats which included clientele, focused on the following initiatives: rangelands west, community viability, noxious weeds, forest health, food safety, direct farm marketing, youth gardening, and others. Programmatic support, monitoring support and political support are being generated to accomplish the goals of these programs. Statewide program priorities for the next three to five years were identified during these exercises. Extension faculty are committed to an on-going process of self-improvement in outreach programs.

## 3) Public Input for College of Agriculture and Life Sciences Programs

Public input is extremely important to the College of Agriculture and Life Sciences. Because we are a Land-Grant College committed to serving the needs of the State of Arizona, the College regularly seeks stakeholder input, programmatic feedback, and advice on future directions from citizens. As noted above, Extension Advisory Boards provide stakeholder input to Extension faculty on a yearly basis.

The College conducts an annual stakeholders forum to refine the vision of the College of Agriculture and Life Sciences. This year's Forum, conducted in September, 2004, focused on a major revision of the College's 5-year (2005-2009) Strategic Plan. A broad cross-section of our stakeholders provided suggestions for additions and deletions of a draft plan that was presented for discussion. The final document resulting from this meeting will provide programmatic guidance for the next five years.

## **PROGRAM REVIEW PROCESS**

There have been no significant changes in the program review processes submitted in the original 5-Year Plan of Work.

## **RESOURCE ALLOCATION**

Allocation of resources across the five goals was based on available dollars, State and College priorities and available faculty with interests and expertise in the various areas.

## **EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES**

Continued progress has been made on nearly all of the goals and outcomes outlined in the revised 7-Year Plan of Work. Much of this can be attributed to our multi-state and integrated programs. We are currently involved in 67 separate multi-state projects and coordinating committees which, coincidentally, allowed us to have direct interaction with scientists from more than 45 separate agricultural experiment stations from the various states and territories. This interaction also involves an increasing number of individuals who have their primary appointment with Cooperative Extension. The relatively small amount of federal dollars that are committed to this process leverages a very significant number of resources in terms of personnel and operations to solve many of our regional and national problems. The Western Region has fully implemented an integrated multi-state research and extension review, accountability and reporting process through the Regional Coordination and Implementation Committee (RCIC). Arizona is fully committed to this process and is a strong player in the formalized multi-state effort.

As noted before, Arizona has a fully integrated research and extension program. This is evidenced by the fact that nearly all of our extension specialists have split appointments as do many of the research faculty. The split responsibility model is carried up through the department heads, center directors and at the dean/director level where resource decisions are made jointly by research, extension and academic program leadership. Therefore, we have minimized distinctly separate extension and research programs. Rather we have a situation in which some activities are largely “extension” oriented, some that are largely “research” oriented and a very large body of activity in the middle that represents a combination of efforts. Much of our day to day progress can be attributed to the joint and collaborative efforts that emerge from this working model. A classic example of this is embodied in our Cross Commodity Working Group which develops collaborative research and extension programs in the areas of insects, diseases, weeds and pesticide use involving forages, vegetables, grains and cotton. Information on this group can be found at:  
<http://cals.arizona.edu/crops/cropxcrop/cropxcrop.html> and  
<http://cals.arizona.edu/extension/programareas/crop2.html>.

As noted above, most of the multi-state “research” activities are conducted through the formalized multi-state programming effort. In the Plan of Work we also outlined a formalized effort with New Mexico and Utah, involving mostly county extension personnel and designed largely to meet the needs of the Native American community. For example, the Navajo Extension Partnership (NEP) brings together Extension personnel from six counties, the three 1862 state universities, Diné (a 1994 College), the Navajo Nation Division of Agriculture and Natural Resources, and others including the Tohono O’odham Community College the nation’s newest 1994 Institution to address new or emerging issues in the State of Arizona.. This is accomplished with very limited funds and wide open spaces where partnerships are invaluable. Work is also developing with regional community colleges.

**Appendix C**

**U.S. Department of Agriculture  
 Cooperative State Research, Education, and Extension Service  
 Supplement to the Annual Report of Accomplishments and Results  
 Multistate Extension Activities and Integrated Activities  
 (Attach Brief Summaries)  
 Institution University of Arizona  
 State Arizona**

**Check one:  Multistate Extension Activities  
 Integrated Activities (Hatch Act Funds)  
 Integrated Activities (Smith-Lever Act Funds)**

Title of Planned Program/Activity	Actual Expenditures				
	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
As described in 5 yr. plan of work	174,917	172,383	_____	_____	_____
1. Agricultural production system competitive in global economy	_____	_____	77,855	88,241	91,521
2. Safe, secure food and fiber system	_____	_____	21,519	12,800	12,471
3. Healthy, well-nourished population	_____	_____	12,083	11,199	16,284
4. Greater harmony between agriculture and environment	_____	_____	5,820	5,303	3,393
5. Enhanced economic opportunity and quality of life	_____	_____	55,570	58,848	53,500
<b>Total</b>	<b>174,917</b>	<b>172,383</b>	<b>172,847</b>	<b>176,391</b>	<b>177,169</b>

*Jim Christenson*  
 Director

April 1, 2005

Form CSREES-REPT (2/00)

Appendix C

**U.S. Department of Agriculture  
 Cooperative State Research, Education, and Extension Service  
 Supplement to the Annual Report of Accomplishments and Results  
 Multistate Extension Activities and Integrated Activities  
 (Attach Brief Summaries)**

**Institution** University of Arizona  
**State** Arizona

**Check one:**  **Multistate Extension Activities**  
 **Integrated Activities (Hatch Act Funds)**  
 **Integrated Activities (Smith-Lever Act Funds)**

Title of Planned Program/Activity	Actual Expenditures				
	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
As described in 5 yr. plan of work	63,818	63,692	_____	_____	_____
1. Agricultural production system competitive in global economy	_____	_____	17,731	22,429	24,838
2. Safe, secure food and fiber system	_____	_____	7,488	_____	0
3. Healthy, well-nourished population	_____	_____	3,948	9,393	11,305
4. Greater harmony between agriculture and environment	_____	_____	2,719	3,635	1,307
5. Enhanced economic opportunity and quality of life	_____	_____	31,762	27,577	25,632
<b>Total</b>	<b>63,818</b>	<b>63,692</b>	<b>63,648</b>	<b>63,034</b>	<b>63,082</b>



**Form CSREES-REPT (2/00)**  
**Appendix C**

**U.S. Department of Agriculture**  
**Cooperative State Research, Education, and Extension Service**  
**Supplement to the Annual Report of Accomplishments and Results**  
**Multistate Extension Activities and Integrated Activities**  
**(Attach Brief Summaries)**

**Institution** University of Arizona

**State** Arizona

**Check one:**  **Multistate Extension Activities**

**Integrated Activities (Hatch Act Funds)**

**Integrated Activities (Smith-Lever Act Funds)**

Title of Planned Program/Activity	Actual Expenditures			FY 2003	FY 2004
	FY 2000	FY 2001	FY 2002		
As described in 5 yr. plan of work	161,119	158,784	_____	_____	
1. Agricultural production system competitive in global economy	_____	_____	92,825	116,760	131,602
2. Safe, secure food and fiber system	_____	_____	1,065	_____	0
3. Healthy, well-nourished population	_____	_____	0	1,494	0
4. Greater harmony between agriculture and environment	_____	_____	21,926	25,639	15,563
5. Enhanced economic opportunity and quality of life	_____	_____	43,395	18,581	16,017
<b>Total</b>	<b>161,119</b>	<b>158,784</b>	<b>159,211</b>	<b>162,474</b>	<b>163,192</b>



**Director**

**Date: April 1, 2005**