2014 New Mexico State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

New Mexico (NM) agriculture must remain competitive in U.S. and world markets. This requires a continuous flow of appropriate technology addressing local needs within New Mexico. It is critical that the College maintains and strengthens programs that address these needs. The College recognizes that agricultural competitiveness and efficiency should take into account social and environmental costs. Determining these factors requires a coordinated, team approach within the College and among researchers and Extension faculty.
New Mexico Cooperative Extension has a tremendous role in helping to keep New Mexico's agricultural economy strong particularly in light of international border competition issues. Drought and water disputes, use of expansive range lands, invading diseases and pests, and national economic down turns, all play a role in maintaining, retaining and building New Mexico's agriculture infrastructure. Extension specialists and agents are working toward resolving conflicts through researched solutions, mediation through involvement of clientele in problem solving, incorporation of technology applications whenever feasible, and continuous reintroduction of tried and true practices.
New Mexico is continuing work to ensure an adequate and safe food and fiber system. Researchers continue to address promotion of regulatory compliance, product process development, food safety (contamination and protection) and sanitation, and marketing of specialty food products. Target audiences include clientele in nearly every county along with Native American meat processors and many farmers' market groups. A challenge in programming is to deliver the same basic message at several different levels of complexity to non-technical audiences, multicultural, and multilingual populations, as well as scientists and industry clientele. Research and education complement each other in the on-going efforts to control and reduce the introduction of pathogens into the food supply. While researchers are constantly seeking ways to reduce or eliminate contamination in the production and processing of food products, extension personnel are working with food handlers to ensure the safe delivery of food and food products from farm to consumer.
Even though New Mexico has a strong agricultural based economy, hunger issues persist for children and families. Extension efforts will continue to focus on improving the accessibility of food that is nutritious, safe, culturally acceptable, and affordable in both rural and urban areas. Food safety and security outreach will include strategies and programs aimed at both consumer and producer education. Extension specialists, agents and educators will continue to implement food safety programs targeted to food managers and handlers, as well as to home food and specialty farm producers and consumers.
A healthy, well-nourished population can be a consequence of access to, safe processing of, and delivery of nutritious foods particularly in households that are economically and nutritionally at risk. Even though agricultural and commercial advances have resulted in abundant food at ever-lower prices, many New Mexico households continue to face obstacles in securing a healthy, well-nourishing diet.
Barriers include a lack of resources and a limited understanding of nutrition. New Mexico State University (NMSU) works annually on strengthening food and nutrition programs and doing research designed to alleviate barriers and improve the nutrition, well-being, and food security of NM citizenry. Agricultural Experiment Station researchers address the research needs of the agricultural products grown in NM. Cooperative Extension faculty deliver food preparation and nutrition education programs. In this tricultural state, not all households choose to consume food in accordance with dietary recommendations nor is

regular exercise part of a daily or weekly routine (47.2% are inactive). In recent years, the focus of nutrition and health policy has shifted, because for many Americans, the problem is now one of overconsumption of certain foods or components. In fact, 4 of the top 10 causes of death in the United States are associated with diets that are too high in calories, total fat, saturated fat, or cholesterol or too low in dietary fiber. Improvements in diet and health can reduce illness and productivity losses, improve educational attainment, and prevent premature death. Solutions center on education to improve consumer understanding, behaviors, and food choices. New Mexico has a rich and diverse land and natural resource base that is arid and semiarid and, in many respects, extremely fragile. This natural resource base is a major contributor to the economic well-being of the state's residents. Its economic uses result in demands for various resources. In addition to direct demands for land and water, there is increasing pressure for recreation-related activities that represent a growing economic opportunity. Activities related to the state's natural beauty and its wildlife make a major contribution to the economy. The potential to develop, manage, and protect natural resources needs to be encouraged.
Both rural and urban human activities can pollute land, water, air, and food. Through teaching, research, and Extension programs, the New Mexico State University College of Agriculture and Home Economics is committed to furthering our understanding of human impact on the environment, and to supporting environmentally-sound agricultural and natural resource practices. The College will continue its efforts to understand the interaction between the environment and production agriculture. New Mexico's future is increasingly tied to regional environments and a global economy. Clearly defined regional and international perspectives are essential for the programs of the College. The University's traditional programs can be enriched by regional and international components and thereby better achieve their full potential. International activities enhance global understanding incorporating international dimensions into the ongoing instruction, research, and Extension efforts of the College. Graduates of the College need an education that will allow them to achieve success in a global economy. They must have the skills necessary to keep New Mexico a supplier of food and fiber throughout the world and keep New Mexico a destination for tourists from around the world.
Economic opportunity and quality of life vary greatly for New Mexican. New Mexico still suffers from some of the highest statistics nationally relative to families with children poverty levels, per capita retirement incomes, numbers of high school graduates, illiteracy, crime, unemployment in rural communities, teen-pregnancy, and uninsured motorists among other unsatisfactory figures. Addressing the quality of life issues is a core piece in New Mexico Extension's educational effort.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	38.5	0.0	61.0	0.0
Actual	18.8	0.0	56.2	0.0

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel

2. Brief Explanation

Projects are reviewed by faculty of the College of Agricultural, Consumer and Environmental Sciences. When necessary or appropriate, we have faculty from outside our college review projects. We also solicited review comments from industry representatives regarding internal grant awards (e.g., chile research).

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of the general public
- Survey specifically with non-traditional groups

Brief explanation.

See above checklist.

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.

See above checklist.

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
- Meeting with the general public (open meeting advertised to all)

- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

See above checklist.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

See above checklist.

Brief Explanation of what you learned from your Stakeholders

National priorities often are not aligned with state needs and priorities.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2121660	0	2103500	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1094553	0	4439341	0
Actual Matching	4469175	0	4439341	0
Actual All Other	253692	0	244634	0
Total Actual Expended	5817420	0	9123316	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

Global Food Security and Hunger

☑ 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	5%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	6%		6%	
202	Plant Genetic Resources	6%		6%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	14%		14%	
204	Plant Product Quality and Utility (Preharvest)	6%		6%	
205	Plant Management Systems	5%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		4%	
212	Diseases and Nematodes Affecting Plants	6%		6%	
213	Weeds Affecting Plants	10%		10%	
215	Biological Control of Pests Affecting Plants	1%		1%	
216	Integrated Pest Management Systems	2%		2%	
301	Reproductive Performance of Animals	10%		10%	
302	Nutrient Utilization in Animals	10%		10%	
305	Animal Physiological Processes	10%		10%	
306	Environmental Stress in Animals	2%		2%	
307	Animal Management Systems	3%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	6.6	0.0
Actual Paid	5.5	0.0	28.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
374958	0	2456537	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
3749580	0	2456537	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

NMSU AES researchers have developed an in vitro production system for GroEl, a bacterial protein hypothesized to aid in curtovirus transmission in onions, and also purified curtovirus capsid proteins. The scientists are now ready to study the interactions between these two components, which will help protect the onion industry in New Mexico.

Researchers have clarified the taxonomy of a pathogenic fungus of clover that produces the toxins slaframine and swainsonine. They have changed the genus of the fungus to Slafractonia, since the fungus produces the similarly named toxin; they also showed that the fungus is not closely related to any other fungal genera. They developed a transformation system for this fungus and demonstrated its efficacy using a gene-silencing system. They have used the nucleic acid sequence of an Undifilum species to initiate projects to characterize polyketide synthases from Undifilum and assess the functionality of one of those enzymes in the swainsonine biosynthetic pathway.

The NMSU alfalfa cultivar, NuMex Bill Melton, was developed for hay production in arid and semiarid environments of the southwestern U.S. that possess both abundant and limited irrigation capabilities. Seed of this cultivar is being commercially produced as part of an exclusive release agreement between the New Mexico Agricultural Experiment Station and a member of the alfalfa seed industry. In 2014, our industry cooperator in California produced certified-class seed of NuMex Bill Melton, which should be available for sale to farmers in 2015.

NMSU scientists employed DNA marker assisted selection (MAS) to transfer 10 DNA markers from an experimental alfalfa population into different elite cultivar backgrounds over two generations. These markers were previously determined to be associated with alfalfa forage yield and root biomass productivity during drought stress. These MAS-derived populations were evaluated in 2011-2013. Results suggested that marker assisted selection impacted alfalfa productivity in all three cultivar genetic backgrounds. The highest yielding second-generation MAS population derived from each cultivar in the LI study was also identified as the top performing population in the NI study indicating that DNA marker assisted breeding approaches can be used to develop alfalfa cultivars with improved forage productivity in both drought-prone and well-watered environments. In 2014, phenotypic selection for plant vigor was practiced in 10 high yielding populations in the LI study. One hundred plants from each population were placed under cage isolation and seed was generated for regional evaluation, including new alfalfa variety trials planted in NM and CA in fall 2014.

QTL analysis was conducted within two alfalfa mapping populations grown under water-stressed field conditions. Among 25 QTL identified, each impacted forage yield by 3 to 7 percent, and three QTL. were located in close proximity to the ERECTA gene. This gene has been demonstrated to influence multiple traits associated with water-use effiiciency in the model plant, Arabidopsis, and our results suggest that it may also be responsible for the yield effects noted in alfalfa during drought stress.

Collaborating with colleagues in Korea and China, NMSU scientists were able to produce whole-genome sequences of chile pepper (Capsicum). Both manuscripts provide excellent resources to the plant science community, and are aiding in plant breeding projects. The NMSU program has used the information to find candidate resistance genes for Verticillium wilt resistance.

Researchers have completed work on the egg laying behavior of the invasive stink bug, Bagrada hilaris. Their research documents that this is the first known species of the 5000 worldwide that lays its egg singly in the soil and then buries it. This has major implications for the management of this pest species, particularly in regard to biological control, sampling, and overall management.

NMSU scientists continue work on the seasonal phenology of the alfalfa weevil, completing a project on the comparative development of the alfalfa weevil strains in the laboratory. This work is the first to compare the development of all three U.S. strains under identical environmental conditions. It also compares individual feeding potential among late-instar larvae.

Researchers completed a field study on the species composition and seasonal development of flea beetles associated with chile. These insects are important early season defoliators of chile and no information is available on these pests in the state. They also completed a feeding choice test by the beetles of chile and two weed species (Wright ground cherry and silverleaf nightshade) and found that the beetles prefer the weeds over chile, particularly Wright ground cherry.

Researchers completed research on the seasonal development of the beet leafhopper (vector of curly top virus) on weed host species. Another two-year project evaluated desert plant hosts to determine development of beet leafhoppers on these species as non-agricultural hosts. These projects provide us with a better understanding of the number of generations and timing of life stages of the beet leafhopper in New Mexico, as well as an evaluation of environmental factors that potentially influence leafhopper abundance.

Researchers at the Farmington Agricultural Science Center (ASC) have shown that weed control in field corn, roundup ready alfalfa, dry beans, sunflowers, and small grains with preemergence herbicides, with irrigation being controlled properly without inducing leaching, that postemergence herbicides may not need to be applied. This scenario also applied to most crops researched at the ASC for broadleaf and grass weed control.

Findings show successful horn fly control in an insecticide treated group, with weekly averages ranging from 2.89 to 64.56 flies per animal. Naturally-occurring horn fly populations observed on an untreated control group ranged from 192.34 to 502.88 flies per animal. Data collected from GPS-derived inferences on animal activity show that animals in the untreated control group travelled on average 0.592 km / day more than their insecticide treated counterparts. In addition, the amount of time spent devoted to grazing in the untreated control group was reduced by 54.05 min/day. Further assessments of behaviors influenced by the presence of horn flies as well as assessing reproductive performances in these animals are currently in progress. Mature cows under naturally-occurring hornfly populations altered their behavior, increasing the amount of time spent devoted to high energy fly avoidance activities ultimately decreasing the reproductive performance of those animals.

Since 2005, sorghum grown for silage has increased 75% and statewide production has nearly doubled

over the past several years from 210 to 400 thousand tons. This indicates that producers are learning of the benefits of forage sorghum, particularly the water-saving benefits that allow for money savings and disaster prevention. In addition, milk production in New Mexico has increased 17% over the same period, indicating that increased feeding of sorghum silage has not negatively impacted milk production as some feared. Producers have been educated on best management practices of forage sorghums and corn in limited irrigation situations and their knowledge has been increased significantly about such systems. It is evident that awareness of the urgency to produce more water-conserving crops has been increased as the landscape has changed, particularly in eastern New Mexico, to include more irrigated sorghum crops (both silage and hay). This has only been strengthened due to extreme droughts in 2011-2014. The variety testing program is used to evaluate variety and hybrid adaptation to both irrigated and dryland growing scenarios in eastern New Mexico. Use of better-adapted varieties allows growers to utilize their resources more efficiently and leads to economic savings. Particularly, more efficient water and nitrogen utilization contributes to conservation efforts and sustainable agricultural production.

Requests for variety information are on the rise, especially with respect to forage and grain sorghums, which are gaining popularity in silage and dryland grain production systems that are hindered by limited water quantities and droughts. Multi-year results indicate that conventional forage sorghums can out-yield corn under restricted irrigation. Dry matter produced per unit of irrigation water is greater for conventional forage sorghums than for corn at restricted irrigation rates. However, corn is more affected by in-season rainfall and this variable determines how well corn competes with conventional forage sorghum in any given year. Forage sorghum is more consistent in its productivity regardless of year. Results have also indicated that on-farm inputs can be reduced by 25% without any detriment to productivity of the forage sorghum silage crops grown with restricted amounts of irrigation. Data from the second phase of this project are now being analyzed further and results from the first phase have been written into manuscript form for refereed journal and extension publications. Results have been presented at appropriate agricultural meetings and seminars. All annual warm- and cool-season forage variety testing programs were carried out from fall 2013 to fall 2014 with success despite extremely dry growing conditions. Results have been presented in research station reports, at field days, and at grower meetings throughout the year. The statewide Corn and Sorghum Performance Report has been compiled which includes corn and sorghum test results from the various Agricultural Science Centers across the state.

Forage sorghum variety trial plots have been expanded at the Los Lunas Agricultural Science Center. A second year of studies was completed in late 2012 investigating the effects of ultra-low irrigation and dryland systems on corn and sorghum grown for grain. This project is irrigated via subsurface drip tapes and allows for multiple water treatments to be applied to the two crops (along with 2 varieties each and 2 seeding rates). It focuses on when and how much water is needed at different growth stages in order to utilize the low amounts most effectively. Results indicate that both corn and sorghum can be relatively productive with minimal amounts of water, with corn requiring slightly more to be economical. Grain sorghum is the most advantageous under true dryland (non-irrigated) conditions, but even small amounts of irrigation added to the system quickly makes corn just as competitive from a yield standpoint. This work is encouraging in that adequate yields were obtained with low irrigation both years in perhaps the worst two drought years on record for the Clovis station.

Preliminary data from alfalfa planting date studies suggests that currently recommended late summer seedings of semi- and non-dormant alfalfa may lead to reduced yield in the next year compared to late spring or mid-summer seedings. If 5% of New Mexico's alfalfa growers selected the highest yielding alfalfa variety over the lowest yielding variety within a region, the return would be approximately $1.7M annually.

Over 5-years of data has contributed to our understanding of the challenges of growing grapes in Northwest New Mexico. Major recommendations include promoting good site selection to avoid frost pockets and selecting cultivars capable of producing grape crops after spring frost events (predominantly hybrid grape cultivars).

Several hops cultivars have been trialed in northwestern New Mexico. "Cascade" hops show most promise for standard hops. Neomexicanus hybrids are also receiving some attention and continue to be evaluated. The experimental trial trellis was retrofitted (raised) and is cabled more appropriately to demonstrate small-farm scale production. A survey of New Mexico brewers also has helped identify production and marketing bottlenecks.

Three Navajo communities are participating in a pilot community-garden-based wellness intervention. An IRB-approved survey instrument is tracking nutrition and gardening habits/behavior change.

The onion industry in New Mexico and the United States is valued at farm gate annually at 50-60 million dollars and 900-1000 million dollars, respectively. The potential impacts of NMSU's research on IYS and thrips are the offsets of yield reduction caused by IYS and onion thrips and the cost of chemical control of thrips. The potential economic impacts of this research could be 10-15% of the current farm-gate value that is estimated to be lost due to injury from IYS and onion thrips. In addition, the cost of chemical control of thrips, which is estimated at $7.5-12 million, could be saved with the availability of a thrips-tolerant onion cultivar.

By enhancing the ability of local growers to have product during more of the year, they may be able to pursue additional markets, including school lunches and year-round farmers' markets. High tunnels used in this research are relatively inexpensive to build, and rely only on sunlight to build up heat inside of the tunnel. Producers need reliable information on which crop cultivars will produce well in their region. Some strawberry cultivars available in seed and nursery catalogs will do fine in other parts of the country, but will fail in northern New Mexico because of climate and soil differences. Results from our studies show which cultivars grow well in our region.

Jujubes, an important crop in China for thousands of years, could become an alternative tree fruit crop in northern New Mexico where traditional tree fruit crops such as apple and peach lose their crop in many years because of late spring frosts. Jujubes flower later, thus avoiding late spring frosts, producing a crop essentially every year. Our research will provide cultivars adapted to northern New Mexico.

Research by NMSU scientist has resulted in the identification, testing, and validation of a low-cost approach to codling moth management for small-scale growers and home gardeners, practical approaches to integrated management of squash bug, and verification that mating disruption is feasible for controlling peach tree borer in the very small orchards typical of New Mexico. Research on organic management of Bagrada bug is on-going; however, the initial results are being used not only in New Mexico, but also by organic growers in California.

A laboratory study was repeated to determine the effects of decreasing soil moisture on persistence in weed seedbanks. Artificial soil seedbanks were maintained for 35 days at the soil matric potentials of 0 kPa, -30 kPa, -60 kPa, 180 kPa. Weed species studied included Amaranthus palmeri, Echinochloa colona and Setaria pumila, which are common weed species in agricultural fields in New Mexico. Using techniques that monitor activities of anaerobic soil microorganisms, it was determined that soil seedbanks at 0 kPa became anoxic. Despite these potentially harmful conditions, weed seed viability was maintained. Persistence in weed seedbanks decreased with decreasing soil matric potentials from -30 kPa, -60 kPa, 180 kPa. Exit from seedbanks at lower moisture levels was primarily due to germination. These results indicate that weed seeds are capable of persistence in saturated soils, which are prevalent in agricultural systems using flood irrigation technologies.

NMSU researchers have found that dexamethasone treatment resulted in decreased serum cortisol and increased serum insulin, glucose, and IGF-I concentrations in sheep. Dexamethasone treatment resulted in a brief period of maternal insulin insensitivity during embryo elongation and point to the need for

additional research on effects of maternal insulin resistance on postnatal growth performance of offspring.

Irregularities in placental development (i.e., placentation) occur early in gestation and are a fundamental cause of pregnancy loss in livestock, causing a serious economic drain on producers, with an average lost to the producer of greater than $600. Improving livestock fertility is paramount for efficient agricultural productivity and sustainability of food supplies. Establishment of functional fetal and placental circulation is one of the earliest events during embryonic development and proper placental vascular development is extremely important for fetal growth and survival. A comprehensive understanding of the subcellular, molecular mechanisms involved in vascularization and growth of the placenta will help reveal causes of poor fertility and provide fundamental knowledge to improve reproductive success in livestock. Impacts from our studies include the generation of essential knowledge with respect to factors regulating trophoblast cell proliferation and survival in concert with driving vascularization of the placenta to improve food-animal management. Research leading to improvements in livestock productivity helps not only the farmer and rancher but increases the world's food supply. We have demonstrated that the C-X-C chemokine receptor 4 (CXCR4) and it ligand, (C-X-C motif) ligand 12 (CXCL12) are up regulated in endometrium and trophoblast cells during early pregnancy in sheep. We also established the specific localization of CXCL12 and CXCR4 in fetal and uterine tissues during early gestation, which we published in 2014. Greater CXCL12 protein immunoreactivity was observed in the trophoblast cells compared to maternal luminal epithelium on days 16-30 of gestation. CXCR4 expression did not appear to change throughout early gestation. The increase of CXCL12 in fetal trophoblasts suggests that CXCL12 plays a role in communication at the fetal-maternal interface. Because CXCL12 promotes proper invasiveness and increases cell proliferation in human trophoblast cells, it is probable that it has similar functions in sheep. Our group also observed increased expression of select angiogenic and growth factors in trophoblast cells treated in vitro with CXCL12, suggesting CXCL12 influences growth and vascularization. We propose CXCL12/CXCR4 signaling plays a role in maternal-fetal communication and possibly contributes to fetal attachment and subsequent placentation. Further, CXCL12 promotes recruitment of select white blood cells into human decidual tissues. These reports, suggest that similar recruitment of immune cells may occur in livestock. To our knowledge, this is the first report characterizing localization of CXCL12 in uterine and fetal tissue of ruminants during early gestation, thus providing new insights into the importance of this chemokine during attachment and placental development. Results from these studies have expanded our understanding of how CXCL12/CXCR4 signaling is affecting early pregnancy in livestock.

Sugarcane aphid will likely be found in New Mexico in the next year and will present challenges in management in sorghum. Fields in eastern New Mexico were monitored periodically for sugarcane aphid so that when found appropriate steps can be taken to allow registration of an effective insecticide. Host plant susceptibility of glandless cotton to insect pests was evaluated and while it has been found to be more susceptible to a number of insect pests in the field and the lab to date we have not seen any impacts on yield suggesting that it might be a good fit in New Mexico where it can be used to produce high value seed that is not toxic to humans or other non ruminant mammals.

NMSU scientists demonstrated that feedlot cattle supplemented with supplemented with zilpaterol hydrochloride do not have greater requirements for ruminally degradable protein in diets to maximize performance. Also, our research demonstrated that supplementation of capsaicin does not reduce inflammation in growing cattle exposed to an endotoxin.

Data mining of 4 years worth of livestock GPS data sets collected between 2004-2008 was conducted. We learned that cattle establish short term (20 days) rotational grazing patterns in seasonally grazed rangeland pastures. Rotation parameters (pixel residence time, return interval, and revisit rate) are influenced by: a) non-forage factors such as distance to fences, roads, and drinking water; and b) forage-related factors such as plant phenology (green-up) stage and availability of herbaceous vegetation (per capita forage allowance). This same effort also looked at the influence of short term forage availability on day vs. nightime movement patterns of nursing cows in the weeks immediately following calving. We found

that higher levels of forage allowance lead to higher levels of nighttime activity and that such activity is associated with lighter calf weaning weights.

To introduce desirable traits and genes from Pima to Upland and Acala cotton, extensive interspecific introgression breeding has been practiced in the program on a yearly basis. Furthermore, selections have been made in intraspecific hybrid populations. As a result, numerous introgression lines (ILs) or advanced breeding lines have been developed and tested. In 2014, 700 ILs were grown in progeny rows and tested for agronomic and fiber quality traits, while 650 lines were established from a multi-parent advanced generation inter-cross (MAGIC) population and also grown in progeny rows and tested for agronomic and fiber quality traits. Replicated field tests will be performed on the IL and MAGIC populations in 2015 for further selection for high yield, fiber quality and stress tolerance traits and for genomewide mapping of quantitative trait loci (QTL). Three other progeny row tests (one on 440 another on 480 glandless lines and the third on 140 single plant selections advanced from 2013) were conducted in 2014. Many promising lines (i.e., glandless, Acala 1517 and Pima) in 2013 for high yield, fiber quality and stress tolerance were divided into 8 replicated field tests in 2014. Desirable lines selected from 2014 will be advanced to replicated field tests in 2015. About 800 single plant selections were made in above tests and other segregating populations and will be tested in progeny rows in 2015. Furthermore, 7 greenhouse tests were also performed to evaluate cotton lines for Verticillium wilt and thrips resistance, and drought tolerance. In addition, two national variety tests, a breeders' testing network test, a regional variety test, a regional high quality test, and an official variety test were conducted to provide unbiased data to farmers, seed companies, USDA and other breeders. Furthermore, 3 selected glandless lines were tested across the Cotton Belt in 14 locations. A 3 acre seed increase for glandless cotton and a 2 acre seed increase for Acala 1517-08 cotton were arranged. Data on lint yield, fiber quality, boll weight and lint percentage were collected for statistical analysis. While data in yield and fiber quality for most of the field tests are not available for analysis, major results can be summarized below:
1. Several new cotton breeding lines are promising as they appeared to out-perform the check Acala 1517-08 in yield potential.
2. At least one glandless line is promising as it had comparable lint yield to Acala 1517-08 and may be released as a new glandless cotton cultivar in 2015.
3. One Pima line, which outyielded a commercial Pima cotton cultivar by 20% when tested in 4 acres of a local farm in 2013, had higher yield than the best commercial Pima cultivar by >20% in the National Pima Variety Test in 2014. Seed increase will be arranged in 2015.
In summary, the NMSU cotton breeding program is continuing to make progress in further increasing cotton yield and improving other traits, providing promising breeding lines in the pipeline for producers in the southwest region. The use of these new products will significantly increase the net income for the New Mexico producer through technology transfer and dissemination.

NMSU scientists developed first recombinant inbred line (RIL) population in Pima cotton in the world for linkage mapping and to identify QTLs for drought tolerance using candidate gene-based single strand conformation polymorphism (SSCP) markers. Seedlings of the RILs were evaluated for plant height, fresh shoot weight, fresh root weight, chlorophyll content, evapotranspiration, and leaf temperature in two replicated tests in the greenhouse under 10% PEG treatment and control (water) conditions. Significant genotypic differences were detected within the RILs, and all the traits were significantly and positively correlated with one another except between fresh root weight and leaf temperature in one test. Based on a linkage map comprised of 247 loci assembled onto 32 linkage groups, 14 QTLs on 11 chromosomes were detected under the control or PEG conditions, each explaining 14 to 23.5% of the phenotypic variation. Three chromosomes each carried two QTLs in the same regions, while 7 QTLs were consistent with previous studies. Out of 63 SSCP-SNP markers that were significantly correlated with the traits studied, 19 from 14 genes were commonly correlated with more than one trait.

Agricultural Experiment Station scientists have demonstrated that alfalfa plants overexpressing the gene encoding for an enzyme sucrose phosphate synthase (SPS) in alfalfa, results in increased biomass and

improved nodule function. SPS catalyzes the synthesis of sucrose, which is the major form of photosynthate used as a source of energy and C required for N assimilation. They have also shown that overexpression of glutamine synthetase (GS), an enzyme catalyzing the first step in N assimilation, is also accompanied by improved plant performance. The improved performance of the two sets of transformants would suggest that for maximal performance both the C and N metabolic pathways have to be tweaked. The goal of the proposed research is to produce double transformants with the GS and SPS genes with the reasoning that the expression of the two genes in the same plant will further improve plant performance. These transformants, besides being analyzed for phenotypic characterisitics, will be subjected to both transcriptome and metabolite analysis. Metabolic analysis of these three classes of transformants could offer insight and point to other genes that would be more appropriate targets for modulation to obtain the desired phenotype. Moreover, the analysis may give us leads as to the preferred organ where the expression should be modulated to obtain the desired traits.

Bovine Respiratory Disease Complex (BRDC) contributes to over 1.1M cattle deaths and an economic loss that exceeds $692M in the US each year. BRDC is the single largest cause of all natural cattle deaths (24.8%) since 1991 and is responsible for over 46% of all weaned dairy heifer deaths. Cattle are predisposed to BRDC due to their genetic, immunological and environmental backgrounds. Despite the availability of vaccines, the prevalence of BRDC has not been reduced. The New Mexico calf trial was started in August 2011, and sample collection finalized in August 2012. Roughly about 900 samples have been collected from BRD and control animals which are currently being analyzed. Calves are anticipated to enter herds as heifers beginning Fall 2013 and will be monitored for performance during 1st lactation. The extension component of the BRD CAP has achieved a number of milestones this year including the development of a website (http://BRDComplex.org) and a dairy risk assessment tool prototype, (http://dcbsp.ucdavis.edu/t2). We have worked to develop linkages with the USDA members of regional project NC1027 (An Integrated Approach to the Control of Bovine Respiratory Disease), personnel at the National Animal Health Monitoring System (NAHMS), and have started to leverage the BRD CAP effort in an attempt to secure additional funding for projects with complementary aims. A number of presentations and publications were presented at various scientific, veterinary, and producer venues (Plant and Animal Genome, 5th BVDV Symposium, American Association of Bovine Practitioners, Academy of Veterinary Consultants, Beef Improvement Federation, National Beef Cattlemen's Association Cattlemen's College, National Beef Cattle Evaluation Consortium webinar, county-based animal health extension meetings) to introduce the concept of the BRD CAP and discuss the value proposition of including BRD as a trait in selection indexes (see http://www.brdcomplex.org/Links/Links.html for a full listing of presentations, papers, abstracts, papers and press).

Western Pecan Growers Association Conference: More than 300 attendees were at the WPGA Conference. They came from states across the US pecan growing belt and Mexico. Ninety percent of the respondents to the post conference survey said that the WPGA conference met their expectations. Western Pecan Production Short Course: More than 30 growers were in attendance from New Mexico, Arizona, California, Texas, and Mexico. Even one attendee from Alabama was there (and he was at the previous pecan short course in 2012 too). As in 2012, fully 100% of those who filled out the post-short course survey indicated that the 2014 pecan short course met or exceeded their expectations and that they learned valuable pecan production information at the short course, which they plan to incorporate this information into their orchard operations.

Surveys were distributed during some strategic statewide conferences to evaluate the impact of Extension programming related to integrated field crop production and management. More than 90% of respondents indicated that they were satisfied with the NM Cotton Conference and gained new knowledge that will help them in their practices. Also, >80% of the clients attending soil health presentations have expressed interest in using either cover cropping, green manure, or organic amendments for soil health improvement.

Indian Livestock Days began in the 1970s and was initially called "All Indian Livestock School". Today this

event is called NM Indian Livestock Days. It was discontinued in 1978 and reestablished in 1985, at the request of tribal livestock producers. Why is New Mexico Indian Livestock Days unique? Agent strongly believes it is the diversity of the people in general. The surrounding pueblo tribes as well as the Navajo tribal members face many challenges raising livestock. For example, there is not enough land, nor food on the land and most importantly lack of water. Uniquely these tribal farmers raise their livestock with traditional values therefore the land and the animals have traditional value and teachings. With that being said, raising livestock means much more to them than the average cattleman. The grassroots program is driven by clientele needs and interest. The planning committee consists of Extension Agents which services the Native American population in the following counties: McKinley, San Juan, Sandoval, Bernalillo, Valencia, Socorro, Otero and Cibola as well as tribal members of the various tribes in New Mexico, and Extension State Specialists. NM Livestock Days is an annual event for producers in NM, it benefits local and tribal producers and everyone is welcome to attend. The agents, specialist, farmers and ranchers meet consistently six months before planning the event based on the needs of the Native American producers. A request from attendees has been for hands-on breakout sessions on various topics these workshops are rotated so everyone has a chance to attend them. A website was developed for Indian Livestock Producers, this site contains information for the Native producer. We also post presentations from past years events. Hands on programs are extremely important to the attendees, so we have started having several different hands on type sessions for the attendees to rotate through. We started with just a half a day on these types of sessions and are now spending a whole day on hands on learning. "It's easier to give a cow a shot then look at a picture or someone telling you how to do it" according to a producer from the Navajo Nation. Some of our hottest topics this year were Fire Wise (fire management around your home and ranch), BQA Chute side - this covered hands on actives related to the BQA certification, Labatt Food Services also conducted a workshop on Native Beef and what they were looking for from producers and the quality of meat and animal they were interested. Other topics included drought management, USDA/NRCS programs and assistants available to Native producers, Wolf update and Sheep and goat management.

2014 was the 5th year the winemaking workshop and class was offered. The workshop/class is popular with students, interested community members, hobby winemakers and people who want to start a commercial business. There were 15 students enrolled that took the class for credit under AgEcon 458 and 7 people from the community as workshop participants. A person can learn the basics of winemaking and marketing and go on for more training, but some discover that winemaking is not for them after all and give up the idea of wanting to own a commercial enterprise, which saves much time and money. With the vineyard at Fabian Garcia maturing grapes are now available and greatly enhance the winemaking experience. This workshop is the only hands on teaching available in southern New Mexico.

The NM-ALIRT and Syndromic Surveillance program is modeled after a similar program in Arizona. The Extension Specialist was able to organize, develop materials, secure funding, purchase equipment and identify veterinarians willing to participate in this program. He then organized and hosted the first NM-ALIRT conference in 2007 held in Albuquerque, NM. Since its humble beginnings, the program has now expanded to include reporting veterinarians in Arizona and Texas, and also has a web- based reporting surveillance component. This program is being evaluated by the USDA National Surveillance Unit for expansion into a national livestock health surveillance system. He has presented this program at several national meetings as a model for other states to follow. This program is now involved in Agribioterrorism classes being taught on the NMSU campus to FBI agents from all over the United States.

2. Brief description of the target audience

The target audience includes: ranchers, feedlot operators, dairy producers. small/medium/large-scale agricultural operations, business, associations, cooperatives, consulting firms and collectives that might or might not be defined as a farm under the USDA economic return criteria, but are land owners, managers, consultants, or students who wish to improve agricultural production and efficiency. Other audience

participants include Extension agents, other agricultural specialists, pesticide applicators, Master Gardeners and garden clubs, youth (4H, Future Farmers of America and other groups) and the general public.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	15	92	107

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of trained professionals
2	# of improved animal varieties
3	# of research publications
4	# of methods, technology, and animal varieties adopted by public and private sectors
5	# Extension publications

Outcome #1

1. Outcome Measures

# of trained professionals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals

307 Animal Management Systems

Outcome #2

1. Outcome Measures

# of improved animal varieties

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

# of research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	92

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #4

1. Outcome Measures

# of methods, technology, and animal varieties adopted by public and private sectors

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

See above.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension

faculty.
lso, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Agricultural Markets, Trade, and Economic/Business Development

☑ 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
511	New and Improved Non-Food Products and Processes	1%		1%	
601	Economics of Agricultural Production and Farm Management	15%		15%	
602	Business Management, Finance, and Taxation	2%		2%	
603	Market Economics	14%		14%	
604	Marketing and Distribution Practices	30%		30%	
608	Community Resource Planning and Development	20%		20%	
610	Domestic Policy Analysis	16%		16%	
611	Foreign Policy and Programs	2%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.9	0.0	7.0	0.0
Actual Paid	3.9	0.0	3.7	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**
110038	0	299053	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
110038	0	299053	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

An assessment and critique of the ecosystem services provided from New Mexico rangeland restoration efforts implemented by the cooperative Restore New Mexico restoration project (part of the BLM Healthy Lands Initiative) was made. This major restoration effort was used as the basis for a Western Economics Forum (WEF) journal article that was published about the feasibility of providing sound assessments and economic valuations of ecosystem service provisioning from rangelands. A proceedings paper of the 17th Shrub Symposium held in Las Cruces, NM in May 2012 was written and submitted to a special Rangelands journal issue that will publish the proceedings.

2. Brief description of the target audience

The target audiences include agricultural producers, business owners, and policy makers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	18	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of professionals trained

Year	Actual
2014	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of research publications
2	# of Extension publications

Outcome #1

1. Outcome Measures

# of research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
610	Domestic Policy Analysis
611	Foreign Policy and Programs

Outcome #2

1. Outcome Measures

# of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Faculty numbers were down down by three.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension faculty.
Also, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Management of 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	10%		10%	
103	Management of Saline and Sodic Soils and Salinity	5%		5%	
121	Management of Range Resources	30%		30%	
123	Management and Sustainability of Forest Resources	10%		10%	
124	Urban Forestry	5%		5%	
135	Aquatic and Terrestrial Wildlife	10%		10%	
136	Conservation of Biological Diversity	5%		5%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
605	Natural Resource and Environmental Economics	15%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	7.3	0.0	14.3	0.0
Actual Paid	2.6	0.0	15.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
427236	0	1330015	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
427236	0	1330015	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

Researchers were able to show how five common desert toads relate to habitat and how future habitat changes might impact their populations. Furthermore, they laid groundwork in demonstrating how environmental factors influence detectability of desert anurans and how to best and most efficiently survey them

In terms of mitigation of climate change, a project using algae to produce biofuels has made huge advances. A review paper about modeling maximum lipid productivity of microalgae has achieved much attention in the international community. NMSU researchers further researched optimum environmental conditions (pH and nitrogen source) to economically cultivate Nannochloropsis salina.

Water used by agriculture is under intense scrutiny as supplies are tight and demand increases from non-agricultural sectors. Hydrologic research NMSU researchers are collaborating on builds understanding of how water diverted into community irrigation systems (acequias) of northern New Mexico can seep from ditches and percolate below fields and then reside in shallow groundwater for a time before returning to the river. This storage and release function provides water to the river in times of low flow and may actually save water on a regional basis by reducing evapotranspiration losses.

Population growth and development in the Southwest U.S. have increased the demand for water in the region. In some areas, due partly to recent droughts and excessive groundwater pumping, available water is insufficient to meet this demand. To conserve water for essential needs, many water districts have placed restrictions on water-use for irrigating food gardens and landscapes. If vegetable production and landscape quality are to be sustained in the region, efficient irrigation management techniques such as microirrigation and irrigation scheduling must be developed. NMSU researchers have identified water requirements and drip irrigation components for efficient irrigation management for production of vegetable crops and maintenenace of landscape plants, including plants that can be used in soil reclamation projects in the arid southwest. Microirrigation components for low pressure, water-saving situations, such as rainwater collection systems or where water is hauled to isolated sites, have also been identified. By using the recommendations resulting from this research, water will be conserved while plant production, landscape quality and soil stabilization may be sustained.

Providing research-based education that allows end-users to use less potable water and effectively use the limited water resources available in the arid southwest is paramount to sustainable living in the region. The results of experiments have provided a significant shift in understanding of the impact of fertilizers to provide best management practices for turfgrasses grown in the arid southwest while reducing the overall turfgrass water requirements, and allowing desired ornamental residential landscapes with minimal impact

to potable water supplies. Before this research, many landscape professionals believed additional fertilizer applications would increase the overall plant water use. However, these fertilizer applications allow plants to maintain acceptable quality with less water as compared to when no additional fertilizer is applied. End-users directly and indirectly touched by the research are making modest modifications in their cultural practices and switching to non-potable water sources for their landscapes.

An internet site that can be used to estimate ET for a crop has been developed. The internet site can estimate ET for any of the lower 48 U.S. states. All that is required from the farmer is crop type, acreage, planting date, and last irrigation date. Testing is continuing to determine any possible problems that may occur when the internet site is accessed and used. A spreadsheet program has been developed that will help farmers evaluate and track irrigation pump performance. This program requires that the farmer enter a minimal amount of data to estimate pump energy costs. These estimated costs can be compared to actual costs so that the farmer can track pump performance and determine if the pumping system is operating properly. This spread sheet has been presented at several irrigation workshops. Refinement of an initial design is being conducted on a simplified canal control gate. A design for a simplified overshot gate has been completed. Two irrigation districts have been given drawings and they are in the process of constructing and installing the gates. An open channel simulation algorithm has been completed to operate in Matlab. The algorithm solves the St. Venant open channel flow equations using a 4 point implicit solving method. This program has been expanded to model several reaches on a canal system. The program is being developed to test a ratio control program.

NMSU researchers identified plant taxa that can be used in greenroof ecosystems installed in arid environments, developed a method to classify urban landscapes, developed remote sensing techniques to detect drought early in pecans, and developed web interface to distribute information on landscape water conservation.

In arid and semi-arid regions where temperatures are warm and precipitation is low, organic matter decomposes rapidly and may have little effect on overall soil properties and soil quality. Research conducted on mine overburden demonstrated that adding 100 tons per acre of municipal biosolids had no effect on New Mexico Locust seedling establisment. Similarly, adding organic mulch to the overburden at rates of 2,000 pounds per acre did not enhance plant growth or establishment. Thus, rules about the addition of organic matter to soils developed in other regions may not be appropriate or suitable for the drier region of the southwestern U.S. Many soil quality indicators may improve with irrigation of saline waste water, however soil salinity and sodicity increase dramatically. Plants may be supported for a few years, but eventually the soil will degrade and need to be reclaimed using nonsaline water. Thus, not all soil quality indicators are equally critical in evaluating the productivity of a given soil. It appears that soil salinity and sodium adsorption ratio are the soil quality indicators most critical for arid and semi-arid regions

NMSU scientists are conducting research that is pertinent to the conservation and sustainable use of our natural resources. Large carnivore research will provide valuable information that state game agencies can use to manage their populations. Our work on examining the movements of golden eagles across North America will provide federal and state resource agencies with information necessary to plan renewable energy projects and mitigate potential impacts. Our work on the movement of rabies across the landscape can be used to evaluate strategies to minimize the spread of future outbreaks and our upcoming work on Department of Defense lands will contribute to finding solutions to reduce human-wildlife conflict.
A previous experimental study has generated considerable information on nitrate-nitrogen (NO_3-N) leaching in onion field under furrow fertigation in arid southern New Mexico. HYDRUS (2D/3D) model was used to simulate spatial and temporal distributions of nitrate-nitrogen (NO3-N) within and below the onion root zone under conventional furrow fertigation with the urea-ammonium-nitrate liquid (UAN) fertilizer. The simulated water contents in the furrow irrigated onion field agreed well with the measurements. Simulations produced similar patterns of the measured NO3-N concentration profiles throughout the

growing season. NO3-N concentrations remained higher and accumulation of NO3-N was observed within the root zone. Higher NO3-N within the root zone was dependent on the rate of the UAN fertilizer application, quantity of NO3-N removed by root uptake, and NO3-N drainage fluxes below the root zone. Simulations also suggested that NO3-N below the root zone during different growth stages remained much higher than a recommended (for drinking water) standard concentration level (10 mg L$^{\&minus1}$). This resulted in higher NO3-N drainage fluxes, particularly during the fertigation events between the establishment and vegetative growth stages. This indicates the need to apply most fertigation events at an early stage of bulb formation to provide the maximum NO3-N demands by onions and to reduce potential NO3-N leaching. The project results demonstrate that Hydrus 2D model can be used to model nitrate-N dynamics in the rootzone and below it and can be effectively used to reduce nitrate-N leaching through the soil profile. The results also demonstrated the usefulness of Fuzzy k-means classification on delineating contiguous areas for better management.

Two papers on the genetics of tadpole shrimp were published. The first paper described genetic structure between populations and found that the initial colonizers of an ephemeral pond strongly influence the genetic structure. There was an indication that migratory birds may facilitate colonization of ponds by crustaceans. The second paper used the complete mitochondrial DNA sequences to characterize the phylogenetic relationships between North American species of Triops and species from elsewhere in the world. Significant progress was made on goals 1 and 3, where a paper is in press in the Journal of Biogeography. That paper analyzes distribution and abundance of a freshwater mussel species that uses a fish host during its parasitic larval stage. The analyses show that biotic interactions with fish affect abundance of mussels over a spatial extent of up to 15 km. The analyses further showed that dams that limit fish movements in rivers have strong negative effects of mussel abundance.

Five New Mexico Meadow Jumping Mouse meetings/allotment visits and data collections were conducted at two different sites with analysis provided to allotment owners, and also assist two allotment owners with grazing management options to continue grazing and protect NMMJM habitat. Extension specialists provided comments on the proposed designated critical habitat and the Forest Service proposed action to improve mouse habitat.

Twenty-five percent of annual dairy permit reports submitted to NMED using NMSU's soil test interpretation workbook together with accurate documentation of land application demonstrate appropriate use of nutrients from all sources.

Twenty-five percent of clientele using NMSU's soil test interpretation workbook that are contacted report an improvement in plant production as a result of improved fertilizer source, time of application, rate of application or placement.
Fifty percent of New Mexico clientele who follow a nutrient management plan with adequate water can demonstrate maintained or improved crop production, reduced accumulations of nutrients, and improved use of nutrient sources.

Ninety-three percent of the 127 participants of the 2014 Master Gardener program in New Mexico considered training in turfgrass maintenance important and 92% of the participants reported that turfgrass training increased their knowledge of turf maintenance issues to either a great or a fair extent (immediately following a 3 hour training program). 57% of all 44 participants that have attended 3 or more years in the Master Gardener Program reported that repeated training in turfgrass maintenance has helped them greatly in their career as a Master Gardener, and 96% reported that repeated training changed and enriched their understanding of turfgrass management differently than one time training would have. 71% admitted that repeated training changed their attitude towards turfgrass.

2. Brief description of the target audience

Target audiences include:ranchers, farmers, urban landscapers, park departments, state and federal agencies, private homeowners, and recreational users of parks, forests, and waters.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	3	76	79

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of trained professionals
2	# of research publications
3	# of Extension publications
4	% of people adopting NMSU recommendations

Outcome #1

1. Outcome Measures

# of trained professionals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	15

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
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

# of research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	76

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
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

# of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3

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
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #4

1. **Outcome Measures**

% of people adopting NMSU recommendations

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
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension faculty.
Also, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The

Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

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
501	New and Improved Food Processing Technologies	50%		50%	
502	New and Improved Food Products	5%		5%	
503	Quality Maintenance in Storing and Marketing Food Products	25%		25%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	0.5	0.0
Actual Paid	0.0	0.0	0.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
82983	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
82983	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	244634	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Organic and nonorganic fruits and vegetables purchased from local grocery stores were evaluated by NMSU researchers for total aerobic, total coliform, and total mold/yeast loads using a swab method. Six types of organic fruits (apples, bananas, oranges, pears, strawberries and tomatoes) and six types of organic vegetables (broccoli, carrots, green onions, lettuce, mushrooms and potatoes) were purchased from each of three stores. Comparable nonorganic products were also purchased from three stores. All products were purchased in one day and stored at 22^{o}C for no more than 18 hours prior to evaluation. Total aerobic counts (APC) for fruits tended to be similar for organic (O) and nonorganic (NO) products. Extension faculty ensure food safety market viability of commercially processed foods by providing certification courses reviewing processing steps, ingredients, and thermal processes of acidified and low acid foods. Without this certification course these products are not allowed by US FDA to be sold. This service is not provided in all states.
In response to the increase in fruit and vegetable associated food borne illnesses, NMSU Extension faculty provide educational materials to food producers and educational professionals associated with agriculture in order to reduce microbial risks in fruits and vegetables through good agricultural practices (GAPs) education.

2. Brief description of the target audience

Target audience is food processors in Arizona, Colorado New Mexico, Texas, and Utah.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of trained professionals
2	# of research publications
3	# of Extension publications
4	% of food processors using NMSU for their food product development

Outcome #1

1. Outcome Measures

# of trained professionals

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	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
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

# of research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

# of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #4

1. Outcome Measures

% of food processors using NMSU for their food product development

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

See above.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension faculty.
Also, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Health and Wellbeing

☑ 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	20%		20%	
703	Nutrition Education and Behavior	25%		25%	
704	Nutrition and Hunger in the Population	5%		5%	
724	Healthy Lifestyle	25%		25%	
801	Individual and Family Resource Management	10%		10%	
802	Human Development and Family Well-Being	10%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	5%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	1.1	0.0
Actual Paid	1.8	0.0	6.8	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**
0	0	104112	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	104112	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
253692	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In an effort to fight obesity and educate children about healthy lifestyles, extension agents from Los Alamos, Rio Arriba and Santa Fe counties have developed the JBI ("Just Be It") curriculum. Part of the curriculum includes a fitness and nutrition field trip experience. Santa Fe was the only county that held this event this year. Los Alamos and Rio Arriba rolled the field trip workshops into the regular in-class sessions. The field trip begins with a JBI Trivia Game, which is a "Jeopardy-Like" game that actually has all the questions and answers for the pre-tests that the students have taken prior to the field trip and in-class sessions. The game sets the tone for the four- 45 minute workshops that students attend during the field trip. The workshop titles include: MyPlate; Vary Your Veggies Focus on Fruits; Power-up with Exercise; and Fun with Food Facts. The home economist presented the Fun with Food Facts workshop. In this workshop students learn how media affects food choices as well as impacting the amount of physical activity each day. These workshops as well as the curriculum are aligned with the New Mexico Health and Physical Activity Standards and Benchmarks. The agents from each respective county present the workshops.

Expanding the program to other youth programs in New Mexico and other states has shown progress. Expanding the program is also a long-term goal of the JBI program. Copies continue to be ordered from individuals working with youth programs throughout the United States. The curriculum is available in print and DVD/CD form, and a website is also available at www.nmcyfar.org to the public as well. Further, in September 2014, the Rio Rancho School District requested a third training once again for 12 teachers. As a result of this training, approximately 232 students benefitted and gained knowledge on healthy lifestyles through the JBI program.

In an effort to fight obesity and educate children about healthy lifestyles, Extension agents from Rio Arriba, Los Alamos, and Sante Fe Counties have developed and implemented the JBI nutrition and fitness field trip experience for fifth grade students. As usual, the 2012 field trip began with a JBI Trivia Game, which is a "Jeopardy-like" game that actually has all the questions and answers for the pre/post evaluations. This game sets the tone for the four - 45-minute workshops that students attend during the field trip. The workshop titles include: MyPlate; Vary Your Veggies Focus on Fruits, Power-up with Exercise and Fun with Food Facts. The home economist presented the Fun with Food Facts workshop. In this workshop students learn to read and understand the importance of nutrition facts food labels through a hands-on activity. Additionally, students learn how media affects food choices as well as impacting the amount of physically activity each day. These workshops are also aligned to the New Mexico Health and Physical Education Standards and Benchmarks. The agents from each respective county present in three of the workshops, and the fourth workshop on physical activity is conducted by another individual. Field trips were conducted in Los Alamos and Santa Fe this year, as there was not a facility available in Espanola to

provide this to the students. Instead, the home economist and two contracted nutrition educators hired through a small grant received by the Los Alamos and Rio Arriba home economists provided the field trip workshops to the selected Rio Arriba fifth grade classrooms. Further, at the fall 2012 field trips, approximately 410 students from seven schools participated in the field trips in Santa Fe and Los Alamos counties. In addition, students were provided with a student-parent booklet containing information and activities reinforcing the workshops. Teachers are also provided with a resource kit containing a nutrition curriculum, additional health and nutrition resources, as well as an exercise kit with a variety of fun exercise equipment. Based on the average results from the field trip pre-and post-tests from the Los Alamos site, students indicated an average knowledge gain of 46% by attending this one-day educational field trip. There was knowledge gain for these fifth grade students regarding nutrition guidelines, choosing healthy snacks, physical activity, food labels, how the media affects food choices, and goal setting after attending this field trip.

An estimated 154,800+ adults in New Mexico have diabetes. It can result in heart disease, kidney disease, blindness, stroke, amputations and death. Research shows that the risk for these complications is decreased when blood glucose levels are maintained within a range that mimics normal levels. The most effective way to achieve this level of control is through diet modifications. Individuals and families affected by diabetes regularly struggle with understanding diet recommendations and separating them from myths and outdated advice. There is a disparity of access to diabetes education across New Mexico, particularly in communities that experience the highest rates of complications and mortality from diabetes. In an effort to better serve New Mexico communities, NMSU Extension nutrition programs has collaborated with Molina Health Care and Joslin Diabetes Research Center to provide programming that would address these needs. 387 participants enrolled in either the Joslin or Molina programs. 85% of participants completed the program. 48.8% improved their A1C if their baseline reading was between 5.7-6.4. 65% improved their A1C if their baseline reading was above 65%. 53% of participants met their weight reduction goals of &ge7% of baseline body weight. 59% of participants with a baseline blood pressure reading &ge140/90 improved.

2. Brief description of the target audience

The target audience includes: teenage mothers, low-income families, families suffering social stress, mal- or undernourished families, diabetics.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	4	9	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of research papers
2	# of Extension publications
3	# of trained professionals
4	% diabetics adopting NMSU recommendations regarding nutrition

Outcome #1

1. Outcome Measures

# of research papers

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #2

1. Outcome Measures

# of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

# of trained professionals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	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
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #4

1. Outcome Measures

% diabetics adopting NMSU recommendations regarding nutrition

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
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

See above.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension faculty.
Also, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

4-H and Youth Development

☑ 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
806	Youth Development	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	5.5	0.0	0.3	0.0
Actual Paid	4.9	0.0	0.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
99338	0	249624	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
99338	0	249624	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

Kids, Kows, and More is an agricultural awareness program written for 4th and 5th grades. Although centered on milk, the program educates youth on the agriculture within their community. This program not only shows the product, but also the end results and what other products come from agriculture. This

program reached 7160 students and teachers.
The New Mexico Military 4-H program seeks to enroll military youth in 4-H clubs, ensuring them access to all 4-H programs, activities, and opportunities at the county, state and national levels. Three 4-H clubs on three military installations are operating, involving 250 members.
The Memorial Middle School Agricultural Extension and Education Center (MMSAEEC) is a unique program within the State of New Mexico and the Cooperative Extension Service. The MMSAEEC is a youth science center delivering inquiry-based learning and experiential education programs. The mission of the MMSAEEC is to deliver educational programs in agriculture and natural resources to youth attending Memorial Middle School in Las Vegas, NM. A basic premise of the mission is to develop a teaching and learning model of excellence for agriculture and natural resource science that complements in-class instruction by providing context to content through hands-on learning opportunities. In facilitating the role of the Center, stakeholders identified three primary areas in which they felt the Center could make contributions to student achievement: understanding the scientific method, general knowledge of agriculture and natural resources, and investigative opportunities and thought. The MMSAEEC integrates inquiry-based learning and experiential education as an important educational component of the delivery model. Inquiry-based learning and experiential education are particularly important in STEM education because investigation is at the core of the learning foundation. Major programming efforts were delivered at each grade level (grades 6-8) in one of the following content areas: scientific method, agriscience, and emerging issues in agriculture and natural resource science.

2. Brief description of the target audience

Youth ages 5 to 19 are targeted to learn life, leadership and citizenship skills through: Project Work, Special Interest Groups, School Enrichment, Competitive Events, Fairs, Clinics, Workshops, Record Books, Camps, Community Service, Public Speaking, Elected/Appointed Offices, etc.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	1	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program. Numbers of students involved in 4-H programs also will be outputs.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of professionals trained.

Year	Actual
2014	8

Output #3

Output Measure

- Number of 4H leaders enrolled on ES-237 report

Year	Actual
2014	457

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of Research publications
2	# of Extension publications
3	% volunteers trained

Outcome #1

1. Outcome Measures

# of Research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

# of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

% volunteers trained

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Faculty resigned.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The majority of adult program evaluations carried out by New Mexico Extension agents and specialists are pre-post and post-program knowledge gain instruments. The majority of youth (primarily 4-H club) program evaluations are demonstrations of knowledge gained and applied in teaching others, competitive events, and climbing 'youth career ladders'. Rarely, if at any time, does an agent or specialist report that participant knowledge attained/gained was less than satisfactory. One can only assume that knowledge gain survey questions are fairly worded, and that audience participation was not mandatory. The only exception to this is with Master Gardener and Integrated Pest Management qualification exams. But again, participation is initially by application and the desire to learn and apply what is learned.

Key Items of Evaluation

What is interesting to note is that most Extension faculty now use goal setting, program objectives, and evaluation instruments in their program plans (as opposed to 10 years ago, when there was a great degree of resistance). The next step in program evaluation is to assist Extension agents and specialists to develop precision evaluation instruments. On-going training, such as the Western Extension Cohort (Evaluation) Training (WECT), needs to be organizationally supported and participation needs to be encouraged by all Extension faculty.
Also, the American Evaluation Association has an Extension group section and should become a legitimate and heavily encouraged professional Extension association. The Association does more than any other organization to encourage evaluation 'best practices.'

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

☐ Reporting on this Program

Reason for not reporting

NMSU does not have a program in this area.

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: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual Paid	{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

See the section on the Sustainable Management of Natural Resources Planned Program.

2. Brief description of the target audience

Undergraduate and graduate students are the target audience.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Conduct classes on climate change.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of students trained.

Outcome #1

1. Outcome Measures

Number of students trained.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	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
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

☐ Reporting on this Program

Reason for not reporting

NMSU does not have a program in this area.

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: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	0.0
Actual Paid	{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

See the section on the Sustainable Management of Natural Resources Planned Program.

2. Brief description of the target audience

Students and producers are the target audiences.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of students trained.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# students trained.

Outcome #1

1. Outcome Measures

students trained.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	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
- Government Regulations
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Childhood Obesity

☐ Reporting on this Program

Reason for not reporting

NMSU does not have a program in this area.

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: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	0.0
Actual Paid	{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

See the section on the Health and Wellbeing Planned Program.

2. Brief description of the target audience

Children, youth, and families are the target audiences.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Conduct workshops and classes on healthy food choices.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of youth adopting healthy food choices

Outcome #1

1. Outcome Measures

# of youth adopting healthy food choices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
	Tons of feedstocks delivered.