

2009 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 tri-cultural 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 over-consumption 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 by 2007 New Mexico State University Combined Research and Extension Annual Report 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: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	38.5	0.0	61.0	0.0
Actual	28.8	0.0	64.5	0.0

II. Merit Review Process

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

- Internal University Panel
- External Non-University Panel

2. Brief Explanation

We have met several times with our Extension and Research Support Council, made up of stakeholders from around the state, to get their input as to state needs. We also have met with the advisory boards of our off-campus agricultural science centers.

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.

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 with invited selected individuals from the general public

Brief explanation.

See above.

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.

Brief Explanation of what you learned from your Stakeholders

New Mexico stakeholders are interested primarily in local or state-wide issues; they have little interest in national initiatives unless the initiatives affect them.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1960364	0	1787769	0

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

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	0	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Animal Production
2	Food Safety and Technology
3	Plant and Animal Protection
4	Plant Production
5	4-H and Youth Development
6	Agricultural Markets, Trade, and Economic/Business Development
7	Health and Wellbeing
8	Sustainable Management of Natural Resources

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Animal Production

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	20%		20%	
302	Nutrient Utilization in Animals	20%		20%	
303	Genetic Improvement of Animals	10%		10%	
304	Animal Genome	10%		10%	
305	Animal Physiological Processes	10%		10%	
306	Environmental Stress in Animals	10%		10%	
307	Animal Management Systems	20%		20%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	6.6	0.0
Actual	2.9	0.0	6.6	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

Targeted grazing studies are refining and evaluating the use of low-stress herding and strategic supplement placement as tools to improve big game habitat with cattle without fencing. To our knowledge, our team members are the only researchers that have attempted to focus beef cattle distribution without fencing in order to accomplish specific land management objectives. Our

approach uses activities that are integral to the western livestock culture to simultaneously improve upland and riparian habitats. This research will also examine the potential to use cattle for developing fire breaks in forested rangeland. We are not aware of any other studies that have examined this potential ecosystem service with beef cattle. In addition, the economic viability of target cattle grazing will be evaluated. This project will provide the baseline information and methodologies that are needed to allow beef cattle producers to join sheep and goat producers in the use of prescribed grazing to manipulate vegetation, accomplish land management goals and provide needed ecosystem services. This research will also contribute much-needed understanding of the factors that determine whether and when ranchers and other land managers are likely to implement this type of innovative management practice.

Since whole-herd data collection systems for beef cattle are slowly developing in the U.S., applied genetic research is greatly needed to develop strategies that provide enhanced economic opportunities for beef producers. A multidisciplinary team of scientist with expertise in reproductive physiology and genetics established a long-term goal to understand genetic pathways regulating reproductive performance in beef cattle, with the intent of using the information to develop gene-assisted improvement programs for fertility. Research is testing the *hypothesis* "we can discover and test functionality of markers in chromosomes that are associated with reproductive performance in beef cattle." The markers to be evaluated will be single nucleotide polymorphisms (SNP). Access to data and DNA resources from large beef organizations is available so the hypothesis can be tested by pursuing these objectives: 1) Conduct a SNP-based whole-genome scan to identify important chromosome regions associated with heifer pregnancy rate. 2) Develop data and DNA resources from large commercial beef operations for validation and technology transfer. These resource populations will be from varied commercial production systems and environments representing the U.S. beef industry. These resources allow expansion of the research efforts to include other economically relevant reproductive traits such as heifer rebreeding rate and stayability. In the past year, the project genotyped 802 Brangus heifers with the SNP-chip of Illumina (San Diego, CA; bovineSNP). This effort yielded ~54,000 genotypes across the bovine genome for QTL detection. From this effort, QTL were mapped to 30 regions on 12 chromosomes (BTA 3, 4, 5, 6, 9, 14, 16, 19, 20, 25, 26 and 29). Average frequency of the A allele for these SNP was 0.50 in this composite population compared to 0.53 in Angus and 0.47 ± 0.05 in Brahman cattle used to develop this beadchip. Nine regions were new findings for CattleQTLdb (Release 8). Two of the 7 SNP associated with birth weight also associated with longissimus muscle area and rib fat and were on BTA 5. The most notable SNP effect was on BTA 6, and accounted for 2.8% of the phenotypic variation in birth weight (35.2 ± 0.4 kg). This type of analyses were also completed for the binary heifer fertility trait, pregnant as a yearling on chromosome 2. In brief, Bioinformatic tools of www.animalgenome.org were used to visualize informative SNP (SNPlotz), QTL published for the region (CattleQTLdb), and potential candidate genes (gBrowse). Ten QTL and 10 annotations were identified in a 4 Mb region flanking the SNP inferring this QTL. Since hypothalamus is a regulatory tissue of the reproductive endocrine axis, transcriptome of this tissue was sequenced using the Illumina Genome Analyzer II and aligned with bovine genome to evaluate presence and level of expression of potential candidate genes among pre and postpubertal heifers through Alpheus®; Three genes with differential hypothalamic-expression were identified. Ontology of these genes included neuron function and cell signaling. The collaborations also collected ~10,000 DNA-blood cards to help build DNA and phenotype resources for technology transfer and development of marker assisted breeding programs in beef cattle.

- 1727 (approx 1.6% population) producers from 5 counties saw an 88% increase of knowledge in management, record keeping, nutritional requirements, feed alternatives and market strategies. Producers show 83% willingness to adopt recommended management changes
 - 1041 producers gained knowledge in noxious weed identification, weed mapping, and eradication
 - 50% increase in knowledge among 1,396 producers from 12 counties in TB, Bovine Trichomoniasis, laws pertaining to cattle disease, disease identification in cattle, and vaccine systems. Counties saw an increase in testing on range bulls (and yearling bulls) for Trichomoniasis.
 - Approx 78% producers that received information on bovine trichomoniasis took appropriate action
 - Increased awareness of importance of vaccinations for cattle and how to produce beef without residue from animal products or pesticides
 - Four counties saw an increase in BQA certified producers/tribal ranchers and increased awareness of BQA guidelines
 - Jemez Pueblo was provided with resources to monitor rangeland and make better grazing decisions and saw a savings of \$6,000/month
 - Educational workshops provided on cattle care and profit during drought saw increased use of management practices appropriate during drought
 - NM senior 4-H members gain knowledge in horse science, selection, conformation, and performance evaluation.
- Participation in 4-H contests resulted in an increase in public speaking skills and decision making skills among 4-Hers
 - 1,850 4th graders from 3 counties gained generalized knowledge in the importance of agriculture
 - Increase in number of agro-terrorism emergency disaster plans
 - Increased awareness among producers in wind energy and wind leasing agreements
 - Increased awareness of xeriscaping techniques and importance of water conservation on Navajo Nation
 - Increased number of cattle pooling groups
 - Increased awareness and use of artificial insemination among producers resulted in higher profitability

- Producers in several counties gain knowledge in how to check for pregnancy in their own cows
- 3,450 residents/producers in 3 counties gained knowledge and understanding in new/innovative farming/ranching practices including new gene technology for bull selection
- In eastern NM \$1000 saved for every square mile that was flagged with a range worm outbreak and treated before damage
- Research procedures and technology •Papers, citations, patents •Train students •Dissemination of research results
- Educational workshops •Conferences •Commercialization of techniques and products

2. Brief description of the target audience

The target audience includes: ranchers, feedlot operators, and dairy producers.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	25	0

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	Target	Actual
2009	0	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

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	Quantitative Target	Actual
2009	2	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a need for postgraduate professionals in the animal production industry.

What has been done

Five students have been graduated with advanced degrees in various areas of animal science.

Results

These students have entered the animal production industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
304	Animal Genome
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	Quantitative Target	Actual
2009	5	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of 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

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

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Safety and Technology

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 professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	0.5	0.0
Actual	1.3	0.0	0.8	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology
- Papers, citations, patents

- Train students
- Dissemination of research results
- Educational workshops
- Conferences
- Commercialization of techniques and products

Traditional methods of detecting microorganisms in food are time consuming and labor intensive, rapid and automated methods that have been developed must be tested in various food products. Although these rapid methods still require confirmation, the VIDAS SLM procedure was a reliable screening procedure combined with BAM Salmonella selective enrichment broth to detect Salmonella in dried red chile pepper powder. Utilizing rapid methods will improve both food processor and health official response time in the event of a food born illness associated with dried red chile pepper powder.

The fermentation of chile pepper mash depends on many factors such as temperature, air, available carbohydrate and microflora is a natural process that has not been fully characterized for industrial processing. Calcium chloride is used to maintain firmness in jalapeno peppers. The theory is that added calcium can block pectin esterase activity and interact with pectin to improve viscosity and maintain soluble solids in the final pepper sauce. Additionally, the effect of calcium on microflora and microbiological characterization of lactic bacteria involved in fermentation can impact the industrial processing of pepper mash.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	2	0

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	Target	Actual
2009	0	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

Not Reporting on this Outcome Measure

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	Quantitative Target	Actual
2009	1	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
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

Not Reporting on this Outcome Measure

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

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Plant and Animal Protection

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		10%	
212	Pathogens and Nematodes Affecting Plants	25%		25%	
213	Weeds Affecting Plants	20%		20%	
215	Biological Control of Pests Affecting Plants	5%		5%	
216	Integrated Pest Management Systems	20%		20%	
312	External Parasites and Pests of Animals	5%		5%	
315	Animal Welfare/Well-Being and Protection	15%		15%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	1.8	0.0	11.2	0.0
Actual	4.6	0.0	10.7	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology
 - Papers, citations, patents
 - Train students

- Dissemination of research results
- Educational workshops
- Conferences
- Commercialization of techniques and products

Our understanding of the distribution and biology of alfalfa weevil strains in the state is a critical component in developing an integrated pest management system specific to the unique conditions of New Mexico. The impacts of *Lygus* on cotton and chile production in New Mexico remain poorly understood. Our research will give us a better picture of that impact as well as the proper timing and implementation of management for its control. These data will be presented to growers and consultants and an economic threshold will be released that reflects our new understanding of the impact of this pest on NM cotton. Little is known about the blister beetles that are present in the state and the relative importance of the various species as threats to animal health even though hundreds of thousands of dollars are lost with the death and care of livestock injured by these insects. Our work will provide information on the important species to animal health. Our work on the beet leafhopper will impact management timing and strategies for control of this insect and reduction in curly top virus incidence. Efficient management of crop pests can result in a reduction in unnecessary control costs and potentially increase crop yields. This can translate into a significant increase in productivity and profit to New Mexico's growers. Also, fewer insecticide applications can result in reduced exposure of the chemicals to the environment. Our work on the Heteroptera provides information on the biology and ecology of our species that fills gaps in our understanding of these understudied taxa of insects.

- Results from annual weed/*M. incognita*/*V. dahliae* studies revealed that unlike crops, none of the three weeds tested experienced reductions in shoot or root weight in response to either pathogen alone or in combination. Neither was the level of *M. incognita* reproduction reduced by *V. dahliae* infection in any of the weeds. These results demonstrate that some annual weeds can harbor and enhance pathogen populations without a loss in primary weed productivity.

- The development of a species-specific DNA identification procedure for the pecan root-knot nematode (*Meloidogyne partityla*) provides a tool for use in rapidly determining if orchards or transplant stock are infested with this serious pecan pathogen. In the absence of effective methods for suppressing nematode populations in established trees, avoiding pathogen introduction or the establishment of orchards at infested sites are the primary means of reducing future crop injury.

The development of a reliable and accurate digital method for assessing root-knot nematode egg densities reduces tedium and potential related inaccuracies resulting from errors during manual counting of the large quantities of samples, such as those generated during the evaluation of host-parasite relationships involving root-knot nematodes.

Results from research directed at imidacloprid use in pecans have resulted in specific producer recommendations for soil applications; indicated the possibility of western aphids developing initial resistance to imidacloprid; and providing the impetus to begin initiating resistance management program for imidacloprid in western pecans. Results from research directed at thrips suppression in western onions have resulted in specific producer recommendations that include the use of a binary tank mix when using spirotetramat as a rescue treatment to control onions.

Ammonium nitrate treatments significantly altered leaf gas exchange measurements and the total chlorophyll concentrations in *A. m. mollissimus* and *O. sericea* species. Higher nitrogen concentration of 4 mM along with copious supply of water resulted in higher biomass and greener leaves. Hence higher concentration of chlorophyll enabled higher photosynthetic carbon fixation. However, alteration in nitrogen supply did not influence swainsonine production in both species. Higher swainsonine production in *A. m. mollissimus* than *O. sericea* is species specific.

Water deficit did not increase swainsonine concentration in greenhouse-grown plants as it had in tissue culture plants, suggesting swainsonine production is influenced more by plant genetics than by environmental conditions. The lack of any obvious above-ground biomass penalty in the presence of endophyte indicates that the amount of carbon and nitrogen used for swainsonine production in the fungus is not large enough for a parasitic effect on the plant. The relationship between the plant and fungus is not necessarily mutualistic though, and may be better classified as commensalistic, where neither organism benefits, nor is harmed. Root biomass data may provide more information about the effects of the endophyte on the whole plant, and therefore the overall relationship between the endophyte and plant.

Understanding more about the ecology, genetics, transmission, and weed hosts of beet curly top virus in New Mexico will aid in developing management options for chile growers. Our predictive model for curly top in southern New Mexico has given growers information on the disease so that they can make informed choices on which management methods they will need to use to handle the disease pressure. The information on virus-resistant plants provides growers with several pepper types that can be grown without significant disease losses.

A better understanding of the role that the fungal endophytes of locoweed play in locoism, the genetics of the fungi, and the factors that influence toxin production will lead to new options to mitigate the disease locoism and its impact. The information generated thus far changed knowledge significantly, in that fungal endophytes had not previously been known to be involved in locoism, much less responsible for the problem.

Results of greenhouse and microplot experiments to identify relationships between weeds, *Verticillium*, and root-knot nematodes emphasizes the importance of weed control in chile pepper fields; not only to reduce the impact of weed competition on yields, but to reduce the impact of diseases. Root-knot nematode resistant alfalfa has been shown to effectively suppress the nutsedge/nematode complex for a season after termination of the alfalfa. However, not all growers can produce alfalfa due to equipment needs or concerns about water availability from year to year. If we can identify cost effective, annual crop rotations that also suppress this pest complex, growers will have an additional, sustainable option for pest suppression in fields infested with these pests. Urban landscapes and crop production land in arid New Mexico are dependent on irrigation water supplied by compacted earthen canals and laterals either continuously or intermittently throughout the nine month irrigation season.

Equisetum hyemale is becoming an increasing problem on the canals, using water intended for irrigation and obstructing water flow in irrigation canals. Effective management of this species is impossible without determining factors that influence its spread on the canals.

- 13,265 New Mexicans were reached through plant and animal protection programs
- 5% of NM growers are doing field sampling and/or mapping
- Research done at Cloves AES and Leyendecker on sentinel bean plots yielding 300 plant samples revealed a new virus disease in cowpea
- 3,000 New Mexicans (18% of which are Master Gardeners) received direct info/training in IPM practices &ndash resulting in a dramatic reduction of insecticide use for cotton bollworm
- CEU trainings for NM pesticide operators resulted in an economic impact of \$31,935,000
- 4,665 plant samples submitted for diagnosis resulted in discovery of 5 diseases not known to occur in NM &ndash data uploaded to National Plant Diagnostic Network for public access
- Over 7,000 New Mexicans increase knowledge of arthropods
- Southern New Mexican Certified first detectors increased knowledge of high risk pests, diagnostic process, and crop bio-security issues by 12%
- NM Master Gardeners participating in plant management trainings/programs saw a 94.25% increase in understanding of environmental impacts on plant diseases
- NM producers participating in grower conference/workshops (1074 producers) saw an 89.5% increase of knowledge in plant health management
- 42 presentations on arthropods were given to audiences in grades K-12
- Middle/high school students competing in statewide 4-H/FFA entomology competitions (142 students) gained interest in arthropods and the sciences
- 80% of residents/producers that received info regarding specific questions in insect identification and control measures used info to control their particular pest situation

2. Brief description of the target audience

Attention will be given to commodity organizations in or serving New Mexico producers as well as pesticide applicators, Master Gardeners and garden clubs, youth (4H, Future Farmers of America and other groups and conferences) and the general public.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	18	0

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	Target	Actual
2009	0	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	% producers adopting NMSU recommendations to protect plants and animals

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	Quantitative Target	Actual
2009	2	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
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
312	External Parasites and Pests of Animals
315	Animal Welfare/Well-Being and Protection

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	Quantitative Target	Actual
2009	3	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
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
312	External Parasites and Pests of Animals
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

of Extension publications

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

% producers adopting NMSU recommendations to protect plants and animals

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)**Program # 4****1. Name of the Planned Program**

Plant Production

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	40%		40%	
202	Plant Genetic Resources	5%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%		10%	
204	Plant Product Quality and Utility (Preharvest)	15%		15%	
205	Plant Management Systems	30%		30%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	7.5	0.0	11.6	0.0
Actual	6.1	0.0	21.3	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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**

- Research procedures and technology
 - Papers, citations, patents
 - Train students
 - Dissemination of research results
 - Educational workshops

- Conferences
- Commercialization of techniques and products

Eastern Extension District:

- Master Gardeners Contributed 1020 hours of service valued at \$17,306
- Master Gardeners in conjunction w/ NM Junior College saw a 60% increase in enrollment as a result of continuing education credits/program offered by Master Gardeners
 - 4992 (approx 1.8% of Eastern Ext. District) contacts made with residents to disseminate knowledge of Southwest gardening, damage control, soil analysis, plant varieties, diseases, weeds, water conservation, IPM, and problems with urban horticulture, insects, and wildlife. Post surveys measure 80% increase knowledge of subjects and 70% willingness to adopt recommended changes with regards to gardening, management, and wildlife and water conservation.
 - Public demonstration/community gardens installed in 5 of the 11 Eastern ext. counties increased public awareness of xeriscaping, effective water use, healthy eating, and responsible practices in gardening by. Increased public interest in gardening was perceived by agents.
 - Pesticide Applicators Trainings in 6 of 11 eastern district counties resulted in 194+ licensed CEU's
 - 2 of 11 eastern dist. counties increased in knowledge (136 residents) in plant selection for SE NM and water conservation techniques
 - 22 pecan producers in three of the 11 eastern counties received direct assistance from extension. Increased knowledge of grading process by 90%, 70% increase knowledge of pecan defects and affect on price, 100% knowledge gained in pecan grading categories.
 - In one of the 11 eastern counties (Eddy), loss of pecans by PNC (pecan nut case) reduced by 22%. As result of info disseminated via email, newspaper, newsletters, workshops, and onsite visits, gross revenue from pecans increased by \$4 million
 - Awareness among 1,500 students in 3 of the 11 eastern counties of the potential dangers connected with agriculture has increased
 - 85% of Master Gardeners saw a change in attitude regarding how much water is actually needed to maintain traditional turf areas through Master Gardener Turf Program

Southwest Extension District:

- Master Gardeners in one of the nine SW extension dist. contributed 2269 hours valued at \$38,573
- In 4 of the 9 SW counties 39,333 (approx 10%) contacts with residents/producers made in regards to IPM, organic gardening/farming, water conservation, and xeriscaping
 - 15 community gardens (3 at elementary schools) established in 2 of 9 SW counties increase public awareness of gardening in the SW, xeriscaping, and water conservation
 - 398 pecan/pistachio producers in two of the 9 SW counties increased knowledge by 93% in IPM (integrated pest management), soil testing, irrigation, pruning, and signs of deficiencies/beneficences. 94% willingness to adopt suggested management changes
 - 85% of Master Gardeners saw a change in attitude regarding how much water is actually needed to maintain traditional turf areas through Master Gardener Turf Program

Northern Extension District:

- Master Gardeners contributed 22,697+ hours of service in N extension district, valued at \$385,849
- Master Gardeners extended ag education services to over 20,500+ (approx 1.5%) residents, of which 10% were children
 - Demo/community gardens developed in 2 of the 13 northern counties (with one being nationally recognized). Residents increased knowledge of vegetable crops and water conservation. 8150 lbs of demo/community garden produce donated to food banks
 - 46,805 (approx 3.5%) contacts made in northern extension district to disseminate knowledge related to water conservation, home garden techniques, xeriscaping, forage crops, organic gardening/farming, fruit production, disease control, agroterrorism, and soil testing. Survey results show average of 84.3% increase in knowledge in any one subject.
 - Residents using plant clinic services report 99% increase in knowledge in horticultural issues and 97% willingness to adopt recommended changes in gardening practices
 - In one northern district county (Torrance), research done with University of Florida and Florida Strawberry Growers on growing strawberry plants in NM saw healthier plants compared with strawberry plants grown in other US/Canada areas. As a result, 20 acres of NM land bought by a Florida grower yielded 2.5 million strawberry plants that were shipped to Florida.

- One northern county saw the expansion of the weather station network &ndash 25 acres of vineyards were converted from flood to drip irrigation resulting in a savings of 19 million gallons of irrigation water
- 85% of Master Gardeners saw a change in attitude regarding how much water is actually needed to maintain traditional turf areas through Master Gardener Turf Program

Intermediate-day and long-day onion accessions, germplasm lines, and commercial cultivars were evaluated for IYSV and thrips tolerance using a field screening method. The field layout for the field screening included IYSV-infected bulbs as the inoculum source, IYSV-spreader plants to allow for the adequate spread of IYSV and onion thrips throughout the field, and test plots that included the germplasm being evaluated. Entries were evaluated throughout the growing season for leaf glossiness (glossy to waxy), leaf color (light green to blue), leaf axil pattern (very open to tight), number of onion thrips per plant, and IYSV severity and incidence. Entries differed in many of these characters. Several entries exhibited fewer IYSV symptoms. In some instances, this reduction in symptom expression was associated with leaf glossiness and color. Bulbs, that exhibited fewer IYSV symptoms, were selected from certain entries. These bulbs were placed in a seed production field in order to self-pollinate each bulb so that progeny, that may possess improved IYSV tolerance, may be generated.

Since 2005, sorghum grown for silage has increased 79% and statewide production has nearly doubled over the past 4 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). Evaluation of various sorghums for biofuel potential will continue in 2010 and project has completed the 2nd year. 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.

Based on the very recent information from seed companies, Acala cotton germplasm lines released recently from the program have been used by the private industry to have developed some very promising lines. These lines are expected to be released by seed companies for commercialization. The National Cotton Variety Testing (NCVT) Committee also requested a new Acala 1517 be considered as one of the national cotton variety standards for 2011-2013.

Numerous cotton germplasm lines were evaluated for Verticillium wit, drought and salt tolerance. This resulted in resistant/tolerant germplasm identified, laying a foundation for breeding, genetic, and genomic studies.

We have developed a number of elite germplasm lines with desired fiber quality and high yield potential from interspecific breeding. This represents one of the first successful examples in cotton breeding in a century long attempt to significantly increase crop yield from interspecific hybridizations by introducing genes from one species to another. The Acala 1517 germplasm will continue to make substantial contributions to cotton breeding and industry in the U.S.

A new marker system called promoter anchored amplified polymorphism (PAAP) was reported from the program, which will provide a means to profile sequence variations in promoter regions and to study their associations with agronomic traits. A number of DNA markers including SSCP, STS and CAP were developed and reported from fiber candidate genes. This will provide candidate markers to study their relationships with fiber yield and quality for marker-assisted selection. Several mitochondrial candidate genes associated with cytoplasmic male sterility (CMS) were identified and reported. This represents the first work in investigating the molecular mechanism of CMS in cotton.

Many drought and salt responsive genes have been identified and confirmed for the first time in cotton, which will provide a base for identifying genes responsible for abiotic stress tolerance and for developing candidate gene markers for stress tolerance breeding in cotton.

The alfalfa cultivar, NuMex Bill Melton, exhibits improved performance under both optimum and deficit levels of irrigation. It appears to be widely adapted throughout New Mexico and will provide alfalfa growers a high quality forage with enhanced yield potential across diverse production environments. The identification of NPGS plant introductions that perform well under limited and optimum soil moisture will provide additional parent populations to use for developing cultivars with greater yield stability. Collaborative development of hybrids using NMSU and commercial industry materials will facilitate the introgression of NMSU breeding materials into the commercial sector. Additional results indicate that measuring the general combining ability of a population, which is quite expensive, is not strictly necessary to identify useful parents for hybrid development. Rather, it is sufficient to measure the yield performance of each individual parent population only (not its' numerous hybrids), and the population's fall dormancy/winter hardiness response. This later approach requires far fewer resources and will improve the breeding program's efficiency. The integration of DNA marker linkage data with field performance of genetically defined alfalfa research population families under varying soil moisture conditions has identified markers that may be useful for improving alfalfa

productivity by 3 to 14% under drought stress. DNA marker assisted selection programs are in progress to validate that these markers will be useful to improve the performance of elite cultivars.

The New Mexico Recombinant Inbred Lines (NMRILs) are having a significant impact on studies of the *C. annuum*/*P. capsici* interaction. Currently, the NMRILs are the standard for race differentiation in the world. Furthermore, this project has established that the different disease syndromes are inherited independently, leading to greater complexity in host/pathogen interactions making breeding for resistance more difficult. This host/pathogen interaction is becoming a model for studying the functional aspects of disease resistance to two very different disease syndromes, root rot and foliar blight. The results from these studies will give insight into host resistance and lead to a better understanding of the mechanisms underlying durable resistance.

2. Brief description of the target audience

The target audience is both small as well as medium and large scale agricultural operations, businesses, associations, cooperatives, consulting firms and collectives that may or may not be defined as a farm under the USDA economic return criteria, but rather are land owners, managers, consultants, or students that wish to improve agronomic production and efficiency as do and are other audience participants such as Extension agents, farmers, ranchers, other agricultural specialists, private-tribal-state-federal and even nonprofit organizations.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	25	0

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	Target	Actual
2009	0	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 producers, growers, homeowners adopting NMSU recommendations
5	# of improved plant varieties released

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	Quantitative Target	Actual
2009	2	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The plant production industry requires postgraduate professionals.

What has been done

One student was graduated with an advanced degree in agronomy.

Results

This student has entered the plant production industry.

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

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	Quantitative Target	Actual
2009	3	25

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

Outcome #3

1. Outcome Measures

of Extension publications

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

% of producers, growers, homeowners adopting NMSU recommendations

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

of improved plant varieties released

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Improved plant varieties will help producers remain competitive.

What has been done

One variety was released.

Results

Some producers have begun planting the variety.

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)

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 and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

4-H and Youth Development

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 professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	5.5	0.0	0.3	0.0
Actual	5.0	0.0	0.5	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology
 - Papers, citations, patents
 - Train students
 - Dissemination of research results
 - Educational workshops
 - Conferences
 - Commercialization of techniques and products

Hatch-funded research extends research on the learning impacts of integrating science and agriculture in the secondary curriculum into middle schools. The MMSAEEC also has a youth leadership development component arising from the students'

involvement in experiential team learning activities like working in research teams that must be assessed. Through their involvement in the Center, Memorial Middle School students are exposed in compelling ways to careers in agricultural and natural resources sciences, creating another needed area of assessment. Eighty-nine percent of Memorial Middle School's students are Hispanic, 66% are economically disadvantaged, and 25% have special needs. Therefore MMSAEEC's impacts on basic and agricultural and natural resource sciences learning; youth leadership life skills development; and science, agriculture and natural resource career interests within this unique population of youth is needed to determine if this learning model is worthy of diffusion and adoption at other middle schools with similar demographics. The results will also be used to improve the model to further enhance the outcome variables of interest.

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.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	1	0

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.

Year	Target	Actual
2009	0	0

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	Quantitative Target	Actual
2009	1	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

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

% volunteers trained

Not Reporting on this Outcome Measure

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

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Agricultural Markets, Trade, and Economic/Business Development

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	5%		5%	
601	Economics of Agricultural Production and Farm Management	25%		25%	
602	Business Management, Finance, and Taxation	20%		20%	
603	Market Economics	10%		10%	
604	Marketing and Distribution Practices	10%		10%	
606	International Trade and Development	5%		5%	
608	Community Resource Planning and Development	15%		15%	
610	Domestic Policy Analysis	5%		5%	
611	Foreign Policy and Programs	5%		5%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	4.9	0.0	7.0	0.0
Actual	3.4	0.0	7.8	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology
- Papers, citations, patents
- Train students
- Dissemination of research results
- Educational workshops
- Conferences
- Commercialization of techniques and products

Following the release of findings on the economic impacts of climate change on New Mexico's water resources, efforts continued to develop related publications and to continue efforts to improve model capabilities and functionality.

Efforts continue on identifying adaptation strategies suitable for watershed managers and water users who confront diminishing water supplies either from heightened competition, drought, or climatic changes. Climate change impact assessment is evolving in sophistication and complexity. A key area of research is the role of behavioral changes and the effects of these behavioral changes on the magnitude and distribution of impacts. Using developed water models, research can continue to investigate the development of specific coping strategies and their benefits in both water and agricultural systems. A paper was published.

Projected 2008 crop cost and return estimates were developed and released prior to the planting season. The set of cost and return estimates includes 49 representative farms. The set covers 39 geographical production areas, 22 different crops, several size classes, and 3 major irrigation types as well as dryland. All cost and return estimates, projected and historical are not exclusively published on the internet at <http://costsandreturns.nmsu.edu> and are posted in January / February for projected estimates for use prior to the decision-making season.

We have developed water use estimates for pecans, cotton, and alfalfa in New Mexico's Lower Rio Grande Valley. Relationships between crop water use and crop yield have been developed for pecans in the region. The economic cost of deficit irrigation in pecans has been quantified.

We have initiated research in Albuquerque's South Valley community to identify and quantify currently unmeasured scientific parameters which affect agricultural productivity and agricultural water use in peri-urban, small, scale, multicultural, traditional agriculture; and use the technical engineering and hydrologic results to develop technologies and guidelines which will enhance the profitability and sustainability of small-scale farms. We are estimating the value of food and agricultural commodities produced in the region (but not necessarily sold commercially) and identifying and documenting BMPs for irrigated agriculture in the region.

We are developing a database of public land ranches in southwestern New Mexico that includes information about various socio-economic characteristics of the ranches. These data are being combined with ecological data to examine the linkages between socio-economic and ecological processes on western U.S. rangelands.

Brush control and ecological studies conducted over a number of years under this and earlier NMSU brush control projects provided guidelines that BLM used to restore over 1 million acres of deteriorated habitat on New Mexico rangelands. The herbicide treatment technologies were developed at NMSU. With input from Kirk McDaniel, BLM summarized their southern New Mexico brush control efforts at http://www.blm.gov/nm/st/en/prog/restore_new_mexico.html. Two fact sheets about the control efforts for creosote and mesquite were written and they are available on the BLM website.

- 10,130 New Mexican residents/producers/elected officials received info/training/consultation resulting in raised awareness of agriculture's role in economic development
- 2,500 producers in eastern NM gain knowledge in agricultural goods and services that benefit farmers
- 4-H rodeo competition in eastern NM reaches 600 tourists
- 4,200 in eastern NM gained knowledge in agricultural tourism and natural resources
- De Baca county received \$120,000 for fairground improvements & agricultural booths at fair grounds attract thousands each year, raising awareness about agricultural development
 - A comprehensive and easily accessible SW NM tourism website increased likeliness of tourists to find tourism related events in NM by 45%. NM tourism magazines saw an increase in add quantity, quality, and effectiveness.
 - Northern New Mexicans have increased awareness of USDA agencies and agricultural organizations
 - Northern NM producers gain knowledge/skills in financial planning and record keeping specifically for agricultural businesses. Of the producers reached 98% recognize role/importance of financial planning for business success

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	10	0

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	Target	Actual
2009	0	0

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 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	2	10

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
606	International Trade and Development
608	Community Resource Planning and Development
610	Domestic Policy Analysis
611	Foreign Policy and Programs

Outcome #2

1. Outcome Measures

of Extension publications

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Health and Wellbeing

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	5%		5%	
703	Nutrition Education and Behavior	20%		20%	
704	Nutrition and Hunger in the Population	20%		20%	
724	Healthy Lifestyle	20%		20%	
801	Individual and Family Resource Management	20%		20%	
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 professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	1.1	0.0
Actual	5.7	0.0	2.1	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology

- Papers, citations, patents
- Train students
- Dissemination of research results
- Educational workshops
- Conferences

This project is expected to impact both research and outreach. First of all, this study will add to literature on parent-child conflict in Hispanic families, which is currently lacking. Second, by examining the cultural antecedents of parent-adolescent relations in terms of the horizontal/vertical elements of individualism and collectivism in the Hispanic ethnic group as well as the nature of parent-adolescent relations in terms of type of conflict experienced within the horizontal/vertical elements of individualism and collectivism, this study advances the research methodology utilized in this area to become more complete and comprehensive. As a result of this, more accurate data will be available for family scientists on the dynamics, nature, and effects of conflict on families. More accurate data will also facilitate the formulation of more effective interventions (managing conflict constructively, conflict resolution, alleviating internalized and externalized behaviors that result from conflict, etc.) that will eventually improve individual and family functioning and the overall, the quality of family life.

Over 500 people have been served under the Healthy Relationships effort. Nearly 300 fathers have been served in the responsible fatherhood initiative. The number of children reached under these initiatives is over 1000. The number of depth of extended family members who have benefited from these programs is immeasurable.

Kitchen Creations Impact:

- 48 Kitchen Creations schools, in 28 counties, were held in New Mexico during FY10
- 897 participated in the schools
- 5 schools were taught in Spanish and reached 117 participants in 4 counties
- 5 schools targeted Native Americans and reached 78 participants in 3 counties
- 1 school targeted African Americans and reached 19 participants
- 92% of the schools were held in rural or frontier counties

At the completion of the 4 class series participants reported the following changes:

- 68.5 of participants demonstrated an improved ability to plan and prepare healthy meals
- 83% of Hispanic and Native American participants demonstrated an improved ability to plan and prepare healthy meals
- 65% used the Diabetes Food Guide Pyramid to plan a day's meal
- 70% stated they were measuring food portions
- 83% used the 50/50 method to control the amount of carbohydrates eaten at a meal
- 91% began reading food labels to find the amount of carbohydrates in serving sizes
- 69% began eating at least 2 servings of whole grains per day
- 78% began eating at least 2 servings of non-starchy vegetables at dinner
- 78% began using more herbs and spices to flavor foods instead of salt and fat

An estimated 15,000 New Mexicans have been impacted by extension financial programs. Impacts include increased savings, financial literacy among youth, innovation among small businesses in money management, ability and willingness to create needed items rather than buy them, and increased awareness in techniques and tools used in financial management. A myriad of programs offered throughout NM are empowering youths through seniors to make smart financial decisions, use financial tools and resources, and invent ways to save money. Programs such as "Jump\$tart" gives NM secondary teachers the knowledge and resources to successfully educate students in good financial practices, and to practice making financial decisions in a classroom setting. Various quilting and craft workshops give residents the means to create needed items, as opposed to buying them, for a significantly lower cost. Workshops designed to increase understanding among New Mexicans of the implications of credit reports resulted in a 50% increase in willingness to obtain and use credit reports.

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.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	1	0

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	Target	Actual
2009	0	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	Quantitative Target	Actual
2009	1	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
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

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

of trained professionals

Not Reporting on this Outcome Measure

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

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

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 Management of Natural Resources

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%		10%	
103	Management of Saline and Sodic Soils and Salinity	5%		5%	
121	Management of Range Resources	20%		20%	
123	Management and Sustainability of Forest Resources	10%		10%	
135	Aquatic and Terrestrial Wildlife	10%		10%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
605	Natural Resource and Environmental Economics	15%		15%	
Total		80%		80%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	7.3	0.0	14.3	0.0
Actual	4.7	0.0	7.5	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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	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

- Research procedures and technology
- Papers, citations, patents
- Train students
- Dissemination of research results
- Educational workshops
- Conferences
- Commercialization of techniques and products

The losses of native fishes has been offset by the introduction of more than two dozen nonnative fish species. The research provides interesting insight into the consequences of radical agriculturally motivated water management that annually ceases river flows during the irrigation off-season. In spite of this profound ecological change to the river system, fish species persist in the region, likely reintroduced every year from upstream reservoirs or from perennially wetted drainage canals. Additional investigations are underway to characterize the tadpole shrimps that occur in the northern reaches of the Chihuahuan Desert. These occupants of ephemeral waters are thought to be effective biocontrol agents for mosquito larvae and they enable considerable energy flow through food webs in desert landscapes. Our research is developing genetic microsatellite markers that will be used to learn more about passive modes of dispersal in these crustaceans.

Our large carnivore research will provide valuable information that state game agencies can use to manage their populations. Our work on examining the effects of climate change with respect to carnivore populations across North America will provide federal and state resource agencies with information necessary to plan future conservation efforts and identify lands important for purchase. This work, which also involves an analysis of habitat use across our border with Mexico, will shed light on how a border fence will influence connectivity of extant populations. Finally, our work examining how climate change is expected to influence the demography and distribution of species is valuable for building a wealth of evidence to convince the public and policy makers that we are having a major impact on our Earth.

This research has the potential to reduce the adverse impacts of livestock grazing on rangeland soils, vegetation and wildlife. Light stocking leaves more residual vegetation for protection of soils, watershed, and wildlife habitat. Light grazing appears to allow forage plants to maximize their productivity and it may be more beneficial than grazing exclusion. Light grazing lowers rancher risks and may increase monetary returns over conservative grazing based on preliminary results. This research has the potential to reduce rancher/environmentalist conflicts by providing better technology to maintain and improve vegetation and wildlife habitat. Increased rancher income could reduce rangeland losses to subdivisions and other development. In previous research from this project, we found conservative grazing was advantageous over moderate grazing in terms of maintaining forage production, drought, reducing rancher risk and providing higher net profits.

Our work on soil quality continues to impact local and regional agricultural practices and potential remediation of contaminated soils. Selection of potential chile pepper varieties will impact local economies and agricultural practices. Our findings on arsenic sorption on waste water treatment sites should cause a modification in land application practices dealing with reverse osmosis concentrate disposal.

Economical use of fertilizers saves farmers input costs and protects the environment. Contrary to results in the eastern US with lower nutrient inputs, many pecan farmers in the western US add sufficient and maybe excess fertilizer to orchards during the summer. When nutrient uptake occurs during kernel fill in September, no additional nutrients are necessary. Under low nutrient conditions, a kernel fill application of nitrogen may be beneficial. Both manures and nitrogen fertilizers can be more economically applied. Nitrogen above a crop's requirements does not result in luxuriant uptake but results in nitrogen moving out of the system.

Research work demonstrated that the organic farming system is sustainable based upon the soil physical properties, soil salinity levels, and mineral nitrogen availability. However, sustainability index indicated that tillage seemed to undercut some of the benefits of organic matter additions. Although 10 years of continuous manure application raised salinity levels to only about 2.6 dS/m, an adjustment in management practice may improve soil properties and sustainability.

The study on chloride and nitrogen transport and irrigation efficiencies showed that although due to the water stress conditions in irrigation systems irrigation efficiencies were similar for furrow and drip irrigation systems. However, shifting from furrow irrigation to drip irrigation can lower $\text{NO}_3\text{-N}$ leaching, and improve N use efficiency with lower water inputs.

- 16,500 contacts with New Mexican residents/producers made to disseminate knowledge on sustainable practices and conservation

- 11,380 New Mexican residents received direct information in water conservation practices and xeriscaping
- A 77% increase in knowledge of water conservation practices and importance of water conservation among NM residents resulted in an increase in residential xeriscaping, a decline in outdoor residential and agricultural water use, and greater community participation in CoCoRaHS (Community Collaborative Rain, Hail and Snow Network)

- 3,795 NM producers received direct information in best farming practices for water conservation
- An increase in understanding of water conservation practices for farmers by 93.5% and a significant increase in the number of NM producers implementing these practices resulted in a savings of \$30 million (\$175 million if counting livestock consumption of these crops).

- A significant expansion of better practices of scheduling and metering of irrigation water has resulted in an increased production value of water, lowered costs, and a decline in water use by irrigation

- 1,793 New Mexicans (37% producers) received direct training/info in management of brush/weed control. Producers/residents gained knowledge in weed identification, mechanical/chemical methods of weed control, and a raised awareness about spread of noxious weeds. As a result, there has been an increase of thinning projects on both private/federal lands, several cooperative weed management areas formed, and increased small-scale cooperative weed management areas among producers

- 351,840 acres of NM land have been mapped and treated to prevent spread of noxious weeds
- Producers in central NM increased in knowledge by 90% in agronomic practices used to stop soil erosion in forage crops
- 828 soil samples submitted to soil lab for interpretation resulted in a 78% increase in understanding of New Mexican soils among producers. Producers show 95% willingness to adopt soil testing techniques in their fields
- 3 new weather stations installed in the Mid Rio Grande/South Valley to collect hydrologic data important to producer success
- 15 tribes/pueblos received training and gain knowledge in techniques/practices in the reuse of wastewater
- There have been 12 new SNOTEL and 4 new SCAN sites installed
- Increased awareness among land managers of the benefits of adopting monitoring systems
- Increased awareness of watershed stewardship and toxic algae
- Programs/camps designed to teach youth about the importance of preservation of natural resources saw a 37% increase of knowledge among youth
- A new tool developed for growers makes analysis of irrigation water quality easier by giving visual cues for quality and calculated leaching fractions
- Increased awareness of appropriate practices for dealing with pests affecting trees

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.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan			
Actual	0	37	0

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	Target	Actual
2009	0	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	Quantitative Target	Actual
2009	3	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The natural resources management agencies and related industry require postgraduate-trained professionals.

What has been done

Eleven graduate students received their degrees in various subdisciplines of natural resources management.

Results

The student have entered the professional workplace.

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	Quantitative Target	Actual
2009	5	37

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

Not Reporting on this Outcome Measure

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 and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}