

**NEW MEXICO STATE UNIVERSITY
COLLEGE OF AGRICULTURE AND HOME ECONOMICS
ANNUAL REPORT OF ACCOMPLISHMENTS AND RESULTS**

**New Mexico Agricultural Experiment Station
and
New Mexico Cooperative Extension Service**

**For the Period Covering
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A1. Planned Programs—Agricultural Experiment Station

Goal 1: An agricultural system that is highly competitive in the global economy.

Overview

New Mexico Agricultural Experiment Station plant scientists have conducted research ranging from genetic transformation for drought resistance in crops to evaluation of water and nutrient use in landscape and ornamental plants. Five cDNA libraries for drought-responsive genes have been constructed and a putative clone encoding capsaicinoid synthase activity into a protein expression vector has been engineered. Along with developing a gene model system for bulb onions and chile peppers, these results contribute to water conservation as well as disease and pest resistance. Four onion cultivars with increase disease resistance and lower pungency were released. Drought-tolerant alfalfa germplasm with resistance to anthracnose was released. New chile cultivars with increased resistance to phytophthora root rot are under development. A new Acala 1517 cultivar was released that had improved fiber, and pest resistance traits. All of these cultivar releases will increase the market share for New Mexico producers and reduce chemical and water use. In the case of the new Acala 1517 cotton cultivar, this translates into a net gain of 3 million dollars annually for New Mexico growers. All 1517 cotton received approximately ten cents per pound quality premium relative to other cotton. That is over 5 million dollar additional value for Acala 1517 cotton over other types of cotton. Other research evaluated soil quality and fertility for composted soil amendments with preliminary results indicating enhanced chile production on saline soils. Water use efficiency, mineral nutrition characteristics, and water quality characteristics also were investigated for landscape trees and ornamental plants in urban environments. Preliminary results indicate which are more drought tolerant and appropriate for the arid southwest; other results suggest that some ornamentals have potential for limiting mineral nutrient runoff, nitrate leaching, and wastewater purification. All of these have important ramifications for New Mexico and surrounding states, where water quantity and quality are critical issues.

Water shortages have led to reevaluation of farming and ranching practices. Researchers are continuing studies that compare stand establishment and the change in sward composition of selected perennial forage legumes and various grazing regimes as a way of maintaining New Mexico agriculture in areas where water resources are being depleted. Researchers also are investigating changes in native plant and animal occurring in the desert regions due to increasing human populations.

New Mexico Agricultural Experiment Station animal scientists are conducting trials to investigate the acute and subacute disposition and effects of swainsonine (locoweed toxicant) in lactating ruminants and mature wethers. Researchers also are investigating the health and performance of northern New Mexico calves as part of a feedlot health study. Results from the feedlot health study indicate that vitamin E supplementation has positive effects on performance early in the receiving period. Finding dose response and length of exposure markers for plant toxicities would be extremely useful for studying the effects of exposure of animals to toxicants

in these plants and aid in the development of management protocols to improve animal tolerance to these plants. Data collected during the feedlot studies will aid in optimizing the health performance of Intermountain West range cattle while improving the income and sustainability of family ranches through the development of economically and logistically favorable cattle health management and production strategies. Animal scientists also are investigating genetic mechanisms regulating growth and reproduction to improve beef cattle production efficiency in semi-arid climates. They are evaluating relationships between DNA markers, physiological responses, and reproductive and (or) growth performance of Angus, Brangus, and Brahman cattle. Information derived from this project may lead to genotypes of cattle that perform more efficiently in semi-arid climates than the breeds and types of cattle historically used in New Mexico. As these cattle become more efficient, fewer cattle will be required to produce equivalent pounds of beef, therefore reducing the grazing pressure on sensitive desert rangelands. As a result of the sheep nutrition research, sheep producers in New Mexico grazing sheep on native ranges do not have to purchase more expensive UIP supplements to maintain acceptable levels of performance.

New Mexico Agricultural Experiment Station researchers studied alternative crops and cropping methods for small-scale farmers in northern New Mexico. Results indicate that by using alternative crops and cropping methods, such as some of those we tested, small-scale farmers in northern New Mexico have the potential to greatly increase the productivity of their small farms on a per unit area basis. Other researchers are working to identify the major sources of price risks and to identify the proper derivative tools to manage those risks. If 1% of New Mexico's businesses that went bankrupt could have avoided bankruptcy via the use of price risk management tools, the value would be approximately 10 million dollars.

The New Mexico Agricultural Experiment Station believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 1 were \$244,404 from Hatch Act and Animal Health appropriated funds. The number of full-time equivalents engaged in research for this goal was 20.0.

Key Theme – Agricultural Competitiveness

- a. NMSU plant breeders are developing low pungency onion cultivars in successive maturity groups to facilitate a continuous supply of mild onions from late May through mid-August. Two low pungency, yellow onion cultivars (NuMex Freedom and NuMex Arthur) were released in 2000.
- b. Further development and release of high-yielding, high-quality, well-adapted, bolting-resistant, disease-resistant, short-, intermediate-, and long-day onion open-pollinated and hybrid varieties with varying maturities, pungency levels, and scale colors will support industry growth in New Mexico.
- c. Source of federal funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Animal Health

- a. New Mexico Agricultural Experiment Station researchers are conducting trials to investigate the acute and subacute disposition and effects of swainsonine (locoweed toxicant) in lactating ruminants and mature wethers. Data provide evidence of rapid clearance of swainsonine on milk and induced changes in nutrient metabolism that may be detrimental to production. Researchers also are investigating the health and performance of northern New Mexico calves as part of a feedlot health study. Approximately 350 calves to date from varying sources throughout northern New Mexico have been utilized in this continuing study. Efforts are continuing to quantitatively describe associated effects of preshipment immune and mineral status on morbidity, mortality and performance throughout the receiving and feeding period. Two experiments were conducted to determine effects of dietary vitamin E supplementation on performance, health, and immune response of highly stressed, newly received feedlot cattle. Results indicate that vitamin E supplementation had positive effects on performance early in the receiving period; however, immune response was minimal in this experiment.
- b. Finding dose response and length of exposure markers for plant toxicities would be extremely useful for studying the effects of exposure of animals to toxicants in these plants and aid in the development of management protocols to improve animal tolerance to these plants. Further understanding nutrient interactions with plant toxins will better enable us to improve animal performance on rangelands via appropriate supplementation during periods of poison plant prevalence. Data collected during the feedlot studies will aid in optimizing the health performance of Intermountain West range cattle while improving the income and sustainability of family ranches through the development of economically and logistically favorable cattle health management and production strategies.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Animal Production Efficiency

- a. Growth and reproduction are initially regulated by hormones synthesized and secreted by the pituitary in response to hypothalamic secretion of releasing hormones. New Mexico Agricultural Experiment Station researchers are investigating genetic mechanisms regulating these areas of physiology to improve beef cattle production efficiency in semi-arid climates. This will be accomplished by evaluating relationships between DNA markers, physiological responses, and reproductive and (or) growth performance of Angus, Brangus, and Brahman cattle. Pedigreed cattle populations are being utilized to evaluate genetic regulation of pituitary responsiveness of growth hormone releasing hormone and luteinizing hormone releasing hormone. Pituitary responsiveness to releasing hormones was found useful in predicting growth and reproductive traits in bulls

and heifers. It was also determined that the phenotypic variation observed in these physiologic responses was not strongly influenced by environmental factors; thus, the responses could be due to intrinsic physiologic or genetic factors such as breed. Further analyses will be conducted to evaluate the utility of genetic markers, physiologic responses to releasing hormones and concentrations of metabolic hormones in predicting growth and reproductive performance in Angus, Brangus, and Brahman cattle. Agricultural Experiment Station researchers also are researching the effect of undegradable intake protein (UIP) on performance and reproductive activity in Suffold and whiteface range ewe lambs. The experiments are evaluated different levels of UIP under both farm and range flock conditions.

- b. Impact — Information derived from this project may lead to genotypes of cattle that perform more efficiently in semi-arid climates than the breeds and types of cattle historically used in New Mexico. As these cattle become more efficient, fewer cattle will be required to produce equivalent pounds of beef, therefore reducing the grazing pressure on sensitive desert rangelands. As a result of the sheep nutrition research, sheep producers in New Mexico grazing sheep on native ranges do not have to purchase more expensive UIP supplements to maintain acceptable levels of performance.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - with states AR, AZ, CA, HI, IA, ID, IL, IN, KS, MI, MN, MO, MT, ND, NE, NV, NV, OH, OK, SD, TX, UT, WA, WI

Key Theme – Managing Change in Agricultural Systems

- a. Researchers are continuing studies at the agricultural science centers at Alcalde and Tucumcari, NM, that compare stand establishment and the change in sward composition of selected perennial forage legumes and various grazing regimes. Among winter annual legumes, hairy vetch and rose clover appear to have the best potential for use in the region as cover crops or in reclamation of disturbed lands. Alfalfa continues as the most suitable perennial forage legume compared to birdsfoot trefoil, cicer milkvetch, crownvetch, sainfoin, and kura, red, strawberry, and white clovers. Russian wildrye and western wheatgrass maintained the higher percent stand across different soil and irrigation treatments in 2000, while altai wildrye and tall wheatgrass produced the most forage yield by perennial cool season grasses. A trial comparing rotationally grazed alfalfa and tall wheatgrass as monocultures and rotationally grazed alfalfa-tall wheatgrass mixtures continued in 2000. There was no difference in animal performance by heifers rotationally or continuously grazing pastures containing alfalfa. However, pastures containing alfalfa gave more head grazing days per acre, higher final liveweights, and more total gain per acre than monoculture tall wheatgrass. Research to determine the feasibility of using alfalfa as an economic crop during the establishment phase of kura clover was initiated in summer 1999. Early results indicate that, in relation to broadcast monoculture alfalfa, plant populations of alfalfa are reduced by either drilling in rows or the inclusion of kura clover in the stand. The effect of inclusion of kura clover is likely

related to alfalfa seeding rate differences. This reduction in alfalfa population, however, did not affect total dry matter yields unless the kura clover was drilled. A study to compare selected small grains and winter pulse species in monocultures and mixtures for local adaptation, compatibility, and use as stored feeds was sown in summer 2000. No data has been summarized at this time. The project also included the development of cost and return enterprise budgets for each pasture grazing treatment. Results for the 2000 grazing season are not currently available. A stripper cotton variety/cultivar performance trial was part of this project in A related study to provide locally adapted information on the physiological development of upland cotton in east central New Mexico was initiated in 2000.

- b. Impact — These research projects are investigating changing grazing regimes as a way of maintaining New Mexico agriculture in areas where water resources are being depleted.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Ornamental/Green Agriculture

- a. New Mexico Agricultural Experiment Station researchers are evaluating mineral nutrition characteristics of ornamental crops in New Mexico, principally new crops and new uses of crops in relation to water quality issues.
- b. Impact — Research results will allow scientists to devise methods to extend postproduction quality of flowering crops without the use of synthetic chemicals; will lead to more efficient use of greenhouse-applied fertilizers, minimization of nutrient runoff, and increase in crop water use efficiency; will minimize leaching of nitrate into groundwater supplies; and allow fast-growing trees to serve as a low-input, natural wastewater purification system for economically disenfranchised communities along the U.S./Mexico border.

Key Theme – Plant Genomics

- a. New Mexico Agricultural Experiment Station scientists have constructed a total of five cDNA libraries of drought-responsive genes and are using bioinformatic tools to design primers to isolate biosynthetic genes. They also have engineered a putative clone encoding capsaicinoid synthase activity into a protein expression vector. A genetic transformation approach developed for a model system, bunching onion, *Allium fistulosum*, is being extended to bulb onion, *Allium cepa*. Transformation systems are being developed for chile pepper, *Capsicum annuum*, using various explant-regeneration systems co-cultivated with *Agrobacterium rhizogenes* binary vectors.
- b. Impact — Development of drought-resistant, heat-resistant crop plants should contribute to water conservation efforts. Disease and pest-resistant crops would result in reduced chemical applications. Higher quality crop products engineered for specialty uses may

contribute to reduced industrial pollution.

- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Plant Germplasm

- a. New Mexico Agricultural Experiment Station scientists have developed various drought- and disease-resistant cultivars for alfalfa, cotton, onion, and chile pepper. The alfalfa germplasm NM-9D11A-AN3 was released during June 2000. This germplasm is drought tolerant and possesses high levels of resistance to anthracnose. A DNA-marker-based linkage map is being developed in tetraploid alfalfa. Conventional pedigree breeding procedures are used to improve Acala 1517 cotton germplasm for agronomic, fiber, and pest resistance traits. DNA markers, primarily SSRs, are being explored for marker-assisted selection for important fiber quality traits. These DNA markers are especially useful in wide crosses where tagging novel alleles from the exotic germplasm. Two onion cultivars, NuMex Chaco and NuMex Snowball were released. NuMex cultivars were screened for resistance to *Fusarium* basal rot using a seedling screening procedure. Promising breeding lines and released cultivars were compared commercial cultivars and experimental lines using variety trials. Hybrid and open-pollinated cultivars were compared for plant characteristics, disease resistance, bolting resistance, bulb yield, and bulb quality. Significant progress was made in the genetic improvement of chile (*Capsicum*) germplasm and cultivars for New Mexico. A total of 176 breeding lines were evaluated in the field for early maturity, high fruit set with desirable fruit size, easy destemming and pungency. DNA was bulked for non-pungent and pungent individuals. Progress in developing cytoplasmic male-sterility breeding lines was obtained.
- b. In 2000, NM growers produced approximately 100,000 bales of Acala 1517 cotton. The new cultivar Acala 1517-99 has demonstrated a 7% yield advantage over other cultivars. This translates into a net gain of 3 million dollars annually for NM growers. All 1517 cotton received approximately ten cents per pound quality premium relative to other cotton. That is over 5 million dollar additional value for Acala 1517 cotton over other types of cotton. Onion cultivars developed by our program will be used by growers in New Mexico and surrounding states. Public and private breeding programs will use the germplasm released from our program and the information gained by our program to develop onion cultivars.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - with States AL, AK, AZ, CA, CO, FL, GA, ID, LA, MS, MT, NC, OK, OR, TX, UT, WA, WY

Key Theme – Plant Health

- a. Research by Agricultural Experiment Station scientists is addressing the long-term goal of preventing soil-borne disease in irrigated agriculture. Progress was made accelerating the development of chile, *Capsicum annuum*, cultivars with improved levels of *Phytophthora* root rot and foliar blight tolerance. Preliminary development of a host differential was begun for both root rot and foliar blight.
- b. Reduction of fungicide use would be the greatest environmental benefit of developing highly disease-resistant chile cultivars. In New Mexico, about 25,000 acres of chiles could benefit. Decreased fungicide use also protects water resources because there will be less leaching of fungicides into the water table.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Plant Production Efficiency

- a. New Mexico Agricultural Experiment Station researchers are measuring the response of chile pepper plants to multiple levels of nitrogen fertilization and salinity, which will improve management practices in the chile industry. Results from the first year of experiments indicate that the highest chile yields were achieved in treatments with low salinity and moderate nitrogen application.
- b. Impact — Soil salinity is particularly bad for chile peppers. Salinity builds up in irrigated soils and requires careful management including periodic leaching of the salts below the root zone. Large quantities of water are sometimes needed to leach salts through the soil but competition for water from domestic and industrial users may limit its availability for agricultural uses. Excessive fertilizer use can also increase soil salinity as measured by electrical conductivity. Thus, soil salinity may be an increasing problem for chile growers in New Mexico. Chile peppers account for about 36% of New Mexico's vegetable crop average but little is known about nitrogen management on saline soils. Increasing or decreasing the amount of fertilizer applied may affect plant response to salinity.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Rangeland/Pasture Management

- a. This research is to determine the relationship between changes in mesquite densities and soil textures and depths. On pastures lightly grazed by cattle, mesquite canopy area and densities were determined on 220 permanent transects. Mesquite density increased nearly 3-fold between 1982 and 1993. Between 1993 and 2000, average mesquite densities across the pastures increased much less. The difference in rate of increase between the two periods is mainly due to above average rainfall in the 1980's, and an extended drought in the 1990s. Broom snakeweed seed production and viability was determined

after broadcast spraying this perennial half-shrub with herbicides. Data suggest that herbicide applications made in early flower before seeds are fully developed can provide both satisfactory plant control and hinder seed production. Herbicide applications made after seed hardens does not significantly lower seed production or viability.

- b. Impact — Because of the native plant and animal changes occurring in the desert regions due to increasing human populations, natural reserves will be established to protect this fragile ecosystem from further development.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Risk Management

- a. Each year millions of dollars are lost and numerous businesses go bankrupt because they lack the ability to handle the risk of absolute price movements. Farmers lose money when the price of grains and livestock go down, utilities lose when they cannot pass the cost of fuel on to customers, banks lose when interest rates change and energy producers lose when the price of natural gas or petroleum goes down. Yet there are tools available to totally control all of these risks. However, only about 5% of all agricultural producers, 2% of utilities, 7% of banks, and less than 3% of energy producers use the tools. Clearly, an educational effort is needed to show the benefits of price risk management. Agricultural Experiment Station researchers are working to identify the major sources of price risks and to identify the proper derivative tools to manage those risks.
- b. The use of price risk management tools have changed the social structure of various companies by causing them to create a new type of business person — one that is concerned not with the risk of absolute price changes in the market place to one that is concerned with management of margins throughout time. If 1% of New Mexico's businesses that went bankrupt could have avoided bankruptcy via the use of price risk management tools, the value would be approximately 10 million dollars. Additionally, with fewer bankrupt businesses, the impact to smaller communities socially should be positive.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Small Farm Viability

- a. New Mexico Agricultural Experiment Station researchers have been studying alternative crops and cropping methods for small-scale farmers in northern New Mexico. The crops and methods studied included: interseeding hairy vetch and alfalfa as green manure into sweet corn, and chile pepper; interseeding forage brassicas and legumes into sweet corn or chile; turnips were found to contribute up to 1.46 and 1.42 tons per acre in additional

fall forage on a dry weight basis interseeded into sweet corn and chile pepper, respectively.

- b. Results indicate that by using alternative crops and cropping methods, such as some of those we tested, small-scale farmers in northern New Mexico have the potential to greatly increase the productivity of their small farms on a per unit area basis. By adapting and fine-tuning the tested alternative crops and methods to their particular farms, and circumstances, many producers in the region could increase farm profits as well.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Urban Gardening

- a. Leaf-water relations, plant development, and cuticular wax content were studied for seven trees subjected to drought episodes.
- b. Impact — Results indicate that although Arizona ash might be favored for managed landscapes because of its relatively rapid growth and pubescence, plant development traits and leaf water relations suggest that tree taxa, such as Texas red oak (*Quercus buckleyi*) might merit more use in New Mexico landscapes prone to drought.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Other

- a. The number of cattle entering the U.S.A. from Mexico varies greatly from year to year, the season of the year, and by port of entry. In an effort to assist APHIS schedule resources where and when needed, statistical models were developed to predict monthly imports by port. Explanatory variables included but not restricted to Mexican/US price ratios, rainfall, and historical imports. A total of nine models were evaluated. Ex ante forecasting was used to validate the models. The use of the models provided better estimates than using last year's crossings. However, the models were better at explaining historical imports than predicting future crossings.
- b. The research will assist APHIS to better schedule personnel to the ports when and where needed. This should assist in providing better service and possibly reduced costs.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Goal 2: A safe and secure food and fiber system.

Overview

New Mexico Agricultural Experiment Station scientists are working in the areas of food handling, food quality, and food safety.

Researchers are identifying best practices of successful restaurants in rural New Mexico and formulating a matrix of critical factors, including sanitation and cleanliness of the restaurant. The results should help independent restaurants in New Mexico stay open in the face of competition from chain restaurants.

Food quality analysis has been conducted for red chile products. The analysis included kcal, ash, moisture, pH, sugar, fat, and protein. Lipid profiles for pecans was conducted. Information generated in these projects will be useful for labeling purposes and for use in food composition tables which currently contain little and/or outdated information on chile products. The impact of press coverage for the pecan research is that the public is being informed that pecans can be part of a healthy diet. This might increase the consumption of pecans and affect pecan production and marketing.

Researchers are determining the ability of *Listeria monocytogenes* 4b, a dangerous food pathogen, to survive in soil stored at various temperatures. Their research shows that *L. monocytogenes* 4b can remain viable in soil stored over a wide temperature range for at least 42 days. Specific information on the survival and recovery of pathogenic bacteria from the environment will aid in the discovery of how to prevent or decrease their occurrence in food products harvested from livestock.

The New Mexico Agricultural Experiment Station believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 2 were \$19,972 from Hatch Act funds. The number of full-time equivalents engaged in research for this goal was 1.1.

Key Theme – Food Handling

- a. New Mexico Agricultural Experiment Station scientists interviewed subjects in independent New Mexican restaurants and formulated a matrix of critical factors for success of New Mexico Independent Restaurants including: sanitation-cleanliness of the restaurant, training-strength of culinary and service staff, uniqueness of facility, marketing (both internal and external), use of indigenous agricultural products of New Mexico, food service management of production system including food quality, timeliness, and service quality. Currently the results for these restaurants are being compiled for publication.
- b. Impact — Independent Restaurants in rural New Mexico are threatened by chain competition and changing demographics. Many are closing as a result. The purpose of

this study is to identify the best practices of successful restaurants in rural New Mexico to provide guidance to those considering opening a new operation and for those already operating restaurants in rural New Mexico.

- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Food Quality

- a. Fiber analysis of three brands of dried red chile pods and two brands of dried, ground red chile was completed. Kcal and ash analyses are currently being conducted. Red chile sauce samples were prepared and analyzed for moisture, pH, and sugar. Fat, protein, kcal, and ash analyses of red chile sauce samples are continuing. The lipid analysis of pecans continued with statistical analysis of data on the fatty acid profiles of pecan nut meats. Graphs, tables, and charts were prepared showing the comparisons of fatty acids present in the cultivars.
- b. Impact — Information generated in these projects will be useful for labeling purposes and for use in food composition tables which currently contain little and/or outdated information on chile products. The impact of press coverage for the pecan research is that the public is being informed that pecans can be part of a healthy diet. This might increase the consumption of pecans and affect pecan production and marketing.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Food Safety

- a. *Listeria monocytogenes* is of major concern to the food industry, especially the ready-to-eat processed meat industry because *L. monocytogenes* is pathogenic and has the ability to thrive at cold temperatures. Researchers at the New Mexico Agricultural Experiment Station are determining the ability of *L. monocytogenes* 4b to survive in soil stored at various temperatures. Their research clearly shows that *L. monocytogenes* 4b has the ability to remain viable in soil stored over a wide temperature range for at least 42 days.
- b. Impact — Specific information on the survival and recovery of pathogenic bacteria from the environment will aid in the discovery of how to prevent or decrease their occurrence in food products harvested from livestock.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Goal 3: A healthy, well-nourished population.

Overview

New Mexico Agricultural Experiment Station scientists are conducting research to ascertain the effect of various food components and environmental activities (for example, smoking and exercise) on the bioavailability of vitamins and minerals, particularly for fat- and fiber-related factors that affect the intake and absorption of calcium, which is critical in decreasing the risk of osteoporosis. The calcium-related food frequency component of the final instrument is being incorporated into DVD format. The food frequency will be used to ascertain calcium intake so that nutrition education can be targeted to Asian, Hispanic, and Caucasian adolescents.

The New Mexico Agricultural Experiment Station believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 3 were \$9,535 from Hatch Act funds. The number of full-time equivalents engaged in research for this goal was 0.6.

Key Theme – Human Nutrition

- a. The aim of the multi-state research conducted in this project is to ascertain the effect of various food components and environmental activities (for example, smoking and exercise) on the bioavailability of vitamins and minerals. In New Mexico, research centers on fat- and fiber-related factors that impact the intake and absorption of calcium, which is critical in decreasing the risk of osteoporosis. To the extent possible, research in New Mexico focuses on foods (for example, chile, pinto beans, tortillas) that are important in the diet of the various segments of the population in the state and throughout the desert southwest. Good calcium nutrition throughout the lifespan is one of the three well know components in lowering the risk of developing osteoporosis. Consumption data indicate that intake of calcium drops significantly at about the age of 11, which is well before maximum bone density is achieved. The aim of the research is to determine the factors that enhance or inhibit the intake of calcium rich foods in teens. Such information can then be used to tailor nutrition education programs for this segment of the population; good nutrition throughout the lifespan should help to reduce the incidence of osteoporosis in the elderly.
- b. Impact — Data can be used for food composition tables and food labeling. The calcium-related food frequency component of the final instrument is being incorporated into DVD being developed as a part of the USDA/IFAFS bone health grant which is being done by a consortium that includes multiple states involved in the W-191 project. The food frequency will be used to ascertain calcium intake so that nutrition education can be targeted to Asian, Hispanic, and Caucasian adolescents.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multistate research

- With states AZ, CA, CO, HI, IN, MA, NE, NV, OR, UT, WA, WY

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Goal 4: Greater harmony between agriculture and the environment.

Overview

Scientists of the New Mexico Agricultural Experiment Station have been developing pest management tools for boll weevil, bollworm, and beet armyworm that will protect cotton yields from insect pests in a semi-arid climate. Researchers are evaluating management techniques that modify conditions such as row spacing and row direction to determine the effect of management on microclimate and insect populations. Testing was also conducted to evaluate variation in resistance of Bt cotton varieties. The objective was to determine if nitrogen or high vegetative growth reduced resistance to cotton bollworm in Bt cotton. As a direct result of this research U.S. cotton farmers may save more than \$30 million per year until boll weevil is eradicated. Other researchers worked on integrated approaches to controlling house fly populations around dairies and controlling Pecan Nut Casebearer infestations. Researchers are also working on developing pest management techniques that can suppress insect populations without insecticides. The use of these techniques will result in lower costs to the farmers as well as less environmental impact.

Yellow starthistle is spreading steadily on western rangelands, causing loss of grazing land carrying capacity as well as serious damage to non-grazed land and recreational areas. This noxious weed can be effectively controlled at the seedling stage by foliar application of the herbicide picloram. New Mexico Agricultural Experiment Station scientists have been studying the inheritance of herbicide resistance so that weed management can be improved to avoid development of herbicide resistance. Woolly locoweed, silky crazyweed, and Lambert's crazyweed cause locoism in livestock resulting in large economic losses. Researchers have found that a specialist weevil feeds differentially on woolly locoweed varieties, indicating differential physio-biochemical characteristics of these varieties. The researchers have been evaluating the phylogenetic relationships among woolly locoweed varieties found in New Mexico. By understanding the role which weedy plant genetic variability plays in susceptibility to potential biological control agents, new management strategies can be developed to sustain agroecosystems. Pesticide drift resulting from an aerial application for pecan nut casebearer control was evaluated. The application of lower spray volumes allows an aircraft to treat more acres per hour when meteorological conditions result in good deposit on the target and low risk of pesticide drift, resulting in reduced operating costs as well as lessened environmental impact.

New Mexico Agricultural Experiment Station soil scientists are evaluating the effect of three composts on the uptake of arsenic and lead by pearl millet. They also are conducting a second greenhouse experiment using leached, nonsaline soils and fertilizer to evaluate their impact on phytoremediation of As and Pb. Scientists also are investigating manure-amended soils for iron distribution, salinity, N mineralization rates, C12/C13 ratios in biogenically-produced calcite, soil pH, and soil microorganisms. Results indicate that manure from dairy farms, numerous in eastern New Mexico, might be used for improving soil quality. The nutrient status of irrigated pecan trees in commercial orchards along New Mexico's Rio Grande Basin was studied by Agricultural Experiment Station scientists. Tissues were analyzed for N, P, K, Ca, Mg, S, Na, Zn, Fe, Cu, Mn, B, Mo, and Ni. The concentration of each of the above elements was determined in the tissues. Soil fertility and nutrient status recommendations will improve fertilizer

applications for pecan orchards, reducing costs and runoff to the water table.

New Mexico Agricultural Experiment Station scientists have quantified the effects of fuelwood harvesting and slash disposal on runoff, sediment concentration, sediment production, bedload, and vegetation responses. Reduced erosion and improved quantity and quality of stream water and water infiltration helps preserve game fish and wildlife, in addition to providing more water for livestock, production agriculture, and communities. All agronomic and municipal conservation practices probably have only minor potential for meeting the state's present and future water needs when compared to potential production from manipulation of rangeland vegetation. Less than half New Mexico's privately owned timberlands are considered fully stocked, with approximately 25% considered poorly stocked or non-stocked. This is due, in part, to inadequacies in the natural regeneration on these sites. Research is being conducted to develop propagation protocols for various native woody plants currently being used or that potentially have use in forestation plantings in this region. The results have potential impacts in almost all forms of reforestation, restoration, reclamation, and revegetation efforts in the state. Reducing the cost of production and improving the quality of the planting stock will result in the improve the efficacy of these types of plantings and reduce their overall costs.

New Mexico Agricultural Experiment Station scientists have studied biodiversity, extinction rates, conservation effort allocation, population model integration, and the effects of habitat and landscape fragmentation. Estimates based on distribution profiles are very promising in terms of the specific conservation recommendations that can be derived from them. Improved estimates of biodiversity dynamics should result in improved understanding and management of habitats in New Mexico, arid areas of adjacent states in the U.S. and Mexico, and worldwide.

Agricultural Experiment Station researchers incorporated soil isotopic records of bioclimatic change into two general areas of study. The first area quantifies relationships between vegetation and geomorphic patterns. The second areas quantifies carbon sequestration in arid and semiarid landscapes. They have now started two follow-up studies. The first measures CO₂ emissions from desert soils. The second measures the amount of soil carbonate derived from marine carbonates versus the amount derived from Ca released by chemical weathering of feldspars and other primary minerals. In both of these studies, C isotopes are used as natural tracers. This research has the impact of estimating the amount of soil inorganic C in the drylands of the western and midwestern United States. It also provided rates at which atmospheric CO₂ is being sequestered. Both values are needed in order to move forward with attempts to sequester C and mitigate the greenhouse effect.

Studies by Agricultural Experiment Station researchers are concentrating on the impacts that free-roaming oryx have on pronghorn antelope and mule deer populations in southcentral New Mexico. Very little research data exists about oryx social structure and home ranges. The results of this study are important for evaluating multispecies grazing systems in a desert environment and developing management strategies for White Sands Missile Range and similar desert environments. This has important economic implications for ranchers because of the potential importance of wildlife ranching in New Mexico.

The New Mexico Agricultural Experiment Station believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 4 were \$264,992 from Hatch and McIntire-Stennis Act appropriated funds. The number of full-time equivalents engaged in research for this goal was 23.0.

Key Theme – Agricultural Waste Management

Nitrogen, a major nutrient for crop production, was found by New Mexico Agricultural Experiment Station scientists to vary considerably among New Mexico manure sources. Lagoon water generated from dairy operation also varied greatly both among dairies and through time. Application of wastewater must be based on soil test requirements for the crop of interest using a 35 percent mineralization factor in order to avoid over-application and potential degradation of surface and ground water sources. Manure sources generally released 1 mg of nitrate-N to the soil for every 4 mg TKN applied while compost released 1 mg of nitrate-N for every 7 mg TKN applied. Adjustments should be made in nutrient management plans that reflect this property of manure versus compost. Phosphorus, another essential nutrient for crop production, was also found to be more available from fresh manure as compared to composted manure. Phosphorus tended to decline in availability during the warm summer months in the soil. Levels of available phosphorus increased during the cool season. Water from dairy lagoons will never supply the amount of water needed for crop production. All applications of wastewater should be mixed or followed with fresh water to meet crop water demand. Salt loading is also a major concern of many New Mexico producers. No accumulation of soil salts have occurred as a result of the soil-test based applications made in this study.

Impact — Organic nutrient sources are not all equal in their ability to supply nitrogen. Nutrient management plans need to reflect this availability. Current state environment department methods of calculating application rates would short most crops of the nitrogen needed for optimum production or allow gross over-application when no nitrogen is needed. Use of compost as nutrient source could assist in lowering the environmental impact of raw manures applied to agricultural land. Alternatively, long-season cropping systems can also help reduce residual soil nitrate levels that are left in fields as a result of applying organic materials at times when crops do not actively take up the nutrients. However, total water available to New Mexico producers is limited and will require improved application efficiencies to make the best use of nutrients from manure.

Source of Federal Funds — Hatch

Scope of Federal Impact — State Specific

Key Theme – Biodiversity

- a. New Mexico Agricultural Experiment Station scientists have studied biodiversity, extinction rates, conservation effort allocation, population model integration, and the effects of habitat and landscape fragmentation. Estimates of the rate at which the Earth's biodiversity is being lost have been a factor in raising awareness of the threats to biodiversity. Relatively little effort has gone into assessing the assumptions of these estimates, or into considering alternative estimates. Alternative estimates of extinction

rates based on biogeographic relationships, in particular on distribution profiles and on distributions of species' geographic range sizes differ substantially from those based on the species-area relationship. Further refinements to estimates of the extent of threats can help focus conservation efforts in appropriate ways. Estimates based on distribution profiles are very promising in terms of the specific conservation recommendations that can be derived from them.

- b. Impact — Improved estimates of biodiversity dynamics should result in improved understanding and management of habitats in New Mexico, arid areas of adjacent states in the U.S. and Mexico, and worldwide.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Biological Control

- a. Woolly locoweed (*Astragalus mollissimus*), silky crazyweed (*Oxytropis sericea*), and Lambert's crazyweed (*Oxytropis lambertii*) cause locoism in livestock resulting in large economic losses. New Mexico Agricultural Experiment Station researchers have found that a specialist weevil (*Cleonidius trivittatus*) feeds differentially on woolly locoweed varieties, indicating differential physio-biochemical characteristics of these varieties. The researchers have been evaluating the phylogenetic relationships among woolly locoweed varieties found in New Mexico. Chloroplast DNA from different varieties was used for amplification of a specific single, contiguous target gene sequence comprised of the rpo C1 and rpo C2 chloroplast genes. After analysis, the resulting phylogenetic tree shows that locoweed varieties cluster coinciding to their geographical distribution in New Mexico; however, feeding behavior of the specialist weevil was independent of the resulting phylogenetic organization.
- b. Impact — By understanding the role which weedy plant genetic variability plays in susceptibility to potential biological control agents, it is possible that new, alternative strategies will be generated for managing and sustaining agroecosystems.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - AS, AZ, CA, GU, HHI, IA, KS, MT, OR, UT, WA, WY

Key Theme – Forest Resource Management

- a. This research program addresses the issues and problems associated with forestation and plant restoration ecology. There are over 6,075,000 ha of forests in New Mexico and approximately 40% or 2,430,000 ha are privately owned. Less than half New Mexico's privately owned timberlands are considered fully stocked, with approximately 25% considered poorly stocked or non-stocked. This is due, in part, to inadequacies in the

natural regeneration on these sites. Specific efforts of this research are to develop propagation protocols for various native woody plants currently being used or that potentially have use in forestation plantings in this region. Along with this effort, the program attempts to quantify underlying variability of individual species to cultural treatments so as to develop more robust propagation strategies for these species. Species selection for research is usually associated with need for the species for specific forestation or restoration projects.

- b. Impact — The impact of this research is broad-based; the results have potential impacts in almost all forms of reforestation, restoration, reclamation, and revegetation efforts in the state. Reducing the cost of production and improving the quality of the planting stock will result in the improve the efficacy of these types of plantings and reduce their overall costs.
- c. Source of Federal Funds — McIntire-Stennis
- d. Scope of Impact — State Specific

Key Theme – Global Change and Climate Change

- a. Agricultural Experiment Station researchers incorporated soil isotopic records of bioclimatic change into two general areas of study. The first area quantifies relationships between vegetation and geomorphic patterns. The second areas quantifies carbon sequestration in arid and semiarid landscapes. We have now started two follow-up studies. The first measures CO₂ emissions from desert soils. The second measures the amount of soil carbonate derived from marine carbonates versus the amount derived from Ca released by chemical weathering of feldspars and other primary minerals. In both of these studies, C isotopes are used as natural tracers.
- b. Impact — This research has the impact of estimating the amount of soil inorganic C in the drylands of the western and midwestern United States. It also provided rates at which atmospheric CO₂ is being sequestered. Both values are needed in order to move forward with attempts to sequester C and mitigate the greenhouse effect.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Integrated Pest Management

- a. Scientists of the New Mexico Agricultural Experiment Station have been developing pest management tools for boll weevil, bollworm, and beet armyworm that will protect cotton yields from insect pests in a semi-arid climate. Most of the cotton pest data have been collected in areas that are not ecologically similar to most cotton producing areas of New Mexico. A number of factors are likely to mitigate damage by insect pests in New Mexico. Most cotton in New Mexico is grown in the Chihuahuan desert. Data collected

to date indicate that low humidity and high spring temperatures characteristic of this region can cause high mortality in insect pests of cotton. Our data also indicate that our agricultural practices change the effect of this environment into one more favorable for boll weevil and bollworm. Researchers are evaluating management techniques that modify these conditions such as row spacing and row direction to determine the effect of management on microclimate and insect populations. Another need identified by our clientele is a need to tie economics to control decisions. To address that issue, researchers are conducting tests to determine the value of cotton by boll position. This is a long-term test since year to year variation must be considered. Data collected to date have already been used to demonstrate the value of managing the crop for earliness. Testing was also conducted to evaluate variation in resistance of Bt cotton varieties. The objective was to determine if nitrogen or high vegetative growth reduced resistance to cotton bollworm in Bt cotton. Results indicate that very high rates of nitrogen may reduce resistance levels to bollworm but that such effects were variable. Other researchers conducted a survey to evaluate the extent of house fly control problems facing dairy producers, and to quantify insecticidal and non-insecticidal fly suppression techniques. The 17-question survey was sent to 146 New Mexico dairy producers. The survey encompassed general management, waste handling and insecticide usage. The results indicated producers are using an integrated approach to fly control, including cultural, mechanical, biological and chemical suppression methods. Manure management is the primary cultural control method used by 55% of respondents, but responses showed sanitation frequency may not be adequate to break the house fly's life cycle. All respondents use insecticides, with pyrethroids and organophosphates being the most predominate classes of insecticide used. Still other researchers quantified the effect of the beneficial insect complex on Pecan Nut Casebearer egg mortality. Sentinel bollworm mortality was correlated with beneficial insect density. Mortality rates of 70-90% coincided with 1,2000 predators per tree. Experiments were conducted on kaolin clay and talc for control of the aphid complex. Talc did not significantly reduce aphid population; however, the kaolin clay formulation reduced aphid populations about 75% over a 30 day period. A neuro-fuzzy approach to insect classification by computer has carried out on 12 genera of insects. Classification was 99.5% correct.

- b. Impact — As a direct result of this research U.S. cotton farmers may save more than \$30 million per year until boll weevil is eradicated. That much money can be saved in application costs if researchers can identify a new formulation of malathion that will allow boll weevil eradication programs to make applications every two weeks instead of weekly. Researchers are also working on developing pest management techniques that can suppress insect populations without insecticides. The use of these techniques will result in lower costs to the farmers as well as less environmental impact. For example, New Mexico Agricultural Experiment Station scientists have been able to develop a set of recommendations to suppress boll weevil populations based on research in New Mexico. The use of these techniques has saved boll weevil control programs money and prior to implementing eradication programs, reduced losses for individual farmers. Scientists developing recommendations to reduce insecticide use for cotton bollworm in New Mexico. One of the goals of the house fly research is to reduce the need for large-volume insecticide usage by utilizing the most effective insecticides and delivery

systems, by determining the most effective time, place and method to apply insecticides and by integrating non-insecticidal pest management methods into control programs. Efficient evaluation of the beneficial insect complex in pecans could go a long way in managing beneficials with the goal of reducing pesticide use for pecan nut casebearer control. Kaolin clay use could significantly reduce aphid population in pecans. Fast computer identification of insects in pecan and cotton ecosystems could greatly improve biological control approaches in these ecosystems.

- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - with States AL, FL, GA, LA, OK, TX

Key Theme – Natural Resources Management

- a. New Mexico Agricultural Experiment Station scientists have quantified the effects of fuelwood harvesting and slash disposal on runoff, sediment concentration, sediment production, bedload, and vegetation responses. The most vegetation and least amounts of runoff and erosion were from plots that were clearcut with the slash homogeneously scattered on the plots. This treatment started protecting the site immediately after clearcutting. Removing the slash after clearcutting left the plots exposed for a couple of years, which resulted in high levels of runoff and erosion. However, results eventually were similar to clearcutting with scattered slash. How long it will take these plots to revert to an ecological situation similar to the uncut controls is not known.
- b. Impact — Reduced erosion and improved quantity and quality of stream water and water infiltration helps preserve game fish and wildlife, in addition to providing more water for livestock, production agriculture, and communities. All agronomic and municipal conservation practices probably have only minor potential for meeting the state's present and future water needs when compared to potential production from manipulation of rangeland vegetation.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Nutrient Management

- a. The nutrient status of irrigated pecan trees in commercial orchards along New Mexico's Rio Grande Basin was studied by Agricultural Experiment Station scientists. Tissues were analyzed for N, P, K, Ca, Mg, S, Na, Zn, Fe, Cu, Mn, B, Mo, and Ni. The concentration of each of the above elements was determined in the tissues. Total uptake of each nutrient for each plant part and for the whole tree is being calculated. A report containing all the data is being prepared in the form of an Agricultural experiment station bulletin.

- b. Impact — Soil fertility and nutrient status recommendations will improve fertilizer applications for pecan orchards, reducing costs and runoff to the water table.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Pesticide Application

- a. Pesticide drift resulting from an aerial application for pecan nut casebearer control was evaluated. A very fine spray, previously determined to be more efficacious when targeting pecan nutlets, was compared to a coarse spray to quantify differences in potential drift. Fluorescent dyes in water were used to mimic the spray droplet spectra of the previously applied pesticide applications. A wind tunnel experiment was conducted to ensure that the droplet spectra distributions of the pesticide and fluorescent dye tank mixes were similar. In addition, samplers were placed on the orchard floor to determine if differences existed in undesirable ground deposit between the two treatments that differed in spray droplet size and total volume applied per acre. Analysis of the data indicates that there were no significant differences in ground deposits between treatments.
- b. Impact — Low total spray volumes atomized into very fine spray droplet spectra can provide greater pecan nut casebearer control and may not produce a greater drift hazard than higher total spray volumes when applied during light winds and slightly unstable air. The application of lower spray volumes allows an aircraft to treat more acres per hour when meteorological conditions result in good deposit on the target and low risk of pesticide drift. The resulting reduced operating costs also are benefits realized directly by the aircraft operator and the crop producer.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Soil Quality

- a. New Mexico Agricultural Experiment Station scientists are evaluating the effect of three composts, varying in composition and organic matter content, on the uptake of arsenic and lead by pearl millet. They also are conducting a second greenhouse experiment using leached, nonsaline soils and fertilizer to evaluate their impact on phytoremediation of As and Pb. Scientists also are investigating manure-amended soils for iron distribution, salinity, N mineralization rates, C12/C13 ratios in biogenically-produced calcite, soil pH, and soil microorganisms.
- b. Impact — Initial results indicate that composted organic matter that is rich in nutrients may help alleviate salinity stress in some plants. Pearl millet may not be an effective extractor of arsenic or lead for phytoremediation purposes, but instead, may be grown in

a contaminated area without sequestering arsenic in the grain heads. Soil manure has had little effect on soil pH and salt content. Manure from dairy farms, numerous in eastern New Mexico, might be used for improving soil quality.

- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Weather and Climate

- a. Two newsletters were published by the New Mexico Climate Center and PDF files of the news letter posted on the World Wide Web. The topics covered were Floods in New Mexico; Using weather data to estimate rangeland carrying capacity; Extinguished for now, New Mexico fire season 2000; and Making your home safe from wildland fires. A calculator for the calculation of Chill units and Growing Degree Hr-Days for Apples was developed. Spread sheets for irrigation scheduling that use Samani's PET calculator and the cooperators climate data base were developed on installed on the New Mexico Climate home page.
- b. Impact — The calculators and spreadsheets are being used by farmers and agricultural consultants.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Wildlife Management

- a. New Mexico Agricultural Experiment Station scientists are determining the effects of vegetation types and season on oryx (gemsbok) distribution, habitat utilization, and preference in areas occupied by mule deer and pronghorn. Additionally, the dietary overlap of oryx with mule deer and pronghorn in relation to season and vegetation type is being investigated. This project also will determine the plant species availability where oryx, mule deer, and pronghorn home ranges overlap. A fecal microhistological food habits study of gemsbok in two different habitat types within the Chihuahuan Desert in White Sands Missile Range showed that gemsbok diets differed significantly in and among all habitats and seasons. Mean annual composition of gemsbok diets in creosote shrubland was grasses 29.9%, forbs 37.1%, and 38.5% shrubs. In Great Basin conifer woodland, mean annual diets consisted of 36.3% grasses, 25.2% forbs, and 38.5% shrubs. Forbs were the dominant vegetation consumed in the warm/wet and warm/dry season (44.7% and 35.9%, respectively) in the creosote shrubland. Shrubs were the dominant vegetation consumed (50%) in the cool/dry season. In the Great Basin conifer woodland, shrubs were the dominant vegetative form consumed (48%).
- b. The deterioration of western rangelands due to overstocking of livestock is one of the most serious environmental problems facing the ranching industry. By using native wild

ungulates in conjunction with livestock, ranchers can make more efficient use of native vegetation without degrading rangelands and with fewer economic inputs and greater profitability. Enterprise diversification increases income opportunities and biodiversity.

- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Other

- a. Yellow starthistle is spreading steadily on western rangelands, causing loss of grazing land carrying capacity as well as serious damage to non-grazed land and recreational areas. This noxious weed can be effectively controlled at the seedling stage by foliar application of the herbicide picloram. To determine the inheritance of resistance to picloram, reciprocal F1 crosses between susceptible and resistant plants were performed. Picloram resistance as a recessive trait is consistent with the observations that while under no additional picloram selection pressure, resistance has not spread from where it was first identified and that no other picloram-resistant yellow starthistle populations have been identified.
- b. Impact — By understanding the inheritance of herbicide resistance, weed management can be improved to avoid the development of herbicide resistance.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multistate Research
 - with states AZ, CA, FL, HI, MT, NV, NY, OR, WA

Goal 5: Enhanced economic opportunity and quality of life for Americans.

Overview

New Mexico Agricultural Experiment Station researchers studied several issues related to family relationships. Researchers prepared resource materials for School-age Child Care Providers via the Latchkey Clearinghouse Lending Library. Materials were also made available to Extension personnel in New Mexico and Connecticut. The economic impacts are evidenced when parents are able to work due to the availability of school-age child care. Continuous, uninterrupted transitions from school to child care allow parents to remain on the job. School age child care allows some parents to further their education. Scientists also examined parenting and child functioning in single-parent families, comparing single mothers with single fathers and divorced parents with never-married parents, using data from the National Survey of Households and Families. Social impacts should include decreased child behavior problems in single-parent families. In another project scientists investigated how individuals regard themselves in their multiple roles, determining to what extent issues of identity and sense of self are key components of the well-being of individuals and families as they respond to social and economic changes. When workers perceive lack of control they become dissatisfied at home and in workplace. When stressors on the job occur, professionals “bring their troubles home” and project them onto their spouses. Other research is being conducted to provide information about the relationships between appearance and behavior among youth in public school settings.

Agri-tourism represents a potentially important form of sustainable tourism development for rural communities. Not only does it provide suppliers with the opportunity to profit financially, but it also allows for the opportunity to educate others about the nature and complexity of farming and ranching today. Researchers of the New Mexico Agricultural Experiment Station investigated the current state of agricultural tourism in New Mexico and the feasibility of further development of agricultural tourism in New Mexico. A database of existing agricultural tourism attractions in New Mexico has been developed. A survey to be used to profile existing agri-tourism attractions is nearing completion. A survey to be used to profile agri-tourism visitors is in the development phase.

The coordinated multi-state Policy Analysis Center for Western Public Lands provides a framework in which the land-grant system can increase their involvement and educational role in the public land policy area. A panel of experts in public land management from the ranching, agency, university, and environmental communities, including scientists from the New Mexico Agricultural Experiment Station, were surveyed to explore the direction public land grazing will likely take in the future and to identify factors that will influence grazing use on public lands. The economic and social motivation of ranchers to remain in ranching when other investments would return a higher rate of investment return was evaluated. Contributions were made to a coordinated publication about public land policy issues, published as a New Mexico State University research report.

The New Mexico Agricultural Experiment Station believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 5 were \$64,872 from Hatch Act funds. The number of full-time

equivalents engaged in research for this goal was 5.6.

Key Theme – Children, Youth, and Families at Risk

- a. During 2000, New Mexico Agricultural Experiment Station scientists lent resources from the Latchkey Clearinghouse Lending Library to School-age Child Care Providers across New Mexico. Feedback indicated they appreciated the access to these materials. Materials were also distributed upon request to county Extension personnel involved with child development and after school child care programs. In addition, some of the materials were used by Family and Consumer Sciences teachers. The Directory of After School Child Care Programs in New Mexico was updated. Professionals affiliated with the Clearinghouse participated with local area agencies to sponsor a New Mexico Regional Care and Education Conference. Speakers and monitors for the conference were lined up. Positive feedback was attained from the participants. During 2000 a researcher communicated with Extension professionals at the University of Connecticut regarding programs in that state for latchkey children.
- b. Impact — Children and parents who feel secure with school and child care are likely to be more fully functioning individuals. The economic impacts are evidenced when parents are able to work due to the availability of school-age child care. Continuous, uninterrupted transitions from school to child care allow parents to remain on the job. School age child care allows some parents to further their education.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Jobs/Employment

- a. Communities and businesses are struggling to adapt to change in the workforce. New Mexico Agricultural Experiment Station scientists are investigating how individuals regard themselves in their multiple roles, determining to what extent issues of identity and sense of self are key components of the well-being of individuals and families as they respond to social and economic changes.
- b. Impact — Workers want to have the ability to control their personal lives. When they perceive lack of control they become dissatisfied at home and in workplace. Professionals enjoy the workplace more when they feel connected to others in environment. When there are few coworkers to whom to turn, there is less opportunity to mitigate the stress at the workplace and therefore less job satisfaction. When stressors on the job occur, professionals “bring their troubles home” and project them onto their spouses.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - with States CA, CO, ID, MT, NV, OR, SD, UT, WA, WY

Key Theme – Parenting

- a. New Mexico Agricultural Experiment Station scientists are examining parenting and child functioning in single-parent families, comparing single mothers with single fathers and divorced parents with never-married parents, using data from the National Survey of Households and Families. A computer software program designed to do structural equation modeling (LISREL) will be used to test various models of parenting and child functioning.
- b. Impact — Social impacts should include decreased child behavior problems in single-parent families. This program will create parenting programs designed to meet the special needs of single fathers as well as single mothers, and never-married parents as well as divorced parents. Additionally, we will develop strategies for supporting parenting and child functioning in single-parent families.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Tourism

- a. Researchers of the New Mexico Agricultural Experiment Station are investigating the current state of agricultural tourism in New Mexico and the feasibility of further development of agricultural tourism in New Mexico. A literature review of agricultural tourism is complete and a list of criteria to be used to determine if an attraction or event qualifies as agricultural tourism has been finalized. A database of existing agricultural tourism attractions in New Mexico has been developed. A survey to be used to profile existing agri-tourism attractions is nearing completion. A survey to be used to profile agri-tourism visitors is in the development phase.
- b. Impact — As rural communities continue to look for viable methods to expand their economic base, many are considering tourism development. Agri-tourism represents a potentially important form of sustainable tourism development for rural communities. Not only does it provide suppliers with the opportunity to profit financially, but it also allows for the opportunity to educate others about the nature and complexity of farming and ranching today.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Other

- a. The Board of Directors for the Policy Analysis Center for Western Public Lands (PACWPL) met in Las Vegas, NV. A second meeting was also held in Albuquerque, NM

to coordinate initiation of an initial Center research effort. This project, evaluating the ecological and economic impacts of pinyon-juniper control, will provide a test of the Western Land Grant University System to respond quickly to public land policy issues with applied research and educational programs. A panel of experts in public land management from the ranching, agency, university, and environmental communities were surveyed to explore the direction public land grazing will likely take in the future and to identify factors that will influence grazing use on public lands. The economic and social motivation of ranchers to remain in ranching when other investments would return a higher rate of investment return was evaluated. Contributions were made to a study coordinated at Colorado State University to evaluate alternative ways that the U.S. Forest Service can value forage for resource planning. An evaluation was made of the performance of the current public land grazing fee formula. It was determined that the fee formula has done a poor job when judged against the criteria of tracking private land lease rates and keeping fee rates current. Contributions were made to a coordinated publication about public land policy issues, published as a New Mexico State University research report.

- b. Impact — The coordinated multi-state Policy Analysis Center for Western Public Lands provides a framework in which the land-grant system can increase their involvement and educational role in the public land policy area. Western land grant universities have an opportunity to expand their role in educating the public about alternative policy choices and the possible consequences of those choices.
- c. Source of Federal Funds — Hatch
- d. Impact — Multistate Research
 - with states CO, ID, NV, OR, UT, WA, WY

Key Theme – Other

- a. This research project has attempted to address the effectiveness and implications of the use of uniforms and dress codes.
- b. Impact — There is a need for research to provide information about the relationships between appearance and behavior among youth in public school settings. Published studies are non-existent; anecdotal reports indicate positive changes in student achievement and behavior when dress codes and uniforms are used.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

A1. Planned Programs—Cooperative Extension Service

Goal 1: An agricultural system that is highly competitive in a global economy.

Overview

New Mexico 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.

Water is the most important limiting resource for New Mexico. All aspects of water use affect agricultural efficiency and profitability. Good water quality and availability are critical for all agricultural and nonagricultural uses. Water management will become more critical as water demands for urbanization and industrialization increase. Consequently, it is crucial for research, extension, and teaching programs to generate technological innovation and technology transfer from the College to the public that enhances agricultural profitability as it relates to water.

Agricultural needs are complex and can best be addressed by teams employing expertise from various disciplines, including both research and extension. Long-term, viable agriculture is dependent on sustainable systems and environmental safety.

More than 70 percent of New Mexico agricultural gross receipts are livestock related. Forage conversion by livestock into meat, milk, wool, and hair products continues to be a principal economic use of rangeland. Research, extension, and teaching programs on grazing and animal production are essential. Multiple-use concerns associated with economic uses of rangelands continue to be an important component of these programs.

New and improved plant varieties are a highly visible result of agricultural research. Plant breeding should be complemented with research in molecular biology. Together, these two fields can make major contributions to agriculture through the development of new genetic material for plant and animal production.

Uses of agricultural chemicals and other technologies and how they affect food safety and environmental quality are becoming more acute problems. Research on new approaches to integrated pest management, waste management, and remediation of disturbed land and polluted waters is a continuing critical need.

Objectives

- Encourage and reward interdisciplinary and integrated management approaches in planning and implementing research and extension programs, emphasizing both applied and fundamental methods for developing comprehensive solutions to important issues.

- Conduct research, teaching, and extension programs on emerging critical issues, including:
 - water-related research, teaching, and extension programs that generate technological innovation and transfer to enhance agricultural competitiveness and maintenance of water quality
 - programs in molecular biology, nutritional toxicology, and microbiology
 - value-added programs in food processing, marketing, and food technology
 - new economically viable uses for various plant and animal species
- Continue to improve and strengthen current research and extension programs in:
 - animal and range management
 - plant science, with significant emphasis on genetic improvement of crop plants
 - integrated approaches to pest management that combine cultural and biological approaches with stringent use of pesticides
 - strategies to market products more efficiently and profitably
 - urban horticulture programs to assist in small agricultural efforts, gardens, landscaping, and nurseries

The New Mexico Cooperative Extension Service believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 1 were \$782,610.58 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 12.3

Agricultural Competitiveness - Orchard Production

- a. Fruit and nut growers need to be informed of those new techniques, developed by research which could help them improve their yields and manage their orchards optimally. A good selection of orchards practices will help growers make their orchard inputs more efficient. Per acre profits can be increased by reducing production costs per acre or by incrementing per acre yields.
- b. Impacts -Adopting the best orchard practices available can help growers reach their goal of being more efficient and more profitable.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ, TX)

Agricultural Profitability - Small Grain Management

- a. Agricultural producers have tremendous needs for up-to-date crop production methods and techniques to enhance agriculture production, minimize costs and produce a quality product for today's market. Fertility management, water conservation, weed, insect and disease control are all necessary to produce a crop.

- b. Impacts — As a result of this program, several farmers will develop and expand their small grain production to provide a higher level of profit from their farming techniques.
- c. Source of Federal Funding — Smith Lever 3(b)(c)
- d. Scope of Impact — State Specific

Agricultural Profitability - Improving Dairy Management

- a. Dairy producers will be exposed to new technologies, and recommendations will be developed to enhance productivity and profitability of dairy operations in New Mexico. This information will ensure viability of the dairy industry in New Mexico.
- b. Impacts - As a result of this program, New Mexico dairy producers will have the opportunity to increase production efficiency and profitability of their operations. Enhancement of the dairy industry will have a major impact the state's economy. The success of dairy operations in New Mexico should positively influence continued expansion of the dairy industry in the state.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Agricultural Profitability - Agriculture Marketing

- a. County elected officials will learn what their official duties and responsibilities are and New Mexico State Law and be better able to serve their county citizens.
- b. Impacts — County elected officials will save half a million dollars annually by doing a more efficient job of running county governments and by staying out of lawsuits.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Animal Production — Efficient and Profitable Livestock Production

- a. Many management practices can increase output and return. Few producers use all proven practices. A major concern of producers and consumers is production of a safe and wholesome human food supply, dictating an increased need for quality assurance programs. Extension and the New Mexico cattle industry participated in phase I of the Beef Quality Assurance Program in the past. Both cattle and sheep producers evaluated production costs and returns and incorporated production practices that would maximize dollar return. New Mexico has different cultural groups who have unique production problems. These include the numerous Indian cultures across the state and the Hispanic

cultures of North-central New Mexico.

- b. Impacts -As a result of these programs, 1000 livestock producers benefited economically by increasing their net incomes and furthering their chances for survival in livestock-related businesses; 500 minor species owners increased the welfare and, where appropriate, increased income due to educational efforts and programs.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (TX)

Invasive Species – Invasive/Noxious Weeds

- a. Non-native plant species are impacting our state through increased production costs, reduced land values, elimination of biodiversity, reduced recreational opportunities, and a general reduction in state revenue. This issue impacts all citizens of the state, not just the agricultural producer.
- b. Impacts -Development of New Mexico Noxious Weed Program as mandated in the 1998 Noxious Weed Law. AS a result of this law, people of New Mexico will have an increased awareness and desire to be involved with the issue of invasive/noxious weeds. Producers will save input dollars through the wise use of available management options and through the early recognition of these unwanted species.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (TX, CO, UT, AZ, WY, CA, NV, ID, WA, OR, MT)

Invasive Species - Pest Management

- a. New Mexico State University participates in the National Cooperative Agricultural Pest survey program with USDA APHIS PPQ to monitor and record the movement of exotic pests and beneficial organisms into and within New Mexico. As a border state with Mexico, New Mexico's participation in the program can be important in monitoring the movement of introduced pests from the south such as Africanized honeybees. Introduction of pest organisms from other states can also occur along interstates and railroads that cross New Mexico. The documentation and survey of agricultural areas for pests of international concern can enhance the export market for many New Mexico agricultural products. Survey data and pest status are reported in a national database. Participation in the program provides a link with USDA APHIS biological control research laboratories. This allows New Mexico agricultural researchers and cooperating growers access to potential new biological control strategies. The program also provides a communication link between other states participating in CAPS and USDA APHIS through electronic mail. The program is funded primarily through an annual cooperative agreement with USDA APHIS PPQ. Cooperative efforts currently include survey of

exotic or introduced pests such as gypsy moth and Karnal bunt, onionweed eradication, and release and recovery surveys of biological control organisms for leafy spurge. Potential exists for future cooperative projects that enhance export or otherwise support goals of USDA APHIS PPQ.

- b. Impacts -As a result of this effort at least 3,000 individuals (urban residents, range and forest land owners, and agricultural crop producers) will gain knowledge on the identification, movement , and management of selected economic and environmental pests. At least fifty percent of learners will apply this knowledge. Statewide economic impacts as a result of increased control of invading pests and weeds could amount to at least \$500,000 in the next five years. This program supports a national effort to detect and suppress exotic pests and can influence the demand for New Mexico Agricultural products abroad.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Invasive Species - Brush/Weed Control

- a. Noxious brush and weeds are found in every county of the state and are a serious problem on New Mexico rangeland. This fact is revealed by a survey of selected woody species in 1981 which showed 50.4 million acres or 65 percent of New Mexico to be infested with one or more noxious plants. About 24.8 million acres or 32 percent is so densely covered that grass production is seriously curtailed. In addition to the loss of forage production, noxious plants result in soil erosion, reduced water use efficiency and increased animal handling costs. These in turn lower animal production and cause loss of income to the ranching community. Land managers want to know the most efficacious and economic means of managing noxious brush and weeds.
- b. Impacts -The estimated economic benefits in five years accruing as a result of adopting recommendations from this project is \$2,325,000 to the ranching industry.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Managing Change in Agriculture — Sustainable Agriculture

- a. Sustainable agriculture is a management philosophy and system providing for agricultural needs of current and future generations. Sustainable agriculture utilizes management practices that are profitable, environmentally sound, and beneficial to society. The vision of NMSU Extension is to develop a comprehensive strategic plan for training Extension professionals in sustainable agriculture methods and theory. Extension also will assume leadership for teaching the fundamentals of sustainable agriculture to the state's agriculture community.

- b. Impacts -Extension outcome indications will include county agents, farmers and ranchers receive current and relevant information from Extension and Research publications on sustainable practices and issues. Mileposts will include the adoption of sustainable agricultural practices, such as, Pheromone disruptions on Cotton and results obtain from the Alcalde Sustainable Agriculture Science Center (Kellogg project) in North-Central New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Plant Health--Plant Pathology

- a. Agricultural producers and urban clientele have a continuing need for information regarding plant diseases and their control. Assistance needs to be provided for diagnosing plant disorders and establishing a plan of action regarding economic, environmentally sound, and effective disease management strategies. Educational programs on plant disease concepts, pathogen biology and epidemiology, environmental influences on disease development, and mechanisms of control must be provided so that clientele can successfully implement disease management programs. The target audience includes agricultural producers, master gardeners, pesticide applicators, landscape maintenance contractors and workers, and the general public. All educational programs are offered to anyone interested in attending. Programs are offered in a variety of locations throughout New Mexico. Diagnostic services are provided to anyone seeking assistance either through their county extension office or through the plant diagnostic laboratory at New Mexico State University. There is currently no charge for diagnostic services.
- b. Impacts
 - Approximately 28 master gardener classes will be presented approximately 7 per year as requested by county agents. Approximately 24 pesticide applicator training workshops will be presented approximately 6 per year as requested by Pesticide Applicator Training Specialist, county agents or officials with the New Mexico Department of Agriculture.
 - Approximately 20 presentations will be made at grower conferences with approximately 5 per year as requested by extension specialists and county agents.
 - Approximately 4 (1 per year) in-service training workshops will be provided.
 - Approximately 2,800 plant diagnostic services (samples, phone calls, field and home visits) will be provided based on average number of requests for service over the last five year period.
 - Approximately 96 newsletter and magazine articles will be written.
 - Approximately 16 extension publications will be written.
 - Approximately 8 TV spots, 40 radio spots, and 48 news releases will be disseminated.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact -Multistate Integrated Research and Extension

Rangeland/Pasture Management-- Range Management Education

- a. Ninety percent of New Mexico is classified as rangeland. In addition to traditional range management issues and programs, conflicts often arise between ranchers, environmentalists and land management agencies regarding goals and objectives of natural resource management. This is especially true on federal land and state trust land. Agencies are not going to monitor ranges as intensely in the future and therefore the rancher should implement a monitoring program on his ranch in self defense. Additionally, monitoring programs will allow management decisions to be made in an informed manner. Livestock and wildlife interaction continues to be a major challenge in keeping ranges properly stocked when wildlife numbers, such as elk, continue to expand. Poisonous plants have always been a problem to New Mexico ranchers. Toxic plants inflict about \$2 million loss on the state's livestock industry annually. Direct losses are the most obvious. Indirect losses such as loss of carrying capacity, low weaning weights and reduced calf or lamb crops are less obvious but are a greater economic drain. Ranchers will be able to monitor ranges and understand why changes in the range condition occur and take appropriate management actions, if needed. Ranchers will be able to take preemptive measures in reducing poisonous plant losses.
- b. Impacts -- Conflict about range conditions and management will be reduced by 25% from the 1998 level of 152 disputes on federal land permits between the rancher and the responsible land management agency. Locoweed management options will be implemented by ranchers and will reduce the economic loss by one third compared to 1998.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ)

Risk Management-- Farm Ranch Management

- a. Profitable commercial agriculture is critical to the overall economy of the state of New Mexico. However, the vast majority of agricultural producers continue to maintain only limited records and those are typically only maintained for tax purposes. To effectively evaluate profitability, make informed production decisions, as well as finance operations, producers must maintain sufficient records to at a minimum be able to prepare the financial statements recommended by the Farm Financial Standards Task Force.
- b. Impacts -The primary intent of the program is to assist agricultural producers in reaching and/or maintaining economic viability of their respective operation. Maintaining and strengthening the profitability of both new and existing operations will in turn help to keep our rural communities viable.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Small Farm Viability -- Specialty Crop Production and Marketing

- a. In 1995, New Mexico's total cash receipts from the sale of farm and ranch production was over 1.4 billion dollars, 32.3 percent of which represented crop sales. Although alfalfa hay ranked third in total cash receipts, horticultural crops like pecans, onions and chile followed closely in ranking. As these horticultural crops are dominantly produced on larger farms in southern New Mexico and marketed through major sheds and brokers, more production and alternative marketing information is needed on specialty crops adapted to smaller farms, especially in northern New Mexico and around urban centers of growth. The generation of this production and marketing information should be integrated with concerns for the environment, water conservation/quality, and cultural diversity of clientele including the interaction between rural and urban communities.
- b. Impacts -A successful Extension specialty crop production/marketing program will result in 500 small or part-time farmers (especially those from under-served audiences) becoming aware of specialty crop options, various marketing alternatives, and sustainable agriculture techniques. One hundred of these farmers will apply this awareness in determining optimum variety, production techniques and marketing systems for at least one specialty crop, implement the production and marketing of that crop, and evaluate the profitability and long-term sustainability of that crop in their farm enterprises. One hundred farmers will adopt new sustainable agriculture techniques for the production of specialty crops that help protect the environment and conserve and/or protect water quality. Farmers implementing the above innovations will realize an average increase in net income of 5 percent.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Small Farm Viability - Small Farm Task Force

- a. The quality of life for rural residents in the Small Farm Task Force Region of north central New Mexico has eroded for many years due to interlocking cultural, educational and economic constraints tied to the unique agricultural environment in the area. This has created family profiles in each of these counties that are among the most depressed in the nation. This tri-cultural region speaks seven languages and each community is as unique as its residents. The small farming operations these families depend on for a living have not been profitable and, to a large extent, are responsible for the complex problems that need to be addressed if community sustainability is to be achieved. A recent influx of land developers into the region has caused inflated land prices causing farmers to sell their land and as a result, threatens a cultural way of life and the economic stability within the region.

- b. Impacts — As a result of regional planning, extension efforts will be maximized in the north central region of New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

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Goal 2: A safe and secure food and fiber system.

Overview

Industries allied with agriculture, family and consumer sciences, food, fiber, tourism, and natural resource management are major components of New Mexico's economy. The agricultural and natural resources industries alone contribute several billion dollars annually, directly and indirectly, to the state's economy, and provide approximately one-fifth of the jobs.

New Mexico's economic growth requires strong development efforts and decisive action. The College's role is the education of community and state leaders to help them design, develop, and implement economic strategies to improve the vitality of New Mexico's economy and facilitate community planning for development.

The College has significantly affected economic development in the past, and it continues to do so. The economic benefits of some programs are short-term and visible. Others involve research that addresses fundamental biological, economic, or sociological processes or concepts, and offers extensive long-term benefits to agriculture and society in general.

Objectives

- Encourage and reward interdisciplinary activities and cooperation with industries and communities, emphasizing both applied and fundamental methods for developing comprehensive solutions to important issues.
- Conduct research, teaching, and extension programs on emerging critical issues, including:
 - supporting New Mexico business development and management
 - pursuing alternative crops for farmers
 - assessing actual and potential impact of College programs on economic development
- Continue to improve and strengthen current research and extension programs that:
 - facilitate community and business planning activities, including activities of ranches and farms
 - emphasize existing programs and encourage the development of new programs that lead to the use of natural and human resources in a manner that provides greatest economic benefits, taking into consideration ecological, biological, social, and cultural values
 - emphasize food science, food technology, and post-harvest handling and processing of value-added agricultural products
 - emphasize practical aspects of agricultural marketing, help identify marketing and promotional opportunities for specific agricultural and fiber products, and include team approaches to solving marketing problems

The New Mexico Cooperative Extension Service believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 2 were \$43,214.95 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 0.8.

Food Handling--Food Technology Program

- a. The value of agricultural food products can be significantly increased through food processing. Value-added food processing may generate a significant number of jobs in the state of New Mexico. Small farmers are raising more and more specialty crops, which lend themselves to unique food products. Many of these crops are taken out of the state as raw material for processed products. These same products return to New Mexico's food markets as processed foods with high value. The added value of those products could significantly benefit the economy of New Mexico if they were processed in the state. If this is to occur, producers and processors need reliable information on basic food processing and product development. Safe food processing methods are essential for processors to be successful. This same safe food handling information is important to New Mexico's restaurant and tourism sector. Occasional outbreaks of food born illness give credence to the importance of directing food safety programs toward the food industry at all levels.
- b. Impacts
 - 200 food processors will attend general information workshops/seminars.
 - 50 food processors will attend various HACCP training.
 - 250 food processors will receive the state newsletter.
 - Labeling assistance will be provided to 100 food processors.
 - New food products will enter the market.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ)

Food Safety--Family/Consumer Food Safety

- a. Foodborne illness is a rising concern. The Council for Agricultural Science and Technology estimates that up to 33 million cases of foodborne illness occur in the U.S. every year. The National Center for Health Statistics estimates the number of deaths per year from foodborne illness to be 9,100. There are several reasons for the rise in Foodborne illness. First, several new pathogens have emerged. Three of the four most serious foodborne pathogens in the U.S., (*E. coli* 0157:H7, *Listeria monocytogenes* and *Campylobacter jejuni*) were unrecognized as sources of foodborne disease only 20 years ago. Secondly, the food supply has become global with many different countries supplying food products to the U.S., and thirdly more food is prepared and consumed away from home. In addition, those most susceptible to serious consequences or even

death due to foodborne illness are infants, young children and the elderly. Yet, these individuals often have the least control over the food they eat. Food safety education should be targeted at consumers, care takers of infants, young children and the elderly, food service and restaurants workers and managers.

- b. Impacts - Adoption of safe food handling practices; food preservation; and understanding food safety risks are expected as long-term solutions.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Goal 3: A healthy, well-nourished population.

Overview

New Mexico has the highest rate of poverty in the nation with 25% of New Mexicans living below poverty (US Bureau of the Census). Low income populations face numerous problems associated with inadequate nutrition. In some cases, children do not eat enough to sustain health and to grow and develop at optimal levels. Even more commonly, individuals make poor food choices, which can lead to chronic disease problems such as obesity, diabetes, and heart disease. Although benefits such as Food Stamps and WIC provide vital resources to some of those in need of food assistance, this resource is often not maximized. This is often due to recipients' lack of knowledge of the relationships between health and four areas: basic nutrition, food safety, food preparation, and food resource management. In addition, many limited-resource individuals do not receive the encouragement and reinforcement needed to put such knowledge into practice. Education can help low income families and individuals maximize their resources to improve their nutritional status. Approximately 28% of New Mexico children below the age of 18 live in poverty. This number has grown over the last 10 years. Reaching New Mexico youth early in life with effective nutrition education will promote the adoption of healthy eating and food management practices. Establishing healthy habits early in life can have life long benefits in optimal health and disease prevention. Further, children are an ideal target for nutrition education in terms of habits being more amenable to change than later in life.

The New Mexico Cooperative Extension Service believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 3 were \$56,164.55 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 1.0.

Human Health--Adult Expanded Food and Nutrition Education Program

- a. Targeted audiences will be encouraged to increase their use of the Dietary Guidelines and the Food Guide Pyramid in making food choices and meal planning. Special emphasis will be placed on increasing consumption of fruits, vegetables, and whole grains, decreasing fat consumption, increasing calcium intake, maintaining healthy weight by making healthy food choices and increasing physical activity, increase use of thrifty shopping and quick, economical food preparation techniques and food choices (that fit with the Dietary Guidelines and the Food Guide Pyramid) and increase use of safe food handling practices.
- b. Impacts
 - ADULT — Dietary change will be measured using 24-hour food recalls upon entry and exit from the program. Information will also be obtained on behaviors related to nutrition, food resource management and food safety at entry and exit. Data will be analyzed using the federal computerized EFNEP Reporting System (ERs).

- YOUTH — Program effectiveness will be determined by using qualitative measures (i.e., stories and pictures from participants).
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Human Nutrition--Food & Nutrition Education

- a. Good nutrition is essential to improve and maintain health. Five of the leading causes of death including heart disease, cancer, stroke, diabetes and hypertension have links to diet. Obesity now affects over half of all Americans. These individuals are at increased risk of illness from hypertension, lipid disorders, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems, and certain cancers. The total costs attributable to obesity-related disease approaches \$100 billion annually (NIH). For programs to truly be effective, both diet and simple physical activity, such as walking, should be emphasized. Youth as well as adults should be targeted so nutrition related disease and obesity can be prevented. Key tools for use by Extension include the Food Guide Pyramid, Dietary Guidelines for Americans (1995), and the Food Label.
- b. Impacts -Data will be collected on numbers of program participants and program participants' intentions to change behavior. Follow up data on actual behavior change will be collected on a portion of program participants.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Goal 4: An agricultural system that protects natural resources & the environment.

Overview

Both rural and urban human activities can pollute land, water, air, and food. Through teaching, research, and extension programs, the College is committed to furthering our understanding, using science-based knowledge, 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 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.

Objectives

- Encourage and reward interdisciplinary and integrated relationships with other research entities, such as NMSU's Geography Department, Biology Department, Chemistry Department, and Physical Science Laboratory, and the USDA Jornada Experimental Range, emphasizing both applied and fundamental methods for developing comprehensive solutions to important issues.
- Conduct research, teaching, and extension programs on emerging critical issues, including:
 - the impact of urbanization on the environment
 - the effects of recreational and tourism activities on natural resources
 - policies resulting from the influx of new residents
 - cultural and social issues related to demographic shifts and agricultural transformation
 - the information and technology needs of natural resources managers
- Continue to improve and strengthen current research and extension programs that:
 - address multiple uses of land
 - investigate alternative enterprises based on utilization of natural resources
 - develop natural resource management practices to ensure that socially and environmentally optimal resource uses are achieved
 - address water quality issues
 - address soil and food contamination, waste management, watershed, and erosion problems
 - address wildlife habitat needs, economic value of wildlife, and maintenance

- of biodiversity
- identify efficient uses of existing water resources
- address the effectiveness of recreational hospitality and tourism practices
- identify the physical and economic trade-offs that would result from modifying existing management practices
- assist land management agencies in developing standards and guidelines for land use and conservation

The New Mexico Cooperative Extension Service believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 4 were \$641,522.43 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 8.9.

Integrated Pest Management-Integrated Pest Management

- a. Approximately 70 million acres in the state are devoted to livestock grazing; nearly 10 million acres of non-federal land are forested. Range caterpillars, grasshoppers, and various forest pests (bark beetles, tussock moths, mistletoes, etc.) are periodic pests in these rangeland or forested areas; in addition, invasive, exotic weeds (musk thistle, various knapweeds, yellow star thistle, etc.) are continuing to spread in various parts of the state, out-competing native plants and replacing them with less desirable, less palatable and even toxic species for livestock and wildlife. Of the approximately 1.5 million people in the state, nearly 75% live in urban centers with 2500 or more people. Consequently, pests of urban ornamentals affect the greater percentage of clientele. Surveys continue to indicate severe over-reliance on commercial pesticides by homeowners and pest control operators to control major and nuisance pests in the state. Urban ornamentals and turf have been attacked by ash whitefly, ash bark beetle, tomato spotted wilt virus and other pests; on-going drought has further weakened landscape plants, making them more susceptible to an assortment of arthropods borers and defoliators. The nursery and greenhouse industries have been shaken by invasive red imported fire ants and Japanese beetles in Dona Ana and Bernalillo Counties, respectively.
- b. Impacts
 - An estimated 7,000 homeowners and agricultural producers will adopt appropriate IPM practices on lands they manage.
 - At least 1,250 pest identifications performed by Extension specialists over the course of the project will provide timely indicators of pest and presumed pest activities and distributions, helping specialists focus on development of appropriate educational materials for similar clients.
 - Homeowners and agricultural producers will save approximately \$7 million in pesticide expenditures by learning to identify pest problems and take appropriate

IPM control measures with a compounding positive effect on the environment and non-target species.

- A minimum of 150 pest control operators and licensed applicators will be trained or re-certified by Extension specialists annually.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Natural Resources Management--Nursery Industry

- a. Nurseries and greenhouses look to the Extension Service for up to date, reliable information to share with their customers and increase their professionalism and profitability. As interest in landscape and garden water conservation increases the need for information on appropriate plant material and cultural practices increases.
- b. Impacts -Teach nursery and greenhouse personnel statewide the appropriate plant materials for water conservation in landscapes and gardens and effective cultural methods to economically produce these plants.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Natural Resources Management – Ag Water Use & Pollution Prevention

- a. Agricultural point and non-point sources of pollution are considered by federal and state regulatory agencies, as well as public sentiment, to be significant sources of water quality degradation. Of the 164 streams and waterways listed on New Mexico's federal Clean Water Act 303d list as "impaired," 81% cite agriculture, and/or silviculture as a "probable source of pollutant/threat". Implementation of best management practices by agricultural producers is generally perceived as being key to reducing the risk of agricultural pollution. Technical understanding of BMP implementation and the benefit to environmental protection is lacking in many of New Mexico's agricultural professionals and producers. Basic educational programs provided for change agents, producers, and agricultural policy makers can help to establish adoption and implementation of improved practices.
- b. Impacts: 5 Extension agents will increase the level of county programs relating to water quality; 50 percent of agriculture producers participating in programs will increase their knowledge or understanding of pollution prevention practices.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Natural Resources Management--Certified Crop Advisor Program

- a. Throughout history, a nation's success has been directly related to the success of its agriculture. Today, with approximately 1.35% of New Mexico's population engaged in production agriculture, the margin for error is small, and the effects of mismanagement extend well beyond the farm gate to all segments of society. Producers rely heavily on the advice of others. The Certified Crop Advisors (CCA) Program came into existence to insure that growers receive sound advice and recommendations. The CCA Program is built on the concept that there are certain things one must know in order to provide sound advice to producers.
- b. Impacts -Estimated economic benefits in five years as a result of adopting a minimum level of sufficiency in soil fertility, soil and water management, integrated pest management and crop management is \$3,500,000 to the farming industry (3.5% of the average state production expenses).
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Natural Resources Management – Wildlife Management

- a. The state of New Mexico possess a great variety and abundance of wildlife species. Many of these species are popular game animals, while others are non-regulated or threatened/endangered species. There is a great deal of need for information on the various species of wildlife that occur throughout the state. Many New Mexicans exhibit an interest in wildlife for varied reasons and illustrate a need for life history information as well as management information. Agriculture producers throughout the state manage their lands in a manner that is beneficial for wildlife as well as livestock. Therefore, up-to-date information is needed to guide these individuals in their management endeavors to ensure the long-term sustainability of our natural resources. Natural resource management agencies also need accurate, unbiased information and research oriented data to help resolve conflicts that arise over the management of the natural resources occurring in the state. The youth of New Mexico also are keenly interested in the wildlife that occurs across the state and require accurate information to further their knowledge about the wildlife resource.
- b. Impacts - As a result of this wildlife management education effort, 10% more farmers, ranchers, and resource managers will implement wildlife management skills as evidenced by a 10% improvement in wildlife habitat on public and private lands of New Mexico and a 10% increase in resolved conflicts over management of wild and domestic ungulates on public lands. At least 200 New Mexico youth will gain increased awareness and participate in wildlife youth programs.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact -Integrated Research and Extension

Nutrient Management--Nutrient Management

- a. Plant nutrients are found in both synthetic and organic materials such as farmyard manure and composts. Animal feeding operations in New Mexico have increased since 1982 resulting in a 56,000 head increase in dairy cows alone. Commensurate with this increase is increased manure production that can be utilized for crop production. However, repeated and excessive applications of manure to cropland can cause nutrients to buildup and cause negative environmental and livestock health implications. Unique soil properties found in New Mexico offer some degree of protection against many of problems found in the eastern U.S. However, permits issued to animal feeding operations require some form of tracking and accounting for the nutrients applied to cropland. Nutrient management is a best management practice suitable to all persons utilizing the land for economic plant production. Managing nutrients for sufficient plant growth, animal nutrition, and environmental compatibility will assure a safe and reliable source of food and fiber in New Mexico. Additionally, proper nutrient management practices will maintain economic viability of New Mexico's cropland and livestock producers.
- b. Impacts -Estimated economic benefits in five years as a result of adopting best management practices from this project is \$7,300,000 to the farming industry.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact -Integrated Research and Extension

Pesticide Application - Pest Applicator Training

- a. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA as amended) is administered by the United States Environmental Protection Agency and mandated by congress requires that pesticide applicators who use restricted-use pesticides be certified and licensed. It is the responsibility of the states to train and license these people. The New Mexico Cooperative Extension Service (NMCES) provides the necessary training to become licensed either through workshops, seminars, presentations or written study material provided to farmers, ranchers and other prospective pesticide applicators. A pesticide license is required to purchase the restricted-use pesticides to protect agricultural commodities and man and the environment from pests.
- b. Impacts -The indicator of how the training is measured is the number of pesticide applicators becoming certified and licensed and the number of complaints the New Mexico Department of Agriculture receives from the application of pesticides. New information that is being used can be determined and evaluated when the New Mexico Department of Agriculture pesticide inspectors make their required inspections.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact -State Specific

Riparian Management--Riparian Management

- a. The EPA estimates that New Mexico contains 110,741 miles of streams and rivers. Of these, approximately 8,682 miles are perennial, 99,332 miles are intermittent, and 2,727 miles are ditches. The EPA has also identified 1,256 lakes throughout the state. Although the matter is the subject of considerable debate, the margins along most of these streams and lakes are riparian ecosystems. In an arid landscape, these riparian habitats represent critical oases for wildlife, livestock, and vegetation. It has been estimated that 80% of all wildlife in New Mexico spends at least some portion of its life cycle in riparian areas. Even in less arid areas of New Mexico, riparian systems are different enough from their upland counterparts to be considered critical habitat. Riparian systems in New Mexico are critical for two reasons: (1) the ecological functions they serve, and (2) the value that resource managers place on them. These are often viewed as competing interests. However, responsible and sustainable management of riparian systems can and do adequately maintain the ecological functions that these systems serve. As a state that relies heavily on agriculture (both farming and ranching) for income and employment, New Mexico must seek to balance the extent to which riparian systems simultaneously serve ecological functions and provide valuable natural resources. It is the role of the New Mexico Cooperative Extension Service to assist farmers, ranchers, environmental interests and federal, state, and local agencies in achieving this balance. As a new effort within the New Mexico Cooperative Extension Service, the Riparian Management program will work with all interests to achieve objective, equitable, and scientific solutions to the challenges facing riparian resource managers. However, New Mexico is geographically, demographically, and ecologically diverse. Consequently, there is no single correct approach to managing riparian resources that function quite differently and under very different pressures across the entire state. Particularly with riparian systems (which vary not only among different systems and areas, but also longitudinally within the same system or area), a site-specific, case-by-case approach should be taken to balancing resource production and ecological function. Prescriptions will range dramatically as riparian systems transition from southwestern desert to Montana forest ecosystems.
- b. Impacts - At least 3 riparian management demonstration projects will be launched each year with increases anticipated once the program becomes established. Monitoring results and participation will be collated and summarized annually. The Riparian Management Specialist will conduct or participate in at least 5 workshops or meetings each year with increasing numbers anticipated as the program grows. Workshop evaluations will be collated and summarized to provide a measure of the effectiveness of educational efforts. At least 2 publications relating to riparian area management will be produced each year. At least one survey each year will be distributed to County Extension Agents and other coordinating personnel to provide feedback and as a measure of program effectiveness.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

- d. Scope of Impact -Integrated Research and Extension

Sustainable Agriculture--Soil & Water Conservation

- a. Major conservation programs are becoming necessary as Conservation Reserve Program acreage is removed from the Conservation Reserve Program. Emphasis is now upon what to do with this high erodible farmland as it is returned to agricultural production. Agricultural producers are required to implement sustainable agricultural practices to return the CRP acreage into production of crops. There is a tremendous need to study alternative cropping systems, crop rotations, and sustainable agricultural practices that will insure the protection of the highly erodible lands coming back into production. New Mexico currently has over 480,000 acres enrolled in the CRP. CRP contracts are held by approximately 600 agricultural producers, most of them located in the eastern sections of the state where wind erosion is a potential problem throughout the entire year. Economic data will be utilized to determine the most feasible alternatives for agricultural producers.
- b. Impacts - Extension outcome indications will include county agents, farmers and ranchers receive current and relevant information from Extension and Research publications on sustainable practices and issues. Mileposts will include the adoption of sustainable agricultural practices, such as, Pheromone disruptions on Cotton and results obtain from the Sustainable ASC (Kellogg project) in North-Central New Mexico.

Reaching farm and ranch producers in general, will be accomplished through commodity group associations, mailings and one-on-one contacts from the county extension faculty and state specialists.

County agents will receive staff training to orient staff to job responsibilities, to understand and apply new technology and to redirect the programs. Content will focus on sustainable agriculture and leadership development and will be presented through workshops and seminars. All county extension faculty-agriculture, will receive training to understand and apply new technology.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Urban Gardening--Urban Horticulture in New Mexico

- a. Although New Mexico's population is almost 3/4 urban, most home garden and landscape problems for rural citizens are identical to those of urban residents. Other than home gardening, urban residents have little contact with agriculture or NMSU and get their horticultural information through local nurseries. Gardening is a major means of relaxation and important fresh food supplement for citizens. Questionnaires have shown that though the primary source of information is the nursery, the most reliable source is perceived by the public to be the Extension Service and Extension Service volunteers

such as Master Gardeners. In New Mexico, concerns over water conservation linked to a desire to maintain attractive landscapes, has increased the need and desire for reliable, research based, water conserving gardening information. Commercial and institutional landscapes and professional landscape managers are aspects of New Mexico's agriculture.

- b. Impacts--Home and landscape gardening [1101] 1) Increase effectiveness, water conservation, and success of home gardening through the use of researchbased horticultural information, 2) continue to increase access to researchbased gardening information for limited resource citizens through cooperation with EFNEP and community gardening associations, 3) reduce landscape water use by 30% through dissemination of Xeriscape and waterefficient gardening information, and 4) enhance professionalism and effectiveness of professional landscape managers. 5) Encourage effective, safe, landscape recycling through composting, 6) teach safe, effective pest control methods utilizing the techniques of Integrated Pest Management [1200]. 7) Develop and maintain Master Gardener programs to assist Extension Service efforts in eight New Mexico counties.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Water Quality--Water Quality in the Rio Grande Corridor

- a. Population growth along New Mexico's river valleys is among the fastest in the nation, resulting in a greater demand for domestic use of surface and groundwater supplies. Conflicts between urban use and irrigated agriculture are becoming critical issues. Population concentrations along the rivers also threaten water quality by increasing pollutants from septic tanks, household hazardous waste, and lawn and garden practices. There is a general lack of knowledge about the impacts to water supplies from land use and waste disposal practices. Educational programs designed for Extension agents, the general public, municipal water and wastewater managers, and garden hobbyists will increase awareness of the need to conserve and protect water resources.
- b. Impacts - To deliver educational programs on wellhead protection, conservation, and household hazardous waste management to Extension agents, public and private water well owners, gardeners, and homeowners/renters. To train homeowners, landscape managers, and pesticide applicators on groundwater and surface water protection and the proper use and management of pesticides
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Wildlife Management--Wildlife Damage Control

- a. Many species of birds, mammals and reptiles can be problematic for the general public,

agriculture and commercial industry in New Mexico each year. Reported predator losses amounted to almost \$2,000,000 for livestock producers in New Mexico during 1995. Some species, such as rattlesnakes and rodents can be a significant source of hazard to the health and safety of many people within the state. Therefore, technical information outlining the methods of control for wildlife damage is greatly needed. Wildlife damage control methodologies and the legal constraints surrounding control change rapidly. This requires farmers, ranchers and the general public to have access to up-to-date information on control techniques and the legalities pertaining to those techniques. Individuals applying for certification to employ "restricted use" pesticides need training materials that will prepare them for certification and the careful use of restricted chemicals. The public, including youth will improve their understanding of renewable natural resource issues and the consequences of their actions. An effective educational program such as this will create informed decision makers that will ultimately lead to actions that protect and improve the environment.

- b. Impacts - As a result of this program, at least 200 farmers, ranchers, and members of the general public will gain awareness of up-to-date practices to reduce or eliminate animal damage problems. At least 100 of these individuals will apply one or more of these practices. Statewide impact will be a 15% decrease over the next five years in the level of damage.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Wildlife Management - Wildlife Management

- a. The state of New Mexico possess a great variety and abundance of wildlife species. Many of these species are popular game animals, while others are non-regulated or threatened/endangered species. There is a great deal of need for information on the various species of wildlife that occur throughout the state. Many New Mexicans exhibit an interest in wildlife for varied reasons and illustrate a need for life history information as well as management information. Agriculture producers throughout the state manage their lands in a manner that is beneficial for wildlife as well as livestock. Therefore, up-to-date information is needed to guide these individuals in their management endeavors to ensure the long-term sustainability of our natural resources. Natural resource management agencies also need accurate, unbiased information and research oriented data to help resolve conflicts that arise over the management of the natural resources occurring in the state. The youth of New Mexico also are keenly interested in the wildlife that occurs across the state and require accurate information to further their knowledge about the wildlife resource.
- b. Impacts - As a result of this wildlife management education effort, 10% more farmers, ranchers, and resource managers will implement wildlife management skills as evidenced by a 10% improvement in wildlife habitat on public and private lands of New Mexico and a 10% increase in resolved conflicts over management of wild and domestic

ungulates on public lands. At least 200 New Mexico youth will gain increased awareness and participate in wildlife youth programs.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

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Goal 5: Enhanced economic opportunity and quality of life for Americans.

Overview

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. Regional and international involvement lead to program enrichment valuable to our state and its people. Research today requires an expanded geographic base of operations because of the worldwide spread of information, data, expertise, and funding sources, and the demand for graduate education. 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 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.

Objectives

- Encourage and reward multistate, regional, and international research, teaching, and extension activities, when appropriate, including:
 - working with industry to develop an international trade center or related institution to enhance the value of New Mexico products for export
 - participating with the University in its effort to internationalize its courses of study
 - working with industry to develop educational, work-related opportunities for students

The New Mexico Cooperative Extension Service believes that it is meeting the short-term goals outlined in the 5-year Plan of Work submitted in July 1999.

Total expenditures for Goal 5 were \$506,005.97 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 10.0.

Children, Youth, and Families at Risk--Expanded 4-H Programming

- a. The 4-H Youth Development Program in New Mexico has expanded to include youth in three delivery modes: Special Interest, School Enrichment and the long-standing 4-H Club. While all youth are at-risk, some youth have a combination of risk factors that create a higher risk environment for suicide, substance abuse, violence, and other at-risk behavior. The New Mexico 4-H Youth Development Program has primarily addressed the increasing higher at-risk youth needs by developing special interest and school enrichment programs, while also searching for additional club leaders. In the 1998-1999 4-H program year, youth involved in 4-H school enrichment and special interest programs accounted for over 87% of 4-H membership in New Mexico. This plan of work

- covers efforts conducted in all delivery modes targeting higher at-risk youth.
- 4-H programming reaches 15% of children under 18 in New Mexico. In order to prepare youth for a positive future, they must possess life skills such as communication, goal setting, decision making, leadership and self-responsibility. These skills and others, are components of the 4-H Youth Development Program and its three delivery modes.
 - Counties receiving funding from OJJDP (Office of Juvenile Justice and Delinquency Prevention) or NMSU Cooperative Extension for 4-H Share/Care after school and summer programs focusing on substance abuse prevention education are included in this plan of work.
- b. Impacts - As a result of 4-H expanded programming, there is an increase of 10% by higher at-risk youth from a variety of socio-economic households and racial-ethnic backgrounds.
- As a result of 4-H expanded programming, 25% of participating youth express to others what they learned and promote the program to their peers.
 - As a result of expanded programs, an increase in adult volunteers involved in expanded 4-H programs by 5% occurred.
 - As a result of 4-H after school and summer programs focusing on substance abuse prevention education, over 1400 youth have increased skills in decision making, teamwork, conflict resolution and substance abuse prevention strategies.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Community Development--Rural Leadership and Organizational Develop.

- a. Northern New Mexico has hundreds of unincorporated rural communities that fall under county governments. This system, although less complicated, is also less rewarding. Community services and facilities are limited, often non-existent in smaller communities. Most resources end up in the larger, more aggressive towns and villages. Rural communities must develop the infrastructure they need to find practical mechanisms to compete for services and facilities.
- b. Impacts - Four hundred limited resource farmers and ranchers, rural residents, and five community based organizations will develop the skills necessary to address policy issues that affect their communities relating to infrastructure; private, federal and state land policy; and water policy by the fall of 2004. Extension workshops and forums on emerging public policy issues such as: leadership conferences, leadership workshops, decision maker forums, water rights workshops and public land management workshops will be conducted in north central New Mexico to develop these skills in the target audience.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

- d. Scope of Impact -State Specific

Consumer Management--Family Resource Management

- a. Basic money management skills are increasingly important. As individuals enter the work force they need to understand the benefits, if any, offered by their employers, the income tax implications, and how to stretch their income to meet basic needs and save for their future. Education is needed to provide these skills. Extension education programs which address setting financial goals, budgeting, cutting costs, wise use of credit, debt reduction, savings, and investing for retirement can help to increase the financial security of New Mexico families now and in the future. Because of the time constraints, employers are being encouraged to offer financial education in the workplace in order to both help employees manage their current finances and learn what they need to know to plan financially for retirement and thus be able to leave the workforce in a timely manner.
- b. Impacts - As a result of these programs 800 individuals and families will have a better understanding of basic financial management and other resource management skills. This will be evidenced by increased savings, reduced debt and fewer bankruptcies. As a result of these programs 100 retirees will have made steps to increasing their financial security in retirement. One hundred families will have adopted at least one new time or organizational management practice.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Home-based Business Education--Enterprise Development and Managt.

- a. Northern New Mexico has hundreds of unincorporated rural communities that fall under county governments. This system, although less complicated, is also less rewarding. Community services and facilities are limited, often non-existent in smaller communities. Most resources end up in the larger, more aggressive towns and villages. Rural communities must develop the infrastructure they need to find practical mechanisms to compete for services and facilities.
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- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Home-based Business Education--Wildlife Enterprises on Private Land

- a. Knowledge of wildlife/fisheries management principles and techniques are needed to successfully manage these types of enterprises. Charging a fee to hunt or fish on private land is a viable method of increasing income on farms, ranches and nonagricultural lands. Fee hunting and fee fishing has succeeded in neighboring states and many New Mexico farms and ranches are attempting to add these enterprises to their agricultural operations. Little information is available to guide them in their has not yet experienced the full economic potential of activities such as fee hunting, fee fishing, aquaculture endeavors. Information dealing with issues such as legal constraints, marketing schemes, contracts as well as other enterprise development considerations are necessary for these endeavors to be Utilizing wildlife and fisheries resources as a means for primary or supplemental income is a growing activity for landowners in the United States. New Mexico successful.
- b. Impacts - As a result of this program, at least 100 landowners will gain knowledge about development and management of wildlife and fisheries enterprises. Twenty of these landowners will adopt management practices learned to develop or expand their wildlife enterprises over the next five years as a means of supplemental income.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Jobs/Employment--Communities in Economic Transition

- a. Per capita personal income levels in NM rank 48th in the nation. Most counties have a lower per capita income than the national average. Providing new and/or better employment for residents of rural areas, where incomes are generally lower, concerns many. A broadening of New Mexico's economic base is needed as non-renewable natural resources are depleted. Oil and gas activity, copper mining, uranium mining, coal mining, and molybdenum mining have experienced cutbacks, affecting the economies of most counties. Federal expenditures, which are a major source of income in New Mexico, continue to decline. New employment opportunities are needed. Community, government, and business leaders recognize that recruitment of outside business affords some promise and working with existing business offers even more potential. Research indicates that two-thirds of all new jobs are created by firms with less than 20 employees. Firms less than five years old produce 80% of all jobs. Retention, expansion, and creation of a local firms offers the greatest hope to the rural communities. Such firms face a high failure probability in their early stages. Prevalent reasons for business failure are lack of capital, poor business management practices, and financial management.
- b. Impacts - Local business, government, and community leaders will improve, develop, conduct, or implement economic development and business development programs to revitalize local economic potential. Principle focus will be on business retention and

expansion programs. A new focus will be on target industry analysis (pending funding).

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Leadership Training and Development--Developing Expertise of Gov't Officials

- a. County elected officials in New Mexico are elected every 2-4 years with little understanding of what their elected jobs require of them.
- b. Impacts -County elected officials will learn what their official duties and responsibilities are and New Mexico State Law and be better able to serve their county citizens.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Leadership Development--Leadership Development

- a. Leadership is a vital component of life skills. Through projects and activities in 4-H, youth and adults have many opportunities to develop leadership skills that include responsibility, self-confidence, self-esteem, communication skills, teamwork and decision making. People utilize a variety of skills to be effective leaders. These skills are introduced, developed and expanded throughout a lifetime. In 1998, there were 1309 youth enrolled in the New Mexico 4-H Leadership Projects. However, there are many opportunities for leadership development. Aside from leadership positions at the club, county and state levels, there are statewide activities, which aim to enhance leadership skills. These activities are Senior Leadership Retreat, which had an attendance of 320 participants in 1998. Teen-Get-Away with an attendance of 209 participants in 1998; 4-H Electric Energy Camp with 56 participants in 1998 and State 4-H Conference which had 541 participants in 1998.
- b. Impacts - 4-H members will gain leadership skills and participate in leadership opportunities.
 - State 4-H Leadership Tem members will conduct activities from the Leadership Project curriculum throughout the course of his/her term.
 - 4-H Leaders and members will demonstrate effective leadership skills to utilize in community organizations and projects.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Parenting--Child Development & Family Life

- a. Although the New Mexico Cooperative Extension Service cannot meet the needs of all families in the state, there are several under-served and vulnerable groups that Extension can assist by delivering meaningful educational programs. These target audiences are parents, childcare providers, and care providers of older adults.

PARENTS. Whether children live in a two-parent household or a single parent home, most parents work outside the home. When parents with young children work, someone else must care for their children. As these children get older and attend school the need for child care does not end. There is an even greater need to keep school aged children and teens occupied in the hours between the time school ends and the time parents come home. Parents and caregivers are in need of support for the role they share in caring for New Mexico's children.

CHILDCARE PROVIDERS. There are 600 licensed childcare centers and 233 family day care homes in New Mexico, not to mention a number of unregistered homes that care for young children. Because of low pay and no benefits, staff turnover is high, thus there is a need for continual staff training. The state licensing agency requires that child care providers obtain 24 hours of training per year, thus child care providers need assistance in getting that training, especially in rural areas.

CARE PROVIDERS OF OLDER ADULTS. Families with older adults need support. Care giving for an older family member who may have diminished capacity is a lonely and difficult job. Because many rural areas in New Mexico have no services for respite to which a caregiver can turn, Extension can fill this gap by providing resources for caregivers of older adults.

- b. Impacts — Parents of young children will gain information on child development and parenting skills. Childcare providers will gain knowledge on caring for young children and will acquire continuing education credits necessary for keeping their job. Care providers of older adults will gain respite from caring for family members.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Leadership Training - Volunteer Development

- a. Increased retention of volunteers is a challenge. Adult leaders need options of how and when to be involved, as their priorities regarding volunteer, personal and work commitments change over time.
- b. Impacts -As a result of new organizational 4-H club leader orientation, 100% of those participating are engaged in supporting and conducting their 4-H clubs in the spirit and within the guidelines of the program.
 - As a result of new group leaders in 4-H special interest and school enrichment delivery modes receiving orientation, 100% of those participating key group leaders are

engaged in supporting and conducting their 4-H groups in the spirit and within the guidelines of the program.

- As a result of opportunities for 4-H leader education at county, multiple counties, district and state levels, 15% of 4-H leaders participated in training, resulting in increased involvement by club members, leaders and parents.
 - As a result of the 4-H Volunteer Recruitment Campaign, an increase of volunteers by 5% occurred, bringing new resources to the club, school enrichment and special interest programs.
 - As a result of increased first year retention of volunteers, stability of clubs and groups occurred, allowing for agent and paraprofessional efforts to be utilized in other areas of county 4-H programming.
 - With the development of job descriptions, volunteers are able to devote their skills and abilities to 4-H, where they may not have seen a place for them in the past.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Tourism–Rural Economic Development Through Tourism (REDTT)

- a. Increase:
- A) the number of tourism employees, managers and owners receiving hospitality training through REDTT’s “Catch Our Enchanted Spirit!” training program.
 - B) readership of and contributors to REDTT’s “Enchanted Spirit” monthly statewide calendar of events and “Trails and Treasures” quarterly newsletter.
 - C) knowledge of the value of tourism, both economically and culturally.
 - D) awareness of rural tourism successes through REDTT web site and media services, including news releases; public service announcements; radio and television broadcasts; “Enchanted Spirit” monthly calendar of events; “Trails and Treasures” quarterly newsletter; and “Food, Festivals and Fun” media promotional program.
 - E) participation in REDTT’s annual meeting.
 - F) the number of successful small and medium-sized festivals held throughout the REDTT service area, and, eventually, statewide.
 - G) REDTT’s visibility in and participation with the NMSU College of Agriculture and Home Economics through greater participation in the annual All College Conference and other college programs and activities.
- b. Impacts
- A) more visitors to rural New Mexico.
 - B) more front-line tourism employees, managers and business-owners educated about local attractions and trained to increase visitor stays.
 - C) more local participation in county tourism councils.
 - D) greater attendance at REDTT annual meeting.
 - E) more New Mexico counties interested in joining REDTT and being asked to join.
 - F) greater awareness of the importance and value of tourism economically and culturally.

G) enhanced cooperation among tourism and agricultural entities at NMSU and statewide.

H) greater cooperation among tourism and promotional entities locally, regionally and statewide.

I) an increase in tourist spending locally, regionally and statewide.

c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact - State Specific

Youth Development/4-H- 4-H Youth Development

a. By the year 2005, it is predicted that New Mexico will have nearly 400,000 young people that fall within 4-H ages. The world that these young people will encounter has many demands -- economically, socially, and technologically. The state's per capita income is \$17,088, 48th lowest in the nation. Unemployment is 6.3% with a poverty rate of 25.4%. New Mexico spends more per capita on welfare than any neighboring state except Arizona. There is a lack of well-paid, available jobs in many communities, both rural and urban. Young people often leave their own community or state in search of good jobs. The state is high in negative indicators socially crime, teen birth rate, and single parent families. In most families, both parent are employed outside the home, leaving children in day care. Older youth are often on their own during after school hours. Gang involvement and poor use of leisure time are often the result. In order to prepare NM youth to become knowledgeable, productive citizens, they must possess basic life skills. Four-H is a proven informal, hands-on Youth Development program that can help youth gain knowledge in job skills, consumer skills, money management, nutrition and health, life skills, personal and family development, and communication skills.

b. Impacts -Four-H youth will:

- Learn subject matter concepts through hands-on experiences, developing skills through project work, competitive events, real-life situations and career exploration opportunities.
- Practice informed decision-making when selecting consumer goods and agricultural products.
- Keep accurate project records which are submitted for project evaluation and completion.
- Speak at club, county, and community events strengthening communication and organization abilities as well as self-concept.
- Participate in club, county, district, state and national 4-H events that develop leadership, teamwork and citizenship potential.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Youth Development/4-H – 4-H Global Education

- a. As interdependence in the world becomes more evident, citizens need a better understanding of a wide range of social, economic and politically oriented international issues. Non formal education through the 4-H Youth Development Program in the area of global education can assist youth and adults to gain this understanding.
 - Global education can include, but is not limited to, 4-H exchange programs, 4-H Global Education projects, a global education component to any 4-H project, community service with a tie to global issues and global leadership.
 - New Mexico participates in the International Four H Youth Exchange (IFYE) Program, which includes opportunities for 4-H senior members and 4-H alumni up to age 30 to live with and learn from families in other countries. U.S. families host young adults from other countries during the summer/fall. Returning IFYE delegates deliver programs to 4-H clubs/groups about their cultural exchange to broaden the outreach and increase the impact of their individual experiences.
 - 4-H Global Education curriculum is limited; one unit is available through National 4-H Supply Service.
 - Global Education resource materials are available from the State 4-H Specialist upon request.
 - Through 2001 the State 4-H Specialist serves on the National IFYE Association of the U.S.A. Board of Directors, which conducts the IFYE Representative and Ambassador programs.
- b. Impacts - Participants in 4-H Global Education will possess positive global attitudes and skills that enhance mutual understanding and acceptance.
 - Participants in 4-H Global Education will appreciate the similarities and differences within their own family, and between U.S. families and families around the world.
 - Participants in 4-H Global Education will have an increased understanding about the world's peoples and their interrelationships.
 - Participants in 4-H Global Education will make connections that help create a world of cooperation, understanding and friendships.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Youth Development/4-H - Natural Resource Management

- a. New Mexico is the fifth largest state in the nation, and 46% of the land is state or federally owned. Agriculture is a major economic activity of the state and is highly dependent on the leasing of public lands. Because of the arid climate, the most critical of all natural resources affected by population growth and agriculture is water. Young

people are the environmental stewards of tomorrow. They need to be introduced to and taught the importance of environmental stewardship, through unbiased experimental learning opportunities.

- b. Impacts -50% of youth participating in natural resource and water quality programs will be able to share their attitudes on how their consumption of water has changed. Club leaders involved in leading natural resource and water quality programs will involve their clubs in some type of activity during the year that focuses on natural resource management.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Youth Development/4-H - Visibility & Image

- a. 4-H is a program offering many opportunities for youth. There are individuals who don't see 4-H as the broad program that it is, as indicated by comments stated in recent focus group studies conducted October through December, 1994. Images included viewing 4-H as an agriculturally-oriented youth organization for children who live on farms or ranches. Four-H's non-traditional programs were not common knowledge to the individuals in the focus groups. The focus group's summary for the 4-H image recommended the need for an effort to change the heavily agricultural image of 4-H to make 4-H appealing to more youth.
- b. Impacts - Four-H awareness will increase among New Mexico audiences as a result of various marketing tools. New Mexico audiences will be able to choose from a broad array of 4-H opportunities. Positive attitudes toward 4-H will result in increased enrollment.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Youth Development/4-H - School Enrichment

- a. New Mexico schools offer an audience for 4-H programming. Teachers, once informed about 4-H curricula, are often delighted with the quality and quantity of 4-H Youth Development programs, according to agent feedback.
 - With the growing demand for experiential curricula and limited school resources to fill that demand, 4-H is a logical resource and partner for schools.
- b. Impacts - Teachers fulfilling one or more "essential competencies" through the use of 4-H curriculum.
 - Children gaining at least one new fact or health, social, science skill through an experiential 4-H school enrichment program.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Management Goals

Information Technologies – Distance Education Delivery System

- a. Today, having "research-based answers" is no longer enough to hold the American public's attention. The channel or method used to provide those answers also has a dramatic impact on the usefulness of the information or educational effort for the target audience. Serving the needs of our state's population also requires delivery of multi-lingual materials. In addition, we often need to deliver the same basic message at several different levels of complexity, from a general overview for youth or non-technical audiences to highly detailed, technical reports for scientists and industry.

Dramatic changes in the dissemination tools and information technologies will have a direct impact on Extension's efforts to disseminate educational efforts, whether to technical clientele or "the general public." It is important to stress that this Program Plan will be an "educational message delivery system" available for meet the needs of any subject matter effort.

- b. Impacts - In result of this distance education effort, 40,000 citizens will receive educational services from NMSU in remote locations.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Institutional Engagement--Staff Development

- a. Formal instruction supplemented by on-the-job experiences is necessary in organizations where individuals are expected to solve problems, work as contributing members of a team, and direct their own work. Regular training of NMSU Extension employees is necessary to anticipate the current and future educational needs of New Mexico's Extension clientele. Therefore, an on-going staff development and training process will be implemented to enhance the knowledge, skills, and abilities of NMSU Extension Employees.
- b. Impacts -Formal instruction supplemented by on-the-job experiences is necessary in organizations where individuals are expected to solve problems, work as contributing members of a team, and direct their own work. Regular training of NMSU Extension employees is necessary to anticipate the current and future educational needs of New Mexico's Extension clientele. Therefore, an on-going staff development and training process will be implemented to enhance the knowledge, skills, and abilities of NMSU

Extension Employees.

- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Multicultural and Diversity Issues--Affirmative Action in Extension Prog.

- a. Title VI of the Civil Rights Act of 1964 mandates that New Mexico State University's Cooperative Extension Service makes available all of its programs to "all" of the citizens for New Mexico. In light of political and fiscal constraints, documented efforts to ensure that Extension programs are available to "all" Extension faculty in New Mexico had made 581, 697 clientele contacts. Specifically, this figure indicates that Extension faculty had contracted 34% of New Mexico's population (1997).
- b. Impacts -Advisory Committees throughout the state will more closely reflect the baseline characteristics of respective counties. Representation by under-represented groups in Extension programs will increase by 25% over the next five years.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Development of Culturally Sensitive Educational Materials--Development of Culturally Sensitive Educational Materials

- a. New Mexico is one of the only "Minority Majority" states in the nation (meaning the majority of our state's population is from ethnic groups considered "minority" in the rest of the nation.) This gives NMSU a unique opportunity among all Land Grant institutions and Extension Services, to give significant attention to special interests or concerns of multilingual populations. While meeting the needs of our own populations, NMSU can also serve as an educational model and supplier to the rest of the nation for Spanish and Navajo materials.
By the year 2020, one-half of the nation's school children will be non-European American, and one-quarter will be Hispanic. Some predict this national "minority majority" in schools will occur within the next decade. Many existing curricula and library resources are inappropriate for today's and tomorrow's student population and are often in direct conflict with these students' cultural background and community life.
- b. Impacts - Extension educators will have the capability to prepare and present electronic materials to meet the educational needs of their multicultural (primarily Hispanic and Navajo) audiences not formally involved in Extension programs.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ)

B. Stakeholder Input

The New Mexico Agricultural Experiment Station received input regarding research priorities from the following stakeholder groups: agricultural science center advisory boards during their regularly scheduled quarterly meetings, interim state legislative committees, general public during field days at the off-campus agricultural science centers, and various commodity commissions listed in the New Mexico State University 5-Year Plan of Work (1999). The Agricultural Experiment Station also received guidance from the New Mexico Extension Support Council, which represents the county constituency from across the state, during their annual meeting as well as during the College of Agriculture and Home Economics All-College Conference.

In addition to the New Mexico Extension Support Council, a large and diverse group of stakeholders are regularly involved in helping the Cooperative Extension Service plan for the future. Across the state, more than 1,500 people serve on local county advisory committees, over fifty people serve on the statewide Extension Support Council and over five hundred producers, commodity group members, and community organizations contribute directly to the Cooperative Extension Services' planned program directions.

C. Program Review Process

There have been no significant changes in the program review process for either the New Mexico Agricultural Experiment Station or the New Mexico Cooperative Extension Service.

D. Evaluation of the Success of Multi and Joint Activities

The multistate, multi-institutional, and multidisciplinary activities, joint research and extension activities carried out by the New Mexico Agricultural Experiment Station and the New Mexico Cooperative Extension Service addressed the critical issues of strategic importance as listed in the 5-Year Plan of Work submitted July 1999, including issues identified by our stakeholders. The planned programs addressed the needs of under-served and under-represented populations in New Mexico. For example, the Tri-State Navajo Project addresses sustainable agriculture issues facing the Navajo Nation in New Mexico, Arizona, and Colorado. For most programs, it is too soon to determine whether expected outcomes and impacts will be achieved. Although we believe that the programs will result in improved program effectiveness or efficiency, we do not yet have sufficient program data to determine the degree of effectiveness/efficiency being achieved.

E. Multistate Extension Activities

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Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)**

Institution New Mexico State University
State New Mexico

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

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
<u>Tri-State Navajo Program</u>	<u>14,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Economic Cluster Study</u>	<u>15,595</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Invasive Noxious Weeds</u>	<u>18,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Environmental Manure Management</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>U.S. Forest Service EIS</u>	<u>9,651</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Navajo Nutrition Project</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Volunteer Recruitment Video</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Navajo Beef Quality Assurance Video</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Pecan Nut Management</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Dairy</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Volunteer Development</u>	<u>5,000</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Total	<u>(over)</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Director **Date**

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Institution New Mexico State University
 State New Mexico

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

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Socio/Economic Impacts of Public Lands	_5,000_				
Financial Management	_12,000_				
Total	_109,246_				

Director **Date**

Tri-State Navajo Project

The land and the livestock are the Navajo's lifeline—a lifeline that is becoming more and more tenuous. The majority of farms on the Navajo Nation lack modern irrigation improvements and operate with unlined ditches. Livestock may move freely through these ditch areas, damaging the ditches, causing water loss, and leaving animal waste in the ditches which may then be carried to the family's vegetable land traditional white corn plot. The majority of these vegetables and corn harvest is either consumed by these families or fed to their livestock. There are food safety and water quality issues that need special attention on these small farm/livestock operations.

Program objectives include improving the safety of home produced foods, integrating pest management practices Navajo small farm and livestock operations and, improving small farm management and increasing the viability and sustainability of individual Navajo agriculture operations. This project is targeting more than 600 Navajo sheep and cattle producers, and over 700 Navajo small farmers, pesticide users and residents on the Navajo Nation. The Nation is located in the "Four Corners" where Arizona, New Mexico, Colorado, and Utah converge. Some 30,000 dwellings, the homes of 202,000 residents, dot the stark windswept landscape.

Through this program significant improvements in food production will be seen, including safer home butchering techniques and safer utilization of pesticides on animal and plant crops. New techniques for integrated pest management will be adapted and new management practices will be employed to increase the potential for sustainability of individual Navajo agriculture operations. To date, a *Navajo Beef Assurance video* is in the final stages of production, several nutrition and food safety workshops and videos have been introduced and partnerships have been expanded through the involvement of Arizona and New Mexico Extension agents.

Economic Cluster Study

The Economic Cluster Project has two components: a contract with the NM Economic Development Department, and a national group to further refine the methodology used in the cluster project. The contract with the state Economic Development Department was completed in July 2000 and the reports were delivered to the target communities. The national group, TRED (Targeted Rural Economic Development) is providing a consensus on research and outreach procedures for targeted and clustered economic development programs. The results enable the community and state economic development entities to focus development actions on viable economic clusters. Multi-state partners are Missouri, Montana, Nevada, Oklahoma, South Carolina, and Utah.

E-Commerce Project

The E-Commerce, or Teleliteracy ABC's project is the model for a Western Region video and educational program on electronic commerce. NMSU Extension is developing seminar content and materials and coordinating a coalition of participating academic and technical institutions. The project aims to raise awareness among local businesses and governments about the growing "digital divide" between urban and rural areas and the need to bridge that gap. It will offer participants basic tools to independently take advantage of e-commerce and e-government

opportunities. The program emphasizes Internet use as the only viable method to effectively integrate rural communities into the emerging global economy, and they are stressing the urgency of acting immediately. States directly involved in the project include Colorado, Utah, Wyoming, and Oregon.

Invasive Weed and Brush Control Management Programs

The New Mexico State University Invasive Weed and Brush Control Management programs are coordinated with management efforts in Arizona, Colorado, Idaho, Montana and Texas. The passage of the Noxious Weed Law in the 1998 legislative session signaled an increased awareness to this issue. Recently, data has shown that lands in the west are being taken over by these species at the rate of 200 acres/hour. Awareness, education, and management are the key components in addressing this problem. State-of-the-art management information and recommendations are provided to weed management groups, state and federal land management agencies and private producers in public meetings, training sessions and field trips.

Invasive brush and weeds are found in every county of the state and they are a serious problem on New Mexico rangeland. The purpose of this program is to demonstrate the most efficacious methods of controlling and managing noxious brush and weeds on rangeland. Historically, 135 demonstration-research trials have been in place throughout New Mexico. These trials are installed at the request of county Extension faculty, producers, governmental agencies or agribusiness. Each trial demonstrates control of a specific species of brush or weed. Control measures are usually mechanical, chemical, biological or a combination of methods. Annually, all trials in place less than four years are evaluated to determine target species control and subsequent forage response. Data are then used as the basis for recommendations in educational programs.

These non-native plant species are impacting the southwest through increased production costs, reduced land values, elimination of biodiversity, reduced recreational opportunities, and a general reduction in state revenue. This issue impacts all citizens in the southwest, not just the agricultural producer.

Environmental Manure Management

As part of the Clean Water Action Plan (1998), the USDA and EPA developed a Unified National Strategy to minimize ground water contamination from animal feeding operations. Concentrated animal feeding exists if more than 700 cows are confined at one location and there is the potential to contaminate a water source (i.e., groundwater, lake, or stream). Operations are being required to develop a comprehensive nutrient management plan (CNMP) which includes nutritional management of animals, waste management and other requirements to remain in compliance. The extension dairy program transfers updated material concerning new regulations/guidelines to producers, as well as assists with developing a CNMP for individual operations. The dairy specialist is also working with NRCS personnel to implement these regulations.

The goal of this program is to educate people on how to assess and improve soil quality in arid regions typical of New Mexico. The most important piece of the educational program is to teach

people the meaning behind soil salinity and nutrient issues in crop growth, remediation of agricultural and state lands, and the enhancement or protection of natural resources such as soil, water, and air. Management, technology, and chemistry are being combined to protect and utilize our resources more effectively and productively with the help of some of the state's most progressive growers.

While soil salinity is not currently perceived as a problem in the Mesilla Valley and other agricultural regions of New Mexico, increased demands on limited water supplies is beginning to require more careful management of irrigation water and soil amendments to prevent salinization. Utilizing dairy wastes as soil amendments on cropland may improve soil quality and increase yields if salinity is controlled or managed effectively. Greenhouse and field studies will be conducted using a variety of crops, soil amendments, and evaluation techniques. Field days will provide growers opportunities to see comprehend benefits firsthand. The multistate portion of this program involves bringing to New Mexico scientists and Extension educators to help educate and analysis greenhouse and field study data.

US Forest Service EIS

This project uses input/output models to develop and analyze investments in New Mexico's economic sectors. This allows construction of state alternatives to Bureau of Land Management (BLM) rangeland reform. Research results from this project also are used in a statewide Environmental Impact Statement (EIS) to build a baseline of how the state was in 1999 and how various policy changes would affect the state's economy by individual sectors and by counties. This project provides the only human deminsion to Environmental Impact Statements in the country. It is state of the art modeling that incorporates tradition, custom, and heritage into an EIS. The U.S. Forest Service asked NMSU to conduct the EIS for its Region 3 (Arizona and New Mexico).

Navajo Nutrition Project

People need educational programs on good nutrition and healthy living. However, in New Mexico and surrounding states English-only tapes will not fill the needs of our multicultural populations. Therefore, over 30 multilingual video and computer-based educational programs have been prepared over the past several years to be used by the Cooperative Extension Service and cooperating agencies. Most of these materials are available in both English and Spanish with many also available in Navajo.

A few programs are available only in Spanish or in a mixed Spanish/English presentation. Spanish, English and/or Navajo videos have been produced on topics including label reading, quick and nutritious meals, using the food guide pyramid, attitudes towards food, shopping for food, nutrition for seniors, food safety, cooking with kids, healthy lifestyle choices, and nutrition and diabetes. Food safety videos (aimed at the home child care business and food processing industry) and nutrition education computer programs and videos (ideal for the waiting room mom or dad) provide practical hints for life long healthful nutrition. Videos and computer programs are evaluated for effectiveness with the target populations. Viewers and users of food and nutrition multimedia report they enjoy using the products. Furthermore, a majority of users

indicate plans to improve their nutrition and food safety practices as a result of watching the videos or using the computer program.

These tapes address some of the most critical nutritional health needs of the Southwest's multicultural population, including diabetes, obesity, and poor eating habits among teenage mothers and their babies. Through providing culturally sensitive and multilingual educational programs, we believe the overall health of Southwest populations will improve. Dissemination is also underway on a national basis through allied agencies as well as through two commercial catalogues. New Mexico can also impact the nation as one of the few sources of research-based, non-biased multilingual materials of this type. There is overwhelming evidence that the demographics of New Mexico's schools preview national demographics within the next 20 years. Multistate cooperation is with Arizona on the Navajo Nation.

Navajo Beef Quality Assurance Video Project

One portion of the Tri-State Navajo Project is the development of a Navajo/English video that explains steps to insuring Navajo ranchers marketable beef cattle. Over the past year, Arizona and New Mexico Extension faculty have been developing a comprehensive video that explains the necessary steps to raising quality meat cattle and preparing them for market. The video is projected to be completed in July 2001.

Pecan/Nut Management

Commercial nut production is a large industry in many of the southern and southwestern states including New Mexico. Growers need to keep abreast of new, or improved techniques in order to manage their orchards and make a profit. Coordinating and maximizing use of orchard inputs helps growers to be selective in their orchard practices, choosing those that can help them to obtain optimum yields with less cost.

The major educational forum is the annual western pecan conference held in New Mexico for growers from Texas, Arizona, California, and New Mexico. Around 700 people participate in conference events. Other educational sessions throughout the year include field days, short courses, workshops and distribution of timely publications including a monthly column for a California magazine. Even though Texas and New Mexico share frequently on nut management efforts scheduled activities benefit everyone growing pecans/nuts in the southwestern region (West Texas, Arizona, California, and New Mexico).

Improving Dairy Practices

The New Mexico State University Dairy Program has collaborated with several College of Agriculture and Home Economic departments and science centers including the Department of Animal and Range Sciences, Extension Home Economics Department, Artesia Agricultural Science Center, and Tucumcari Agricultural Science Center. The dairy program covers a wide range of aspects related to dairy farming and production. Information dissemination takes place through extension demonstration projects, experimental research projects and college courses pertaining to dairy science. Multi-state collaboration was established between the NMSU Dairy

Program and Arizona, Oklahoma, Texas, and California. These multi-state ventures included production management workshops, extension fact sheets and monthly newsletters.

Western Region Volunteer Development and Leaders' Forum

Adult volunteers provide a significant amount of direct contact with 4-H youth and are essential partners in the 4-H Youth Development Program for maintaining and expanding the New Mexico 4-H program. Four-H volunteer leaders must be recruited, selected, oriented, trained, supervised, evaluated and recognized for a sustaining volunteer program to exist. An increasing number of adult 4-H volunteers are being empowered to assume roles that, in the past, have been filled by Extension 4-H faculty and staff: This allows for more outreach to under-served youth audiences, the addition of new 4-H projects or activities and the on-going development of unpaid and paid 4-H staff.

Increased retention of volunteers is a challenge. Adult leaders need options of how and when to be involved, as their priorities regarding volunteer, personal and work commitments change over time. Volunteer leaders need orientation and education about the organizational structure of 4-H, 4-H delivery modes, affirmative action requirements, risk management efforts, enrollment procedures, youth protection standards, youth friendly attitudes, leadership styles, leadership roles, 4-H projects, and local, state, national and international 4-H opportunities. Adult 4-H leader enrollment in New Mexico declined by over 500 in the 1998-1999 program year. The 4-H Volunteer Specialist is focusing on bringing volunteer development resources to counties. A 4-H volunteer recruitment video has been provided to each county office along with printed volunteer resources. New Mexico is a member of the western region marketing committee which studies the issue of volunteer recruitment and is currently collaborating with western states serving on that committee.

Socio/Economic Impact of Public Lands

Public land management continues to be controversial throughout the West. Both traditional and nontraditional public land users have concerns about current and proposed management of these lands. This project focuses on lands managed by the Bureau of Land Management (BLM) and the U.S. Forest Service for domestic livestock grazing. Public policies related to traditional uses, such as grazing, have impacts on those users as well as on the local communities they live in. Analysts have focused on local impacts for many years, but there has not been a concerted effort to address the local and regional impacts using common methodologies. This project is developing common methodologies for analyzing the economic and social impacts of applying public land grazing policies. Impacts to ranchers, communities, and local economies are being considered. The common methodologies are widely applicable for assessing other resource use demands on public lands, such as timber, mining, recreation, and water quality. We are analyzing the impacts of selected land use policies identified through scenario analysis and by evolving policy in progress. We are applying the economic models to new BLM standards for rangeland health and guidelines for grazing management using these methodologies and conducting public policy education activities in the areas analyzed. Extension efforts are being coordinated across six western states (New Mexico, Nevada, Oregon, Idaho, Utah, and Wyoming).

New Mexico Money 2000

Money 2000 is a national extension initiative to encourage individuals and families to set goals to reduce debt and/or increase savings. The program in New Mexico consists of a bi-monthly newsletter mailed to just over 350 participants. Participant evaluations report sixty-nine participants have saved \$108,110.62 for an average savings of about \$1,500 per participant. Forty-four participants have reduced debt \$144,056.34 for an average debt reduction of about \$3300 per participant. As of December 2000, twenty-nine states reported 13,338 participants reported increased savings of \$10, 618,271 since the beginning of the program providing participants with a cumulative decreased debt of \$8,247,219. (It's been reported that states have joined at various times from 1995 to the present.)

Indoor Air Quality

Many households are effected by poor indoor air quality in their homes. Educational programs on Radon, Indoor Air Quality and Second Hand Smoke are provided to New Mexico families. In addition, training for agents and other agencies networking with Extension are provided trainings in these areas upon request. The most widely requested program, Second Hand Smoke, has been presented at child care facilities to over 300 participants in the past year. The New Mexico Indoor Air Quality program is part of a national Extension program effort offered in nearly all states.

Financial Management

Wise financial management practices enhance the economic stability of a family, a state, a nation. How families use their money-whether they spend it or save it-affects the total economic picture of the nation. Educational programs that provide basic family resource management and financial planning are important to the well-being of New Mexicans. The Cooperative Extension Service seeks to provide programs that will assist New Mexicans, both youth and adults, in developing effective money management skills and sound consumer habits. Women's Financial Information Program cosponsored New Mexico Extension and AARP was offered in several localities around the state until AARP discontinued their participation in December 2000. This program encourages women to take responsibility for their financial management and is offered in many states.

The high school financial management program was used in twenty-seven New Mexico high schools and reached approximately 2025 students. Nationally the program was offered in all 50 states and the District of Columbia in 819 schools reaching over 63,000 students.

F. Integrated Research and Extension Activities

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Institution New Mexico State University
State New Mexico

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

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
<u>Agricultural Economics</u>	<u>7,392</u>				
<u>Nutrient Management</u>	<u>3,454</u>				
<u>Pest Management of Cotton</u>	<u>3,454</u>				
<u>Pecan Nut Development</u>	<u>1,796</u>				
<u>Forage Fiber Tradeoff – Piñon-Juniper Woodlands</u>	<u>6,908</u>				
<u>Integrated Weed Management for NM Rangeland</u>	<u>6,217</u>				
<u>Costs & Returns for Crops & Livestock</u>	<u>4,836</u>				
<u>Risk Management in Ag. & Natural Resources</u>	<u>6,217</u>				
<u>Vegetable Production</u>	<u>1,589</u>				
<u>Turfgrass, Soil, Water</u>	<u>1,658</u>				
<u>Dairy Production</u>	<u>1,243</u>				
Total	<u>44,764</u>				

Director

Date

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

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Riparian Management	2,556				
Systematic & Floristic Studies of SW Plants	6,217				
Cattle IPM	7,599				
Biological Control of Rangeland Weeds	6,908				
Food Safety	1,036				
Total	69,080				

Director **Date**

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State New Mexico

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 Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
<u>Range Improvement Task Force</u>	<u>20,450</u>	_____	_____	_____	_____
<u>Systematic & Floristic Studies of SW Plants</u>	<u>2,727</u>	_____	_____	_____	_____
<u>Peanut Research</u>	<u>10,452</u>	_____	_____	_____	_____
<u>Riparian Management</u>	<u>9,089</u>	_____	_____	_____	_____
<u>Vegetable Production</u>	<u>11,361</u>	_____	_____	_____	_____
<u>Soil, Water Pesticide Issues</u>	<u>5,908</u>	_____	_____	_____	_____
<u>Integrated Media Projects</u>	<u>58,623</u>	_____	_____	_____	_____
<u>Economics Risk Management</u>	<u>5,226</u>	_____	_____	_____	_____
<u>Brush and Weed Management</u>	<u>12,951</u>	_____	_____	_____	_____
<u>Integrated Pest Mangement</u>	<u>9,089</u>	_____	_____	_____	_____
<u>Food Safety</u>	<u>9,089</u>	_____	_____	_____	_____
Total	<u>154,965</u>	_____	_____	_____	_____

Director

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 Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
<u>Water Quality</u>	<u>6,817</u>				
<u>Pecans Nut Development</u>	<u>12,724</u>				
<u>Turfgrass, Soil, Water</u>	<u>11,361</u>				
<u>Costs & Returns for Crops & Livestock</u>	<u>8,180</u>				
<u>Excess Property</u>	<u>6,817</u>				
<u>Dairy</u>	<u>11,361</u>				
<u>Soil, Water, and Ag. Productivity</u>	<u>3,636</u>				
<u>Agricultural Economics</u>	<u>8,407</u>				
<u>Food Safety and Nutrition</u>	<u>2,954</u>				
Total	<u>227,222</u>				

Director **Date**

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Descriptions of Integrated Research and Extension Activities

Costs and Returns of Crop and Selected Livestock Enterprises in New Mexico

There is a definite need to examine the effect of costs and returns of crop and livestock enterprises on the structure of New Mexico farms and ranches and the resulting response to conservation policies, commodity programs, chemical restrictions (such as EPA Section 18 applications), water quality, and quantity problems, and other national and state policy concerns. This project draws on the combined expertise of all County Extension Agents, many state Cooperative Extension Service specialists, and many Agricultural Experiment Station researchers. We have successfully drawn on this combined expertise of the College each year over the last 15 years to publish a projected set of cost and return estimates as a Cooperative Extension Service release and an actual (after actual yields and prices have been established) set as an Agricultural Experiment Station research report.

Research–Extension Continuum for Soil, Water and Agricultural Productivity

The Agricultural Science Center at Farmington is located in the driest portion of New Mexico. Demand on water resources is great and increasing. Diverse groups, including rural, urban, municipal, industrial, Native American, and agricultural, have vested interests in water use. Approximately 60% of the surface water exiting New Mexico is within this system and downstream groups are also demanding their allotment of the river. For agriculture to continue in the Four Corners region and the rest of the State, management strategies and crop species must be found that more efficiently use this valuable resource. To address the conservation of soil and water in this semi-arid environment, a research project has been established to investigate subsurface drip irrigation (SDI) for several economically viable crops. The increased efficiency of SDI has translated into increased crop productivity. The Navajo Agricultural Products Industry has requested the Center to use the research results of this project to develop plans for the transition of abandoned rectangular side roll fields into productive SDI fields for high value crops. A Diné College (1994 Land-Grant Institution) demonstration farm is being developed in Shiprock, NM. The Center has been requested to provide input into the design of the proposed irrigation system, a sizable component of which is drip. Orchard managers and urban horticultural enthusiasts have requested the Center for advice on low water application technologies. These technologies will be included in an irrigation workshop for farmers, ranchers, and other interested parties from the Four Corners region. The workshop is the second in a series of collaborative irrigation workshops being organized by Colorado State University, Utah State University, the University of Arizona, and New Mexico State University. Such activities are the deliberate streaming of information along the research – extension continuum. This Soil, Water and Agricultural Productivity project is designed to facilitate this sort of information exchange.

Food Safety

Our Food Scientist established testing facilities at NMSU to examine food products for factors affecting their safety and stability. Included in the testing procedures are microbiological analyses including the standard plate count, yeast and mold counts, coliform determinations and

E. coli determinations. Water activity and pH are two other characteristics of foods that are tested at the Extension Food Technology Laboratory. The results of the testing provides information that can establish whether certain food items are being processed safely or not.

Biological Control of Rangeland Weeds

This is an AES/CES project to demonstrate that inundative biological control with *Aphthona* flea beetles can be used as a tool for eliminating small isolated populations of a noxious weed: leafy spurge (*Euphorbia esula* L.). By using early intervention techniques we hope to prevent the spread of leafy spurge, which could potentially become a serious problem impacting at least 50,000 ha in New Mexico alone. Knowledge gained from this project will be shared with the scientific community, the extension community, and private landowners. The primary beneficiaries of our efforts are landowners. Tours were conducted at each location throughout the lifetime of the project. Landowner involvement ensures there is producer-to-producer information exchange. Information on the projects outcome was disseminated through radio interviews, the popular farm press, scientific journal articles, and other means. The Extension State Weed Scientist organizes an annual noxious weed short course and provides talks to interested producers and land managers from New Mexico and surrounding states (Colorado, Arizona, Utah). The PIs gave presentations at many different venues, including the New Mexico Vegetation Management Association annual meetings, Native Plants Society meetings, garden clubs, county agent training sessions, and New Mexico Soil and Water Conservation Districts annual meetings.

Brush and Weed Management

Noxious brush and weeds are found in every county of the state and are a serious problem on New Mexico rangeland. data has shown that lands in the West are being taken over by these species at the rate of 200 acres/hour. The purpose of this program is to demonstrate the most efficacious methods of controlling end managing noxious brush and weeds on rangeland. Historically, 135 demonstration/research trials have been in place throughout New Mexico. These trials are installed at the request of county Extension faculty, producers, governmental agencies, or agribusiness. Each trial demonstrates control of a specific species of brush. Control measures are usually mechanical, chemical, biological, or a combination of methods. Annually, all trials in place less than four years are evaluated to determine target species control and subsequent forage response. Data are then used as the basis for recommendations in educational programs. Awareness, education, and management are the key components in addressing this problem. These non-native plant species are impacting our state through increased production costs, reduced land values, elimination of biodiversity, reduced recreational opportunities, and a general reduction in state revenue. This issue impacts all citizens of the state, not just the agricultural producer.

Pecan/Nut Development

Commercial nut production involves pecans and pistachios. Growers need to keep abreast of new or improved techniques to manage their orchards better. Coordinating and maximizing use of orchard inputs helps growers to be more selective in their orchard practices, choosing those that

could help them to obtain optimum yields with less cost.

Improving Dairy Practices

The Improving Dairy Practices program focuses on increasing efficiency of both human and animal production. Information is offered to producers through constant update of the website, newsletter, publications, and one-on-one communication. Workshops pertaining to employee management, reproduction efficiency, heat stress, milk quality issues, fitting/showing for 4-H heifer projects, and other pertinent topics are conducted in four general locations throughout the state: south of Albuquerque, Las Cruces area, and two sites in eastern New Mexico. Opportunities for interested students to acquire further knowledge of the dairy industry through distance education and internship programs exist through the extension dairy program.

Agricultural Economics

Wise financial management practices enhance the economic stability of families. How families use their money—whether they spend it or save it—affects the total economic picture of the nation. Educational programs that provide basic family resource management and financial planning are important to the well-being of New Mexicans. The Cooperative Extension Service seeks to provide research-based programs that will assist New Mexicans, both youth and adults, in developing effective money management skills and sound consumer habits. Management of time and other resources are also topics of educational programs.

Vegetable Production

The vegetable production program at NMSU integrates AES and CES functions. The target clientele is commercial vegetable producers. The focus is on drip irrigation, fertilizer use, pest management, and varieties. Some of the recent AES activities have been a field experiment on the effect of planting date and fungicide treatment on stand establishment of chile pepper at Leyendecker Agricultural Science Center and Pumpkin cultivar trials at Leyendecker and Artesia Agricultural Science Centers. Examples of recent extension activities include an on-farm demonstration of drip irrigation at the Rincon Farm of Marty Franzoy and a short course on drip irrigation on November 9, 2000, that attracted 130 participants.

Pest Management of Cotton

The needs of extension clientele drive this research program. Over the past five years we have had research/extension programs that have addressed one of our most immediate problems—boll weevil establishment in New Mexico. We have operated monitoring programs in conjunction with, and funded by grower organizations, to detect early infestations as well as migration lines to determine the source of infestation. At the same time we conducted research trials that would develop pest management tools to suppress and help eradicate boll weevil. Boll weevil establishment and control in New Mexico is different than in other areas of the cotton belt that are more humid. We found, for example, from both our extension monitoring program and our research program that overwintering habitat particularly in urban areas had a major influence on the success of boll weevil establishment and subsequent yield losses. Implementing the resulting

recommendations for weed control and delayed planting saved farmers in south Eddy county over \$50/acre in 1998 alone.

A number of cultural techniques were tested that proved to be effective in boll weevil control that have also been recommended. We are also supporting eradication efforts by developing techniques that will save programs Beltwide money, for example in developing better boll weevil traps and in testing experimental microencapsulated formulations that may reduce application intervals in half potentially saving cotton farmers in eradication zones over \$30 million per year.

Systematic and Floristic Studies of Southwestern Plants

This project continued plant identification services, as well as providing information about range plants and plant toxicity upon request. The PI edited the “The New Mexico Botanist” newsletter; four issues appearing, compiled and maintained “A Working Index of New Mexico Vascular Plant Names” on the web, maintained links to information sites about poisonous plants, copies of “The New Mexico Botanist” newsletter, and a list of identification sources for New Mexico plants, and presented plant identification workshops.

Integrated Media Projects

The NMSU Agricultural Communications Department does a number of media projects annually that integrate AES and CES functions. Recent projects include: Southwest Yard & Garden, a weekly statewide PBS program hosted by Extension faculty and often featuring AES scientists and their research; a chile video depicted mechanical harvesting research and Extension efforts to disseminate new information; and a pesticide how-to video, which is an Extension outreach piece based in AES research. All people in New Mexico need educational programs on good nutrition and healthy living. English-only tapes will not fill the needs of our multicultural population. Therefore, over 30 multilingual video and computer-based educational programs have been prepared over the past several years to be used by the Agricultural Experiment Station, Cooperative Extension Service, and cooperating agencies. Most of these materials are available in both English and Spanish with many also available in Navajo. A few programs are available only in Spanish or in a mixed Spanish/English presentation.

Turfgrass, Water Quality, and Soil and Water Conservation

There are numerous places throughout the state that are covered by Turfgrass and require management strategies to achieve and maintain optimum quality. There are approximately 90 golf courses in New Mexico, numerous athletic fields (baseball, soccer, football fields), and parks and home lawns. Water is the biggest concern in turf management as quantity and quality can rarely be maximized for optimum growth and maintenance. Especially for athletic fields, such as high school football fields, the resources are not readily available to provide adequate turfgrass maintenance. Therefore, the conditions on these fields range from very poor to average. Homeowners spend a great deal of time and resources to achieve the perfect looking lawn and are often prevented from reaching their goals because of water quality, quantity, and species selection. Golf courses range in quality from the top fifteen nationwide for public golf courses to poor quality due to water restrictions.

Nutrient Management

Plant nutrients are found in both synthetic and organic materials such as farmyard manure and composts. Animal feeding operations in New Mexico have increased since 1982 resulting in a 56,000 head increase in dairy cows alone. Commensurate with this increase is increased manure production that can be utilized for crop production. However, repeated and excessive applications of manure to cropland can cause nutrients to buildup and cause negative environmental and livestock health implications. Unique soil properties found in New Mexico offer some degree of protection against many of problems found in the eastern U.S. However, permits issued to animal feeding operations require some form of tracking and accounting for the nutrients applied to cropland. Nutrient management is a best management practice suitable to all persons utilizing the land for economic plant production. Managing nutrients for sufficient plant growth, animal nutrition, and environmental compatibility will assure a safe and reliable source of food and fiber in New Mexico. Additionally, proper nutrient management practices will maintain economic viability of New Mexico's cropland and livestock producers.

Riparian Management

During FY 1999–2000, the New Mexico State University Riparian Management Program participated in state- and regional-level activities incorporating both AES and CES missions. At the state level, the NMSU Riparian Management Program conducted AES-sponsored research and transferred information via CES programs regarding sustainable management of livestock in southwestern riparian ecosystems. Audiences included state and federal management agencies, State and County Faculty in the Cooperative Extension Service, and private producers through public meetings, training workshops, and field trips. At a regional level, the NMSU Riparian Management Program collaborated with faculty, specialists, and administration representatives to explore cooperative research and outreach funding in Arizona, Montana, and Utah, among others. Research and outreach topics focused on landscape-level watershed, riparian, and wetland management.

Integrated Pest Management

Ranked by annual cash receipts, alfalfa, chile, pecan nuts, various fruit (apple, cherry, grape) greenhouse/nursery crops, cotton, corn and small grains are the leading plant crops for New Mexico producers. The boll weevil, pink bollworm, cotton bollworm and cotton aphids resistant to various insecticides have become key pests for the state's cotton crop; while genetically engineered cotton cultivars are now available to the state's producers, the added *Bacillus thuringiensis* genes protect the developing bolls only to a point from caterpillar problems. Alfalfa weevil, three species of aphids, and occasional caterpillars continue to plague the alfalfa crop; cyclic populations of grasshoppers and blister beetles cause occasional crop losses and, in the case of blister beetles, subject growers to legal liabilities and additional economic losses. Several species of aphids plus additional arthropods, diseases and weed pests are annual problems for corn, small grain, nut and fruit crop producers. In the last five years, European corn borer has been detected infesting corn in two additional counties (total now of seven infested New Mexico counties), karnal bunt-infested wheat seed has brought new regulations to the south-central part

of the state, sorghum ergot has invaded the milo fields of eastern New Mexico, and pecan nut casebearer has become well established in pecan groves and yard trees throughout Dona Ana County. Pepper weevils, various caterpillars and whiteflies are major threats to both the fresh and processed chile markets in the state. Chile and other vegetables generated over \$163 million in New Mexico farm income during 1997; over 1 million acres of these crops are irrigated.

Approximately 70 million acres in the state are devoted to livestock grazing; nearly 10 million acres of non-federal land are forested. Range caterpillars, grasshoppers, and various forest pests (bark beetles, tussock moths, mistletoes, etc.) are periodic pests in these rangeland or forested areas; in addition, invasive, exotic weeds (musk thistle, various knapweeds, yellow star thistle, etc.) are continuing to spread in various parts of the state, out-competing native plants and replacing them with less desirable, less palatable and even toxic species for livestock and wildlife.

Of the approximately 1.5 million people in the state, nearly 75% live in urban centers with 2500 or more people. Consequently, pests of urban ornamentals affect the greater percentage of clientele. Surveys continue to indicate severe over-reliance on commercial pesticides by homeowners and pest control operators to control major and nuisance pests in the state. Urban ornamentals and turf have been attacked by ash whitefly, ash bark beetle, tomato spotted wilt virus and other pests; on-going drought has further weakened landscape plants, making them more susceptible to an assortment of arthropods borers and defoliators. The nursery and greenhouse industries have been shaken by invasive red imported fire ants and Japanese beetles in Dona Ana and Bernalillo Counties, respectively.

An advisory group exists for the urban landscapes IPM program; various crop commodity groups for cotton, alfalfa and chile make suggestions for IPM programs in those commodities. New Mexico also participates in the USDA-APHIS-PPQ Cooperative Agricultural Pest Survey Program. Data from agricultural, rangeland and forest pest surveys are gathered and entered into the National Agricultural Pest Information System data base. The program documents the occurrence and movement of various pests within and between states and tracks exotic pests introduced from other countries.

Risk Management in Agriculture and Natural Resources

The risk that prices can move enough to cause major economic damage to agricultural producers has long been a significant problem. Likewise in the new era of deregulation, other industries such as finance, utilities and energy face the same risks that agriculture faces. Tools exist, such as futures, options, and swaps, that can help manage the risks of price changes and thus be helpful to industries. This project looks at each industry and the tools that can help provide economic benefits to those that choose to use them.

Range Improvement Task Force

The Range Improvement Task Force (RITF) seeks to extend the Agricultural Experiment Station and Cooperative Extension Service's efforts by investigating impacts to federal lands, focusing at the ranch-unit level. It provides objective information to ranchers and governmental policy

makers, and offers solutions to rangeland issues/disputes based on science. The RITF's only concern is the long-term health of rangeland.

Integrated Weed Management for New Mexico Rangelands

This project studies weed establishment, persistence, and interference within rangeland ecosystems by evaluating fire and herbicides in different seasons and application procedures to produce desired vegetation mosaic. The scientists are developing low-input, sustainable approaches utilizing integrated control methods to achieve desired vegetation response. This results are disseminated via Extension workshops.

Peanut Research Program

Peanuts are a mainstay cash income commodity for Eastern New Mexico. With approximately 18,000 acres and income of approximately \$15,000,000, peanuts average over \$800.00 per acre. This is the single largest income-producing crop for producers. As peanuts are sold primarily in shell, quality is a major factor related to price received. Maintaining this quality through control of diseases such as Web Blotch, Southern Blight, *Rizoctonia*, Pod Rot, Blackhull, and *Fusarium* becomes extremely important. The breeding program is also designed to maintain quality through development of disease resistant varieties. Other production variables include fertility management programs and irrigation. Drip irrigation studies relate to water consumption and lowering input costs. Four other projects for the year included herbicide studies for weed control. Other minor projects are conducted to evaluate control of early season insects such as thrips and worms. Late season insects include beet armyworm and grasshoppers. All of these programs focus on research-based information transferable to producers through publications, news media, field days, and quarterly meetings with the Peanut Research Board and annual meetings with the New Mexico Peanut Growers Association.

Water Quality

Population growth along New Mexico's river valleys is among the fastest in the nation, resulting in a greater demand for domestic use of surface and groundwater supplies. Conflicts between urban use and irrigated agriculture are becoming critical issues. Population concentrations along the rivers also threaten water quality by increasing pollutants from septic tanks, household hazardous waste, and lawn and garden practices. There is a general lack of knowledge about the impacts to water supplies from land use and waste disposal practices. Educational programs designed for Extension agents, the general public, municipal water and wastewater managers, and garden hobbyists will increase awareness of the need to conserve and protect water resources.

Food Safety and Nutrition

The value of agricultural food products can be significantly increased through food processing. Value-added food processing may generate a significant number of jobs in the state of New Mexico. Small farmers are raising more and more specialty crops, which lend themselves to unique food products. Many of these crops are taken out of the state as raw material for

processed products. These same products return to New Mexico's food markets as processed foods with high value. The added value of those products could significantly benefit the economy of New Mexico if they were processed in the state. If this is to occur, producers and processors need reliable information on basic food processing and product development. Safe food processing methods are essential for processors to be successful. This same safe food handling information is important to New Mexico's restaurant and tourism sector. Occasional outbreaks of food born illness give credence to the importance of directing food safety programs toward the food industry at all levels.

Forage Fiber Tradeoff — Piñon-Juniper Woodlands

The purpose of this project is to analyze the impacts of dispersed recreation on public lands to test whether income from recreation can offset losses of extractive industries (livestock grazing, timber, and mining). This project shows where and how industry (ranches) expenditure patterns affect the New Mexico economy by sectors.

Integrated Weed Management for NM Rangeland

This project's goal is to determine the relationship between changes in mesquite densities and soil textures and depths. Because of the native plant and animal changes occurring in the desert regions due to increasing human populations, natural reserves will be established to protect this fragile ecosystem from further development.

Excess Property

Excess federal property is identified and procured on behalf of both research and extension programs at New Mexico State University.