

**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
October 1, 2000 – September 30, 2001**

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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 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.

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 \$626,217 from Hatch Act and Animal Health appropriated funds. The number of full-time equivalents engaged in research for this goal was 19.0.

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. For chile peppers, efforts continue to develop high yielding paprika cultivars, rich in carotenoids that mature early maturity, have high dry matter content, desired pungency, and mechanical harvest traits. Also, researchers evaluated breeding material for plant habit, fruit detachment force, and fruit set characteristics that would facilitate mechanical harvesting. Advanced breeding lines of paprika were tested in replicated trials. At least 2 lines exhibit superior color, yield and dry matter content when compared to existing cultivars. These lines are being considered for cultivar release.
- b. Impact — This research focused on postharvest physiology of chile peppers (red chile and paprika) and onions (principally sweet onions). Sweet onions have a high market value, and sweet onions that mature during the summer market window supply approximately half of the nation's onion crop during that time period. Chile (all types) and onion production made up 10.3% and 6.9% of all New Mexico crop cash receipts in 2000, with a value of \$48.9 million and \$32.8 million, respectively. Postharvest losses of vegetable commodities ranges from 5 to 25% of the harvest crop in the United States; in the developing world, postharvest losses range from 25 to 50%. Onion and chile varieties developed by our scientists will be used by growers in New Mexico and surrounding states.
- 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. The data support a non-saturable, concentration-driven, rapid transport system for swainsonine. Further, elimination rates indicate it would take 80 to 120 days to eliminate 99.9% of the swainsonine from the animal's system. Researchers also are investigating the health and performance of northern New Mexico calves as part of a feedlot health study. More than 200 calves from varying sources throughout northern New Mexico were used during the fourth year of this 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. 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 may enhance an inflammatory response. A separate study evaluated effects of dietary fat (yellow grease) concentration on serum and lung lavage sample concentrations of florfenicol. Results suggest that added dietary fat influences serum concentrations of florfenicol. Methods more sensitive to small antibiotic concentrations need to be conducted to evaluate the effects of dietary fat on host tissue concentrations.

- b. Impact — 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 Suffolk 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 — Multistate 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. Tests at the Alcalde Sustainable Agriculture Science Center comparing stand establishment and change in sward composition of selected perennial forage legumes under various harvest/grazing regimes have been completed. Alfalfa variety testing continued to indicate that varieties in fall dormancy categories 6–8 are best for this area. New tests were sown at Artesia, Farmington, Los Lunas, Tucumcari, and Alcalde (grazing tolerance) agricultural science centers. Hairy vetch and rose clover may have the best potential as cover crops or in reclamation of disturbed lands. Alfalfa continues as the most suitable perennial forage legume in the Southern High Plains compared to other perennial legumes. Russian wildrye and western wheatgrass maintained the higher percent stand in 2001, while alтай wildrye and tall wheatgrass were the highest yielding grasses. A trial comparing rotationally grazed alfalfa and tall wheatgrass as monocultures and rotationally grazed alfalfa-tall wheatgrass mixtures was completed in 2001. There was no difference in animal performance by beef cattle yearlings rotationally or continuously grazing pastures containing alfalfa. Pastures containing alfalfa gave greater head grazing days per acre, final live weights, and total gain per acre than monoculture tall wheatgrass. Order of animal preference was indistinguishable. Research to determine the feasibility of using alfalfa as an economic crop during establishment of kura clover continued. Early results indicate that, in relation to monoculture alfalfa, plant populations of alfalfa are reduced the inclusion of kura clover in the stand. A study to compare selected small grains and winter pulse species in monocultures and mixtures for use as stored feeds was started. Among pulses, Austrian winter peas performed best under all irrigation regimes, likely having a significant effect on quality although there was no difference between monoculture and mixture yields within small grains species. In 2001, selected warm-season annual grasses and legumes were sown in monocultures and mixtures as a companion trial. Observations indicated that later maturing grasses should be used to allow the pulse time to emerge into the canopy and make a contribution to forage quality.
- 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. Research directed at mineral nutrition and mineral stress on a diversity of ornamental crops exposed to southwestern USA semiarid growing conditions have revealed the following: 1) major re-evaluation of current hybrid bermudagrass nitrogen fertilization

practice is needed in order to abate potential groundwater nitrate contamination, 2) fast-growing clones and species of woody ornamentals have been identified to maximize biomass and salt accumulation capacity when irrigated with saline municipal wastewater, 3) in young trees, high sodicity drastically alters root function, and 4) two alternatives to the heavy metal containing flower preservatives, calcium and 1-methylcyclopropene, show promise in extending vase life of cut bluebonnets, a promising alternative cut flower crop in New Mexico.

- b. Impact — Lack of regulatory mandates and economic penalties combined with emphasis on economic profitability at the expense of environmental husbandry have encouraged excessive application of fertilizer nitrogen. The cost of remedying excessive nitrate in groundwater is difficult to quantify but someone will ultimately be responsible. Our work with tree crops, floral crops and turfgrass has demonstrated a serious need to examine our nitrogen fertilization practices.

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. A tetraploid alfalfa population of F1 genotypes segregating for forage yield potential, water-use efficiency, and forage quality traits was developed. To help farmers select the best cultivars for their region, over 200 alfalfa cultivars and experimental lines were evaluated in 11 yield trials planted at 5 locations in New Mexico. These cultivars were evaluated for forage yield potential under varied management conditions including optimum irrigation, drought, winter irrigation, drip irrigation, and high salt. Over a three year period, nematode resistant alfalfa cultivars planted at high rates were more effective at reducing yellow and purple nutsedge weed densities than were nematode-susceptible

alfalfa cultivars planted at low seeding rates. 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 cayenne cultivar resistant to the root-knot nematode (NuMex NeMatador) was developed and released.

- b. Impact — Alfalfa hay constitutes most of the New Mexico dairy livestock diet because its nutritive quality exceeds that of most other forages. By using information provided through variety trials to select the highest yielding cultivars, farmers can easily improve forage yields by 3 to 5% over standard cultivars. Based on calendar year 2000 statistics of 1.5 million tons of hay harvested at \$125/ton, this amounts to increased profits of \$5 to 9 million annually. With approximately 290,000 acres of alfalfa in production, and a state-wide average of 2 acre-feet of water applied annually (conservative estimate), we estimate that improved water-use efficiency of 10% could save a minimum of 58,000 acre-feet of water. At \$12 acre-foot (EBID estimated cost) this amounts to \$700,000 annually. 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. The new root-knot nematode-resistant cayenne cultivar will enable chile growers to have increased yield with decreased use of soil fumigants.
- 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. Researchers also began analysis of

curly top virus infecting chile and found two viral strains, singly or in combination in infected plants.

- b. Impact — 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. New Mexico chile production brought in \$48,910,000 in 2000; during this past season many chile fields lost 30% or more of their crop due to curly top virus.
- 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.

The Sustainable Agriculture Science Center at Alcalde serves north-central New Mexico which includes the counties of Mora, Rio Arriba, Sandoval, Santa Fe, and Taos. The great majority of the irrigated agricultural acreage belongs to small-scale, resource-limited, farmers with less than 20 acres. The Alcalde Center seeks to assist farmers and ranchers of north-central New Mexico to use their land in a more efficient, productive, and profitable manner by developing new research-based information that will assist them in improving their current cropping and crop-livestock systems. Overall objectives are: 1) To develop and evaluate cropping methods and crop-livestock systems which increase the efficiency of resource use in order to increase agricultural productivity and profitability on a per unit area basis while maintaining or enhancing the natural resource base, and 2) To evaluate crop varieties and alternative crops for their adaptation and productivity in north-central New Mexico. A new alfalfa variety trial was planted in fall 2001. We completed data collection in a yerba mansa medicinal herb trial from which a poster was developed and presented at an international symposium on new crops. Data collection continued on studies relating to: forage grazing management, and use of plastic mulches in vegetables.

- b. Impact — Maximizing use of the growing season and land resource effectively leads to increased production. The degree to which economic gains follow the increased productivity depends on many factors including seed, water, and labor costs. The economic benefits of including a green-manure legume in a rotation are long-term in nature and relate to increasing the overall productivity of the soil for other crops. In the shorter term, they can serve to decrease the need for herbicide applications, and/or nitrogen fertilizer. However, the cost-benefit ratios are very difficult to determine, except under long term cropping studies. Based on project results to date, interseeding a forage

crop into a vegetable cash crop can clearly increase fall or spring feed availability in a mixed vegetable- livestock operation. The degree of economic gain will depend on the factors above as well as off- farm feed availability/cost. Developing methods for high-value herbs production would allow increased economic opportunity for small- scale growers. By providing more knowledge and options to producers, the hope is that the project will make it easier for producers to stay in production. By staying in production, the decentralized land ownership common in the region can produce more equitable economic opportunity for rural residents.

- 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. Mesquite density and canopy cover have been periodically recorded on permanent transects to determine changes in mesquite populations across the pastures. During the summer of 2000, soil depth to caliche and soil texture were determined for each transect. It was found that soil depth to caliche was positively correlated to both mesquite canopy cover and density. Canopy cover was also positively correlated to percent clay, but was negatively correlated to the amount of sand and silt in the soil. Soil parameters explained very little of the variation in the mesquite density and canopy cover.
- b. Impact — With proper understanding of plant dynamics on desert rangelands and proper stocking, there is the potential to drastically reduce dust pollution in nearby urban areas and to reduce sediment in any runoff from these rangelands.
- 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. Fifteen feedlots in Texas, New Mexico, and Arizona were contacted and agreed to participate in a study of their labor practices as they relate to operational risk of the cattle feeding business. This study will be completed in 2002.
- b. Impact — 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. Impact — 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. Leaves of Texas red oak (*Quercus buckleyi*) had one of the highest stomatal densities, and also had leaves which were among the waxiest, most dense, and thickest. Across species, drought led to lower ratios of leaf surface area to root dry weight, and leaf to root dry weight. *Q. buckleyi* plants subjected to drought had the highest root-to-shoot dry weight ratio.
- b. Impact —The low relative growth rate of Texas red oak (*Quercus buckleyi*) might limit their widespread landscape use. However, *Q. buckleyi* may merit more use in landscapes on a reduced moisture budget because of foliar traits, carbon allocation patterns, and the relative lack of impact of drought on plant tissue water relations.
- 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. Impact — 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

Key Theme – Other

- a. Agricultural Experiment Station scientists are conducting research in the areas of irrigation technology adoption, economic impacts of the New Mexico chile pepper industry, environmental attitudes, agricultural structure, irrigation efficiency, and live cattle trade between the U.S. and Mexico.
- b. Impact — New Mexico is dealing with increased population growth in some of the most agriculturally productive areas of the state (i.e., throughout the Rio Grande Valley).

Federal subsidies to agriculture, environmental regulations, and public attitudes toward agriculture are changing. International trade is directly affecting many of the state's agricultural industries. Reliable assessments of economic impacts, benefits, and costs will help the state's population and agricultural industries adapt to the radically changing future.

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

Key Theme – Other (Commodity Marketing)

- a. In many states, producer marketing efforts are supplemented through state-sponsored promotion programs. Evaluation of these commodity promotion and other producer-funded/supported programs is an important issue in agricultural marketing. New Mexico Agricultural Experiment Station researchers have examined the existence and scope of state-sponsored programs throughout the United States. A publication summarizing the thesis findings is in progress. Additional work looked at determining the effectiveness of specific programs implemented by the New Mexico Department of Agriculture.
- b. Impact — Both state and federal government agencies are moving away from direct subsidies for agricultural commodities, preferring to provide or authorize assistance for demand expansion activities as a method of stabilizing or improving commodity prices. Millions of dollars are currently spent on commodity specific and state-sponsored promotion programs. Research into overall effectiveness measures and funding allocation issues can reassure producers and the public that these funds are being used wisely.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Range Livestock Enterprises

- a. Before the New Mexico livestock cost and return series can be updated, intensive studies must be undertaken to refine, improve and validate definition of "representative ranches" that have been previously defined and used in the cost and return series. Demographic, social and economic characteristics of New Mexico ranchers were studied using Census of Agriculture and National Agricultural Statistics data to define the location, size of operation and apparent type of livestock operation for each New Mexico livestock producer. GIS procedures were used to visualize the location of each ranch relative to the National Resource Conservation Service definitions of major land resource areas in New Mexico. With this visualization, the population of livestock producers in New Mexico was categorized as to size, type of production, and production area. Formulation of an additional mail survey to gather social and economic data from ranchers statewide was initiated.
- b. Impact — A better understanding of the social, demographic, and economic

characteristics of New Mexico ranchers will give additional detail in the New Mexico livestock cost and return series about the social and economic motives of ranchers and how and why it is they continue to ranch when other alternative investments would yield a higher rate of return.

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

Key Theme – Other (Strategic Planning/Issue Resolution)

- a. Agricultural Experiment Station researchers are focused on assisting “communities of interest,” rural communities, and organizations of all kinds to succeed. This is accomplished through the application of planning and organizational design methods based on Open Systems theory and participative democracy as an organizational design model. Researchers continued work on College of Agriculture and Home Economics constituent issue identification and strategic planning for issue resolution and/or development of positive, desirable futures. Projects included assisting: the *New Mexico Agricultural Property Tax Task Force* by conducting strategic planning with producer group representatives focused on revision of agricultural property tax statutes as they relate to agricultural assets; *Chile Pepper Task Force* by continuing work initiated in 1998 to foster the development of a broad-based collaboration between growers, processors, and NMSI research and development and marketing professionals to address the future of the Chile industry in New Mexico; *The Future of Agriculture in the Urbanized Rio Grande Corridor* – working with representatives of stakeholder groups on strategic planning focused on the management of water and land resources and the adjustments in research/development/crops necessary to maintain and grow a viable agricultural sector at the urban fringe; and *Mexico/US – Southwest Borderlands Strategic Planning* – strategic planning with stakeholder group representatives for the economic development of the lagging western “quadrant” of the Paso del Norte region (Luna, Hidalgo and Grant counties in New Mexico, Cochise county in Arizona, and the municipios of Agua Prieta, Janos, and Ascension in Sonora and Chihuahua, Mexico).
- b. Impact — The impacts of the program will always be difficult to assess. For example, if the long-term viability of the New Mexico chile industry (production, processing, marketing, R&D, etc.) is ultimately linked to the success of the New Mexico Chile Pepper Task Force, the impact of the program on individual producers, the producing areas and the state will be measured in hundreds of millions of dollars.
- 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 and green chile products. Lipid profiles for pecans were constructed. Information generated in these projects will be useful for labeling purposes and for use in food composition tables which currently contain little 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 the ability of *Lactobacillus acidophilus* to inhibit the growth of a non-pathogenic strain of *E. coli* by competitive inhibition. Specific information on the survival and suppression of bacteria from the environment will aid in the discovery of how to prevent or decrease the occurrence of pathogenic bacterial strains in food products.

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 \$31,861 from Hatch Act funds. The number of full-time equivalents engaged in research for this goal was 1.0.

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. Formulations for two red and two green enchilada-type sauces have been prepared and evaluated informally for sensory characteristics and pH. Red enchilada-type sauce prepared with dried red chile pods and tomato sauce had a pH value of 4.34 while the same formula with fresh tomato instead of tomato sauce had a pH of 4.11. Green enchilada-type sauce prepared with green chile alone had a pH of 5.80 while the formula prepared with green chile and tomatillos had a pH of 4.20. Additional recipes will be tested to determine desirable characteristics. Information will then be used to develop standardized recipes to which treatments such as addition of various types of acids can be applied. Jam-type products using combinations of green chile/apple and green chile/raspberry and two butter-type products made from green chile alone and a green chile/apple combination were prepared and evaluated informally for sensory characteristics. Revisions to the preserve products are planned. The lipid analysis of pecans continued. Sixty-eight grams of pecans were fed to normolipidemic and hyperlipidemic individuals in a pecan treatment group. These were compared with control groups who did not consume nuts. In the normolipidemic group, LDL cholesterol declined by 10% at week 4 and by 6% at week 8.
- b. Impact — Home preservation is an important cost-effective means of extending the shelf-life of perishable and semi-perishable foods. Development of formulations for green and red chile based products that can be safely water bath-canned could reduce waste from spoiled produce and decrease the chances of foodborne illness and related health care costs. The major social impact from this research could be a reduction in the risk of foodborne illness from improperly home canned food products. Pecans are the second largest cash crop in the state of New Mexico. 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. Bacterial contamination of meat products has been an ongoing concern in the food industry. Pathogenic strains of *E. coli* have been a primary concern. Researchers at the New Mexico Agricultural Experiment Station are determining the ability of the ability of *Lactobacillus acidophilus* to inhibit the growth of a non-pathogenic strain of *E. coli* by competitive inhibition. *Lactobacillus acidophilus*, a gram positive bacteria, was chosen because it is a prominent strain of *Lactobacillus*, indigenous to the intestine, and has been promoted as a probiotic. Preliminary results indicate that *L. acidophilus* does not outgrow *E. coli*. More research needs to be conducted to better characterize the findings of the study.
- 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

The New Mexico State University College of Agriculture and Home Economics gives special emphasis to the needs of rural health, food safety, and nutrition issues. 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 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 \$18,957 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 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 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

Goal 4: Greater harmony between agriculture and 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.

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.

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 \$511,780 from Hatch and McIntire-Stennis Act appropriated funds. The number of full-time equivalents engaged in research for this goal was 19.9.

Key Theme – Agricultural Waste 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 crop land 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 the problems found in the eastern United States. Permits issued to animal feeding operations in New Mexico require some form of tracking and accounting for the nutrients applied to crop land. Nutrient management is a best management practice that is the first line of defense against pollution and is suitable to all persons utilizing the land for economic plant production or home gardening. 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 crop land and livestock producers.

- b. Impact — This program can benefit nutrient management planners that offer assistance to dairies and feedlots that dispose of manure and wastewater. This program can prevent fines that are levied against animal feeding operations to the tune of \$1,000 to \$10,000 per day for violations in permit requirements. This program could save \$1,000,000 or more in costly groundwater cleanup programs to mediate nitrate contamination.
- c. Source of Federal Funds — Hatch
- d. 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. This year Experiment Station researchers began studying the ecosystem role of re-established colonies of the black-tailed prairie dog (*Cynomys ludovicianus*) on the Armendariz Ranch.
- b. Impact — Nationwide, millions of dollars are spent per year on management of threatened and endangered species. Millions more are spent on invasive species. Potential environmental impacts include better overall environmental health through effective management of native and non-native biodiversity.
- 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. Researchers also analyzed the genetics of the fungal endophytes found infecting locoweeds. They found the same species of fungus regardless of the species of locoweed it was recovered from or the area in the state where the plants were collected. The fungus is a new species of *Alternaria*, distinct from species which commonly cause plant disease.

- b. Impact — Locoweed causes losses of more than 100 million dollars annually to the livestock industry of the western U.S. 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. Several tools for snakeweed and locoweed management do not appear to influence native insects that feed on these weeds if applied during periods when insects are dormant. *Aphthona* beetles continue to exert great pressure on all of the leafy spurge populations where they have been released.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — Multi-State Research
 - AS, AZ, CA, GU, HI, 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 — Environmental impacts of this work include the obvious features of disturbed land revegetation, riparian restoration, post-fire rehabilitation and erosion control (wind breaks). Other environmental impacts also include reduced water use by landscape plants and the conservation of native plant germplasm through the selection and propagation of native seed sources.
- 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 are measuring natural bioclimatic climatic changes in order to assess changes caused by humans. They have finished 90% of the mapping and digitizing of the geomorphic units and soil parent material units of the Jornada Experimental Range and Chihuahuan Desert Rangeland Research Center north of Las Cruces; these maps are needed for comparing historic and prehistoric erosion. They also measured the carbon isotopic composition of seven soil profiles in the Jornada Basin and one profile in the Tularosa Basin on Hollaman Air Force Base. These data are needed to track conversions of grasslands to shrublands recorded by $\delta^{13}\text{C}$ in soil carbonate. Results from these measurements indicate that the Jornada Plain was occupied by grasslands for the last 10 to 20 thousand years. In addition, they measured the carbon isotopes of 20+ termite galleries. The purpose of this research is to determine if termites modify the $\delta^{13}\text{C}$ -signal used to reconstruct prehistoric vegetation patterns. In other research, Agricultural Experiment Station scientists are measuring the amount of CO_2 released from desert soils to the atmosphere. Specifically, they want to determine if emissions of CO_2 from soil carbonate that have been exposed by erosion are greater than neighboring soils in which carbonate has not been exposed.
- 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 CO_2 is being sequestered. Both values are needed in order to move forward with attempts to sequester C and mitigate the greenhouse effect. Storing carbon as the result of management practices has the potential to not only help curtail global warming, but also to increase rangeland health.
- 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. Tests conducted over the last year were part of ongoing studies to develop pest management strategies appropriate for a southwestern semi-arid climate. Cultural and biological controls are emphasized in an effort to reduce pesticide applications and reduce the cost of production. This year studies that had been conducted at NMSU off-campus agricultural science stations were expanded to commercial farms to evaluate the impact of alfalfa on predation in cotton, in order to determine the impact of distance from cotton, cutting and irrigation on predation. That data is currently being analyzed. 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. An attract and kill device significantly reduced pecan nut casebearer moth density during the first generation. An automatic insect counting and classification program correctly identified 11 genera of cotton insects 95.5% of the time in the laboratory. Repeated applications of Karate and malathion on cotton reduced beneficial populations in direct relation to the residual period. Repeated applications of long residual insecticides promoted secondary pest outbreaks of whiteflies and aphids. A key to the parasitoids of cotton and alfalfa in New Mexico was prepared.
- 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. We are also determining how to manage transgenic crops to maintain insect resistance levels so that no additional insecticide applications are needed for bollworm. Additionally, we are evaluating the impact of insecticides and other control methods on beneficial insect populations to conserve beneficial and non-target species. 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. Biological control of alfalfa weevil saves New Mexico growers \$12,000,000 annually and insecticide applications have been reduced 99% in the world's second largest pecan orchard. Biological control reduces environmental contamination, the chance for resistance and may increase monetary savings and enhance worker safety.

- 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. A special, non-radioactive isotope of nitrogen was applied to a commercial pecan orchard and the nitrogen followed in the tree, soil, and nuts for 4 years. In the year of application, about 47% of the nitrogen applied remained in the soil or tree, about 43% was lost to the environment, about 6% was recycled, and only about 4% was harvested. Four years after fertilization, about 78% of the nitrogen applied was lost to the environment, 17% remained in the soil or tree, and only about 5% was harvested as nuts. The results indicate that much of the nitrogen applied to pecan trees is never harvested as nuts but is lost to the environment.
- b. Impact — With more efficient use of nitrogen fertilizer, less ground water pollution (nitrate) and less air pollution (oxides of nitrogen) may be incurred during the production of pecans.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Pesticide Application

- a. Applications of a biopesticide, *Bacillus thuringiensis* were applied by aircraft to a pecan orchard and evaluated for deposition on pecan nuts for the control of pecan nut casebearer. The treatments varied in droplet size spectra, total volume per acre and timing of application (early morning or late evening). All treatments received the same rate of active ingredient per acre. The two treatments that were applied late evening resulted in higher deposits of *B. thuringiensis* on nuts than treatments applied early morning. Population levels of pecan nut casebearer were not high enough to gather meaningful efficacy data. The increased deposition resulting from the late evening application was most likely due to the meteorological conditions that existed rather than the time of application. A wind tunnel study was conducted to evaluate the droplet spectra of air-induction spray nozzles at helicopter airspeeds for herbicide applications. These nozzles utilize a venturi to draw ambient air into the spray solution. This forms bubbles in the spray solution that increases the overall droplet size without an increase in flow rate. The affect of air-induction nozzles on drift potential from aerial applications remains to be determined.
- b. Impact — By identifying a specific target (pecan nuts) and tailoring a spray droplet size that is most efficiently collected by the intended target, pesticide applications can be made more effective and reduce drift hazards. Air-induction hydraulic nozzles can produce a larger droplet spectrum at the same flow rate and pressure as conventional

nozzles, which lend themselves to some herbicide applications. Identifying a spray droplet spectrum and/or spraying technique that will increase deposition on the underside of leaves should result in increased insect control in some crops. 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 conducting laboratory and greenhouse phytoremediation (the use of plants to clean up the environment) experiments on arsenic, lead, and uranium contaminated soils to determine if the addition of composts or other organic matter sources would enhance plant growth and uptake of the toxic metals. They have also been working on optimizing fertilization rates for salt-affected soils used to grow chile peppers. Additionally, they are conducting experiments to evaluate the effects of various amendments on soil salinity, crop yield, and soil quality. In the field researchers compared nutrient levels in soils that were subjected to different uses and management. They also looked at the effects of manure additions to soil as well as the control of certain soil properties by the parent material mineralogy and geology.
- b. Impact — Improving soil quality directly translates to the improved capacity of a soil to store wastes including radioactive, toxic, and biohazard. Better soils will release fewer toxins to the atmosphere, groundwater, and plants or animals living in the soil. The quality of food will improve along with the quality of soil.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Water Quality

- a. Agricultural Experiment Station scientists have begun studying vegetation management effects on runoff and water quality. At Santa Fe Ranch, they have set up experimental watersheds that will be cleared of pinyon juniper vegetation after two years of baseline study to determine effects of tree clearing on runoff and sediment yield. Near Mora, they began study to determine runoff and sediment yield effects of clearing small diameter ponderosa pine stands. Researchers also began studies of irrigation ditch management effects on shallow groundwater quantity and quality. At three site along the Rio Grande River, they began a study to determine effects of seepage from *acequias* and irrigation ditches on shallow groundwater quantity, shallow and deep groundwater quality, riparian vegetation, and river flow. Other recent research examined three new potential programs for interstate coordination of surface water withdrawal and reservoir operations for their potential in reducing economic losses resulting from water shortfalls in periods of severe and sustained drought, such as the one facing New Mexico beginning in early 2001. The first program analyzed was increased carryover storage at Elephant Butte Reservoir. This carryover storage was based on reducing Rio Grande project deliveries downstream of Elephant Butte by 25,000 acre-feet per year in normal years, to be stored for use in drought years. The second program analyzed was a proposal to invest in technical measures to increase irrigation efficiency for the Middle Rio Grande Conservancy District, in which net stream depletions required for application to crops would be reduced by 18 percent. Results showed that this policy would produce virtually zero drought damage mitigation to both New Mexico and West Texas. states. Reduced water diverted from the Rio Grande brought about by greater irrigation efficiency would also considerably reduce irrigation return flows to the river.
- b. Impact — With better understanding of land management effects on runoff and water quality, pollution source areas can be targeted directly. This makes water quality improvement more efficient and economical for public agencies. Producers will not bear the costs of remediation when they are not causing pollution problems, and they will fix problems and increase operation sustainability when they do need to improve management. The long-run average annual economic value of drought damages mitigated by institutional change at Elephant Butte Reservoir was negative \$200,000 for New Mexico, and negative \$433,000 for west Texas. This means that the current Law of the River produces less drought damage than the proposed institution of storing the added water at Elephant Butte. The result would be virtually zero water saved and essentially zero economic benefit. Greater irrigation efficiency showed \$7,000 per year drought mitigation benefits to New Mexico, and \$15,000 to West Texas. This means that the cost of technologies needed to implement these increased irrigation efficiencies would have to be virtually zero to justify such investments economically.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Weather and Climate

- a. A newsletter was published by the New Mexico Climate Center and PDF files of the newsletter posted on the World Wide Web at <http://weather.nmsu.edu/news.htm>. A program to analyze wind direction data was written; see <http://weather.nmsu.edu/windgraph.htm>. A program to interpolate missing hour data was written; see <http://weather.nmsu.edu/map/graphs.htm>.
- b. Impact — The calculators and spreadsheets are being used by farmers and agricultural consultants. Monetary decision are based on climate analysis.
- 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. Other Experiment Station researchers are studying vegetation structure, composition and seed abundance, distribution, and diversity associated with wintering Chihuahuan Desert avian communities. Seed abundance influenced avian abundance and group composition. Abundance of mesquite had the strongest influence on bird community structure with a positive influence on shrub-adapted birds and a negative influence on grassland species. This has important implications as desert grasslands continue to be lost due to shrub encroachment in the Chihuahuan Desert. Seed type and abundance was associated with specific avian species indicating structuring of populations within the grassland and shrub systems. Urban nesting burrowing owls in Las Cruces, New Mexico were associated with rock squirrel burrows and human made cavities. Burrowing owls in grasslands were associated with reestablished black-tailed prairie dog colonies. No difference was found between reproductive success in urban and grassland habitats, however, different factors contributed to nesting success. Spacing between nests differed significantly between habitats with nests in prairie dog colonies significantly closer together and this negatively influenced reproduction. As these colonies expand, distance between nests should increase. Reproductive success in urban areas was positively related to the number of nesting pairs suggesting that owls benefit from the presence of other owls. This past year researchers have initiated three projects related to winter and migratory ecology of grassland and shrubland birds, including wintering grassland birds in coastal grasslands of southeast Texas and Tamualipas Mexico, migratory ecology of grassland and shrub-adapted birds in south central New Mexico, and influence of fire and grazing on wintering grassland birds in southwest New Mexico and northern Mexico.
- b. Impact — 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. We will have a better understanding of the distribution and ecology of vertebrate fauna (especially avifauna) native to this region, including permanent resident species and seasonal migrants. As a result of these projects, we will be better able to sustainably manage our native vertebrate fauna. Data collected for this project can also help alleviate future entanglements related to the management needs and status of specific species.

c. Source of Federal Funds — Hatch

d. Scope of Impact — State Specific

Key Theme – Other

a. Yellow starthistle and broom snakeweed are 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. Picloram is the major herbicide used for rangeland weed control. Adequate control can be achieved at recommended rates; however, range weed control is not always consistent. Agricultural Experiment Station scientists have characterized picloram uptake from the leaf surface of broom snakeweed as environmentally dependent and determined that its susceptibility to the herbicide varies greatly due to the environmental conditions previous to application; however, these periods of enhanced uptake and physiological sensitivity to the herbicide are not related to the growth stage(s) during which broom snakeweed is most susceptible to herbicides in field trials. Researchers are currently evaluating the role of detoxification of the herbicide by analyzing the metabolites formed during different times of the year and mechanisms of photodegradation of picloram on leaf surfaces. Preliminary work characterizing herbicide translocation as it relates to photosynthate redistribution in these woody perennials showed that the herbicide is not redistributed with carbohydrates as one would hypothesize for a weak acid molecule.

b. Impact — By improving herbicide use efficiency through understanding mechanisms of herbicide action, we will reduce the cost of managing the weed as well as reducing the amount of herbicides necessary for adequate control.

c. Source of Federal Funds — Hatch

d. Scope of Impact — Multistate Research

- with states AZ, CA, FL, HI, MT, NV, NY, OR, WA

Key Theme – Other (Remote Sensing)

a. Agricultural Experiment Station scientists continue to receive and archive daily satellite images of the Mesilla valley and are using aircraft to take aerial infrared photographs of selected areas. Preliminary studies have shown that infrared photographs can monitor

plant development and reveal problem areas. Problems of geo-registration and image calibration have been addressed.

- b. Impact — The goal is to develop more efficient and effective crop and pest management. It is now possible to monitor plant development by comparing images using standard change analysis procedures.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

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.

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 \$41,211 from Hatch Act funds. The number of full-time equivalents engaged in research for this goal was 4.5.

Key Theme – Children, Youth, and Families at Risk

- a. The focus of The New Mexico Latchkey School-age Child Care Clearinghouse is on the provision of support for New Mexico School-age Child Care Program Directors. A library is maintained of resources they can borrow. A mailing is done twice a year to alert them of materials. In addition, a newsletter is published. Collaborations occur with other agencies to provide workshops and seminars as needed.
- b. Impact — The economic impacts of this project are evidenced when parents are able to work due to the availability of school-age child care. These programs allow for continuous, uninterrupted transitions for the children from the school to child care, thus allowing parents to remain on the job with a sense of security. In some cases, school-age child care allows the parents to further their educations, thus increasing their employability. The children being provided day care will be the future leaders and workers in New Mexico. A sound educational base will help ensure their success.
- 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 — Employers spend millions of dollars to improve productivity in the workplace. By understanding some of the psychological aspects associated with productivity, employers will enjoy greater productivity by implementing suggestions from this research. Diminishing stress within workers also can lead to less domestic unrest (including violence, divorce, spouse, child abuse, suicide, self medication with drugs and alcohol).
- 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. Experiment Station scientists have examined parenting in single-parent families, comparing single mothers with single fathers and divorced parents with never-married parents. The researchers have found that single fathers successfully manage the parenting role as well as single women. A follow-up study will look at economic strain in single-parent households. This project will create parenting programs designed to meet the special needs of single parents.
- b. Impact — Every \$1 spent on prevention of problems such as substance abuse and teen pregnancy saves the state \$7 on intervention services. In addition, parents who are currently on welfare and receiving food stamps are recruited as peer parent educators for the project. Five individuals have been employed through the AmeriCorp*VISTA program. In addition to a monthly stipend and benefits, they receive a \$5,000 educational award after one year and a \$10,000 educational award after two years of employment. Through their work as parent educators, they develop job skills and will be able to go off welfare and pursue a college education. The social impact of this project can be enormous. The families who graduate from the project are less likely to commit child abuse, and their children are much less likely to engage in risky behaviors during adolescence.
- 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 database of New Mexico's agri-tourism attractions continues to be developed. A mail survey that will be used to examine the motivation of agri-tourism suppliers for offering agri-tourism attractions and to determine the extent to which suppliers perceive that their objectives are being met is nearing finalization.
- 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 significant means by which rural communities and agricultural producers can broaden and diversify their revenue streams.
- c. Source of Federal Funds — Hatch
- d. Scope of Impact — State Specific

Key Theme – Other

- a. 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 managing sage grouse.
- 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

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 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 is becoming 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

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

2. Continue research, teaching, and extension programs that generate technological innovation and transfer to enhance agricultural profitability and maintenance of quality. Examples include:
 - 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.

1. 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 its goals as outlined in the five-year Plan of Work submitted in July 1999.

Total expenditures for Goal 1 were \$837,393.32 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 12.3 FTE.

Key Theme – Agricultural Competitiveness (Crop Management)

- a. Curriculum development for new alfalfa, cotton, corn and other agronomic crop programs was established based on a need from clientele throughout New Mexico where these crops are grown or grown in rotation. The programs are based on farmer, consultant and other agricultural professional training, information and current needs in these crops.

2. Accomplishments – Baseline data for three main crops (alfalfa, cotton and corn) has been started. A series of publications, news articles, E-mail information releases and radio sound bytes have been utilized as well as the development of training modules for the comprehensive statewide Certified Crop Advisor program.

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

- d. Scope of Impact -State Specific

Key Theme – Animal Production Efficiency (Profitable Livestock Production)

- a. New Mexico livestock producers have a need for educational and service programs to assist them in maintaining viable economic and sustainable livestock production systems. The Profitable Livestock Production Practices effort includes numerous state, regional and county workshops, field-days, short-courses, meetings and demonstrational research efforts in which various livestock production practices are discussed and/or evaluated.

- b. Accomplishments – A number of publications written to be used at educational and service programs reflect the large amount and variety of work being done in this area. Publications include: Mathis, C. P., J. E. Sawyer, and R. Parker. 2001. *Managing and Feeding Beef Cows Using Body Condition Scores*. NMSU Circular XXX (in press). Sawyer, J. E., and C. P. Mathis. 2001. *Supplement Delivery Systems*. Circular 571. Mathis, C. P., and J. E. Sawyer. 2001. *Evaluate your product: Ranch to Rail*. In: Proc., New Mexico Cattle Growers' Short Course. Clayton, NM. pp 31-32. Parker, W. R., C. P. Mathis, and J. E. Sawyer. 2001. *Adding value with weaning programs*. In: Proc., New Mexico Cattle Growers' Short Course. Clayton, NM. pp10-11. Sawyer, J. E. and C. P. Mathis, 2001. *Adding value with growing programs*. In: Proc., New Mexico Cattle Growers' Short Course. Clayton, NM. pp 20-25. Mathis, C. P., and J. Duffey. 2000. *4-H Market Lamb Project*. NMSU Guide 100 B-14. Mathis, C. P. et al, 2001. *A collaborative study evaluating in situ and in vitro techniques for estimating protein degradability of different forages*. Anim. Feed Sci. and Techol. 63:32-41. Farmer, C. G., R. C. Cochran, D. D. Simms, J. S. Heldt, and C. P. Mathis. 2001. *Impact of divergent wheat milling byproducts in supplements on the forage use and performance of beef cattle consuming low quality, tall grass-prairie forage*. J. Anim. Sci. 79:2472-2480. Mathis, C. P. et al. 2001. *Pregnancy Rate in Beef Heifers after Synchrony to Random or Programmed Estrous Cycles*. J. Anim. Sci. 79:561-567. Mathis C. P., and J. E. Sawyer. 2000. *Beef Cow Production Efficiency in Western Rangelands*. CL-732. Mathis, C. P., and J. E. Sawyer. 2001. *Results Summary of the 2000-2001 New Mexico Ranch to Rail Program*. In: New Mexico Stockman. September 2001. Mathis, C. P. 2001. *New Mexico Ranch to Rail*. In: New Mexico Stockman. September, 2001. Mathis, C. P. 2001. *Will selection for lamb production sacrifice wool quality?* In: New Mexico Stockman. July, 2001. Mathis, C. P. 2001. *Economics of implanting suckling calves*. Feed Lot 9(Jan./Feb):15. Mathis, C. P. 2000.. In: New Mexico Stockman. *Beef production efficiency is affected by milking ability*. December, 2000. Duff, G.C. and J.E. Sawyer. 2001. *Tools of the trade optimizing gains on pasture*. Proceedings, Plains Nutrition Council Fall Conference. Sawyer, J.E., L.A. Knox, G.B. Donart and M.K. Petersen. 2000. *The nutritive value of cholla cactus as affected by burning*. J. Range Manage. 54:249-253. Sawyer, J.E., G.D. Pulsipher, R.C. Waterman, G.B. Donart, and M.K. Petersen. 2001. *Research observation: Moving cows to a fresh pasture influences diet quality during late winter and early spring*. J. Range Manage. (submitted). Duff, G.C., D.A. Walker, K.J. Malcolm-Callis, J.E. Sawyer, J. Weaver, and M.G. Thomas. 2001 *Feedlot performance and carcass characteristics of Mashona sired steers*. J. Anim. Sci. 79(Suppl.1):Abstr.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - Agricultural Profitability (Improving Dairy Management)

- a. With a 210% growth of the dairy industry in New Mexico, comes many new challenges to dairy producers. Implementation of efficient dairy practices and philosophies are essential for dairy operations to remain profitable. Dairy producers need assistance with issues including milk marketing, sales of excess cattle, environmental stewardship, waste management (i.e., composting and comprehensive nutrient management planning), nutrition, reproduction and heat stress. Proper management of personnel is as important as management of animals. It is necessary to educate dairy producers as employers so as to train and maintain quality employees. Employees also must be trained (in both English and Spanish) in proper production techniques (i.e., milking, calf rearing, feed bunk management) for continued success of the New Mexico dairy industry.
3. Accomplishments – Continued development of multi-state relationships between New Mexico, Oklahoma and Texas and a series of workshops, eight Extension fact sheets Three radio stories were developed as Extension learning tools through this multi-state consortium.
4. Source of Federal Funding -Smith Lever 3(b)(c)
5. Scope of Impact - Multistate Extension (OK, TX).

Key Theme - Agricultural Profitability (Agriculture Marketing)

- a. New Mexico farmers continue to have difficulty obtaining adequate prices for their agriculture products. These prices are impacted by many variables from national agriculture policy to need for local buyers of New Mexico agriculture products. This program is carrying out a marketing education program to help farmers obtain adequate prices for their agriculture products, and to provide information on how to develop alternative markets for products produced in New Mexico.
- b. Accomplishments — The economic impacts of this project total over \$500,000 per year. As farm incomes improve because of better price information and the development of new marketing outlets, growers can retail their product directly to the public, which allows them to develop new year round customers.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - 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. Accomplishments -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 (AZ, TX)

Key Theme - Invasive Species (Invasive/Noxious Weeds)

- a. Noxious brush and weeds are found in every county of the state and 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, 142 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 agri-business. 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.
- b. Accomplishments - Development of a new series of range improvement publications titled: "New Mexico Brush Busters". The first two publications are entitled: Mesquite Control: Individual Treatments of Mesquite Control: Aerial Application. Revision of the NMSU-CES Guide 400B-17: Chemical Weed and Brush Control Guide for New Mexico Rangelands.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (TX, CO, UT, AZ)

Key Theme - Invasive Species (Pest Management)

- a. In New Mexico, range lands, forests, and virtually every crop (for example, alfalfa, chile, pecan nuts, various fruit and greenhouse/nursery crops, cotton, corn, and small grains) can be considered as candidates for IPM. In the course of this state program, the

investigators use various educational methods, materials, and all appropriate media to aid growers, crop consultants, and industry groups in identification of and management techniques for the various plants and animals in and around their fields and pastures. In recent years, urban IPM has come into its own; some of the investigators on this program have extended their educational efforts to urban/suburban clientele.

- b. Accomplishments -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

Key Theme - Managing Change in Agriculture (Sustainable Agriculture)

- a. Sustainable agriculture in Northern New Mexico has been declining over several decades as citizens have changed socially in their activities. The way of life for many of our limited resource farmers and ranchers has also eroded over the years because of cultural, educational, economic constraint tied to a unique agricultural environment. The families that this project has affected have passed their small land holdings from generation to generation. Through educational workshops, newsletters, demonstrations, one on one contact, clientele are educated on issues, techniques, and new technology to help improve their production methods to help their operations become effective and sustainable.
- b. Accomplishments -This project has helped implement and develop sustainable farming programs appropriate for northern New Mexico families, their culture and their historical roots. An obvious program outcome is the increasing number of individuals participating in workshops and demonstration sessions.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - Plant Health (Plant Pathology)

- a. The plant pathology program supports agricultural producers and urban clientele by providing educational programs and diagnostic services for identification of plant disorders. Educational programs are conducted at Master Gardener Classes, Pesticide Applicator Training Workshop, Crop Conferences (vegetables, specialty crops, field crops, and turf and ornamentals), and various public workshops on plant health. Diagnostic services are provided on a formal basis in the Plant Disease Laboratory at

New Mexico State University. Plant specimens submitted by county agents, extension specialists, agricultural producers or the general public are evaluated for disease by use of modern laboratory procedures. A diagnosis of the plant problem is made and a formal report is provided to the individual who submitted and to the owner of the plant (if different). Disease diagnosis is also made on an informal basis at plant clinics held throughout the state. At plant clinics, specimens are generally evaluated on site and a diagnosis is made without laboratory analysis and recommendations are provided to the plant owner (if laboratory analysis is required, the specimen is taken to the lab for a formal diagnosis).

- b. Accomplishments - In 2001, a field project was conducted to investigate the ability of 4 different fungicides to control powdery mildew on chile peppers. In 1999-2000 an applied research project was conducted to investigate the potential of biological control organisms to suppress diseases in chile when applied through an innovative injection (BioJect) system.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – State Specific

Key Theme – Plant Production Efficiency (Pecan Production)

- a. The Southwest Pecan Project is studying three of the most important environmental issues facing pecan production. The first is the efficient use of water and the maintenance of acceptable water quality in southern New Mexico. The second is the wise use of agricultural chemicals including fertilizers, and pesticides. Work on the fate of fertilizers (especially nitrogen) and a more complete understanding of irrigation requirements will help increase the efficiency of water use and minimize any degradation of area water supplies.
- b. Accomplishments – Research conducted to date has provided valuable data on optimum rates and timing of fertilizer applications and clues about the alternate-bearing property of pecans that is a perpetual problem in the industry. A window of only several days is available where pesticide treatment is effective against the Pecan Nut Casebearer (PNC) . Research and extension activities have provided orchard managers with PNC treatment information. The result of this effort has changed the perception of the PNC presence from that of a high, potentially devastating threat to one that is manageable and one that has a lower potential for severe impact in most years. Calculating water balance requires monitoring to be continued over several years. Preliminary analyses of these water balance measurements have been published (Sorensen and Jones, 1995; Sorensen and Jones, 1999; Sorensen et.al.1999).
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ, TX)

Key Theme - Rangeland/Pasture Management (Range Management Education)

- a. The extension wildlife program provides educational information to landowners, land management agencies, wildlife management agencies, urban audiences, and youth concerning the management and conservation of wildlife resources. The extension wildlife program also investigates wildlife/livestock interactions through scientific studies to develop solutions to minimize wild ungulate damage to public and private land. This major program effort includes numerous projects designed to increase knowledge about wildlife and its habitat needs, natural resource conflict mediation, and provides methods to cope with wildlife damage problems. Multiple methods are used to implement the program.
- b. Accomplishments - Techniques for Improving Wildlife Habitat Cooperative Extension Service publications were developed on livestock management in riparian areas and range, riparian, water quality, and wildlife monitoring for ranchers in New Mexico during 2001. Curriculum materials were developed for the monitoring program. A Cooperative Extension Service publication on raising trout in the western United States is in print. The Cooperative Extension Service publication on how to prepare pelts and tanning deer hides and small fur skins are currently being revised. A manuscript was developed for a general audience on wildlife survival in desert environments and was published in the New Mexico Journal of Science. A poster on ungulate distribution and forage utilization in the Sacramento Mountains was presented at the 2001 Society for Range Management Conference. An audio release was produced dealing with elk hunting by NMSU CES. Several newspaper articles were written including scaled quail habitat management and deer hunting in New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Multistate Extension (AZ)

Key Theme - Risk Management (Farm Ranch Management)

- a. 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.
- b. Accomplishments - Two major seminars were conducted (Carlsbad and Clovis) on price risk management. The Clovis seminar was in conjunction with the Chicago Mercantile Exchange. A technical paper, Using the Stocker Feeder Cattle Futures and Options, was published by the New Mexico Agricultural Experiment Station and a new book was published, "Investing in Futures and Options Markets" by Libbin and Catlett, Delmar Publishers, 1999.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

d. Scope of Impact -State Specific

Key Theme - Small Farm Viability (Specialty Crop Production and Marketing)

- a. In an effort to increase farm income, many farmers in New Mexico are turning to specialty crops that yield greater returns per acre. Greater returns, however, are often correlated with greater risk factors, particularly with new crops with limited track records. Production databases need to be developed for these new crops in a small plot environment before wider recommendations can be made so as to limit these risk factors. New techniques also have to be developed to curb the use of water and reduce inputs and environmental problems associated with pesticides and fertilizers. Lastly, new markets need to be identified for these crops and new value-added products need to be promoted to capture the interest of consumers.
- b. Accomplishments – Some of the consequences of this program vary from increased farm income for smaller growers to a more secure yearly income through a diversity of specialty crops and value-added products sold on the farmers' market resulting in a steady cash flow through the year. This results in a more stable workforce. Water-saving techniques like mulches in the rural environment can also be applied to the urban environment resulting in increased water savings that can be returned to agriculture and less use of herbicides.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Key Theme - Small Farm Viability (Small Farm Task Force)

- a. The Small Farm Task Force/RAIPAP is a project of the New Mexico State University Cooperative Extension Service. This project presents a holistic approach through its intended goals, to provide the essential resources required for empowerment that would sustain rural family life. This is accomplished by training the local residents to carry out rural development that will improve the quality of life and increase economic opportunities in their communities.
- b. Accomplishments - The New Mexico Cooperative Extension Service received the National Range Conservation Award from the USDA Forest Service for their contribution to the Valle Grande Grassbank project. Nine new small businesses were stated this past year in Mora, Taos and Rio Arriba Counties through technical and educational assistance from the project. The project assisted La Jicarita Enterprise Community in planning and implementing a value-added small diameter timber business for Mora County. This venture will employ up to 20 county residents in the first year and provide a wholesale outlet for up to 50 county residents. The project assisted La Jicarita Enterprise Community in planning and implementing a natural beef and lamb marketing program for Rio Arriba, Taos and Mora Counties. This program will increase the economic return for more than 50 county residents.

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

Key Theme - 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. Accomplishments - The application of principles emphasized in home gardening, may have the following economic impacts: 1. More effective use of money to develop and maintain landscapes and gardens, 2. Reduced water use in landscapes and gardens, releasing previously wasted urban and residential water for other users and economic development, 3. Reduced stress and pollution related problems in gardeners and others, reducing medical expenses, 4. Increased landscaping success due to better knowledge of the needs of plants and the constraints of the Southwestern environment, 5. Enhanced attractiveness for businesses relocating, and more desirable business sites for employees and managers. Although no precise measurement is available, the economic impact of horticulture programs could range from tens of thousands of dollars annually to well in excess of ten million dollars in direct benefits to gardeners. Indirect benefits include improved quality of life and enhanced attractiveness of the environment for economic development as new industries are attracted to New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

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 \$46,240 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 0.8.

Key Theme – Food Accessibility & Affordability (Multilingual Food/Nutrition Education)

- a. All people in New Mexico need educational programs on good nutrition and healthy living. However, 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 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.
- b. Accomplishments - Over 50 video tapes and interactive programs have been produced since the program began, many of which are listed in the detailed narrative. 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 indicate plans to improve their nutrition and food safety practices as a result of watching the videos or using the computer program.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Integrated Research and Extension

Key Theme - 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. Accomplishments – Since this is a new program the following accomplishments are predicted: food processors that attend educational program will produce safe food products. These processors will be able to understand state and federal regulations pertaining to their product. Furthermore, these processors will be in compliance with all food regulations.

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

Key Theme - 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. Accomplishments - Adoption of safe food handling practices; food preservation; and understanding food safety risks are expected as long-term outcomes.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Integrated Research and Extension

Key Theme – Food Resource Management (Food and Nutrition Education)

- a. Good nutrition is essential for optimal 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. Cooperative Extension Service educators promote the understanding of the relationship between diet and health, nutrition research findings and making healthy food choices. Special emphasis is given to the food guide pyramid, the dietary guidelines and food labels.
- b. Accomplishments - Over 20,000 nutrition contacts were made by Extension staff in the past year, either in person or on the phone. In addition, thousands more were reached with research-based nutrition information via Extension newsletters, local newspaper, radio and TV stories and other media outlets.

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

Key Theme – Food Resource Management (Diabetes Education)

- a. In New Mexico, an estimated 105,000 people have diabetes. Approximately 35,000 of them do not even know they have it. Many of the state's citizens are at particular risk, because the disease is more prevalent in minority populations. Hispanics in the state are almost one and one-half times more likely than Anglos to die of diabetes, and Native Americans are more than five times as likely to do so, according to the Centers for Disease Control and Prevention. Education is the key to helping New Mexicans prevent or control diabetes with regular physical activity and a balanced, nutritious diet. Twenty-five NM counties have provided diabetes education over the past two years. Diabetes education in New Mexico is accomplished using a variety of methods.
- b. Accomplishments – Over 1,400 diabetes education contacts were made by Extension faculty this past year, either in person or on the phone. In addition, thousands more were reached with research-based diabetes information via Extension newsletters, local newspaper, radio and TV stories and other media outlets. Results from diabetes education programs include: Twice as many participants planned to follow a meal pattern to control diabetes, plan meals using the Food Guide Pyramid and exercise a total of 60 minutes a week after attending an Extension diabetes workshop as compared with the number doing these things regularly before attending the workshop. Three times as many planned to regularly measure food portions. Selected results from counties include the following: After attending a diabetes support group in Quay county for at least four months, there was a 30% increase in people checking their feet for sores, cuts or blisters daily, a 30% increase in people getting their kidneys checked regularly, a 44% increase in people making decisions with their health care provider to better manage their diabetes, and a 64% increase in people getting their hemoglobin A1c checked regularly (hemoglobin A1c is a measure of long-term blood glucose control). In Grant County, more than 200 people have learned the basics of living with diabetes from monthly cooking schools. In Hidalgo County, participants in a diabetes education program are now committed to monitoring their food portions and their blood glucose levels to better control their diabetes. In Luna County, families are using information from the lending library to improve their diets and meal preparation. In addition 10 Extension publications and one video were produced as educational resources.

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

Key Theme - Food Safety (Family and Community Food Safety)

- a. Educational programs are provided by the New Mexico Cooperative Extension Service that focus on safe handling, processing and storage of food. Programs are designed to create awareness of practices that increase the risk of food borne illness and to change

behavior of participants. Foodborne illness is a rising concern. To address the food safety issues in New Mexico, consumers, restaurant and food service managers and staff are targeted with Extension education programs. These programs emphasize: keeping hands and surfaces clean, preventing cross-contamination, cooking and processing at proper temperatures and chilling foods promptly and properly.

- b. Accomplishments - Over 3,600 food safety contacts were made by Extension faculty in 2000, either in person or on the phone. In addition, thousands more were reached with research-based nutrition information via Extension newsletters, local newspaper, radio and TV stories and other media outlets. One special project included the use of the bilingual (English/Spanish) curriculum, "The Safe Food Trail: Adventures of Will Cook", in training with food service employees. It was used to provide work training for Welfare to Work participants entering the food service industry.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Integrated Research and Extension

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 \$60,096.07 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 1.0.

Key Theme – Baby Weight (Folate Education)

- a. The Folate Education Project is a three year educational intervention (1999-2002) project which is a portion of a larger project funded by the Centers for Disease Control. Extension has partnered with WIC (Women, Infants, & Children), March of Dimes, and NM Health Dept. to educate women of childbearing age on the benefits of folate and has developed a research design to document the effectiveness of an educational intervention.
- b. Accomplishments - For the first two years of the project research was conducted. Results showed that the educational intervention was found to be effective in increasing knowledge of women of childbearing age on the benefits of taking folate before becoming pregnant. It is hoped that this education will result in the reduction of preventable birth defects in New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - Human Health (EFNEP Program)

- a. Targeted audiences are encouraged to increase their use of the Dietary Guidelines and the Food Guide Pyramid in making food choices and meal planning. Special emphasis is 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, increasing 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 increasing use of safe food handling practices.
- b. Accomplishments - Dietary change are 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 is 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

Key Theme - Human Nutrition (Food & Nutrition Education)

- a. Good nutrition is essential for optimal 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.
- b. Accomplishments – Nutrition education is implemented in a manner that is very practical. Demonstrations are conducted on healthy food preparation including lowering of fat, salt and sugar in the diet and increasing grain, vegetable and fruit intake as appropriate for dietary concerns related to health. Often, participants are engaged in hands-on activities that build their own skills. In addition, counties identify resources to address conditions that affect health and well being and cooperate with other agencies to deliver appropriate nutrition services. This includes developing coalitions, networks and other types of collaborative arrangements to create and sustain support systems and educational programs that promote sound nutrition, good diets and health.
- 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 \$686,429.00 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 8.9.

Key Theme - Integrated Pest Management (Integrated Pest Management)

- a. The goal of this program is to make cotton more profitable in New Mexico. We are doing this by reducing insect damage and insect control costs. Boll weevil threatens the cotton industry in New Mexico. Our project is addressing boll weevil control in a number of ways including developing techniques that will dramatically reduce the cost of eradication. We are also developing low-no cost techniques to reduce boll weevil numbers through modification of habitats and growing conditions to increase desiccation in this desert environment.
- b. Accomplishments – Evaluation of the impact of beneficial insects on pest control and the effect of insecticides and transgenic plants is being assessed. Evaluation of the performance of Bt cottons, transgenic cotton lines that are resistant to bollworm—a significant pest of cotton in New Mexico, is also being done. In order to determine the cost/benefit of control decisions, we are determining the value of cotton while the bolls are being developed over the season. This will help us determine the value of protecting the crop at that point in time.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - Natural Resources Management (Nursery Industry)

- a. The nursery industry in New Mexico is small, but growing and changing. The industry as served by the New Mexico Cooperative Extension Service consists not only of the commercial nurseries, but includes landscape design and maintenance, tree and lawn care, and the turfgrass management professionals. These related industries are changing to meet the needs of citizens demanding more water conservative landscapes at home and throughout the state. This nursery industry in New Mexico is also actively promoting and incorporating the principles of integrated pest management (Urban IPM).

- b. Accomplishments - Increased implementation of water conservative landscape practices as assessed by self-assessment questionnaires and the growth of the Southwest Turfgrass Association.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - 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. Accomplishments: 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

Key Theme – 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. Accomplishments -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

Key Theme - Natural Resources Management (Wildlife Management)

- a. Many New Mexicans exhibit an interest in wildlife for varied reasons and illustrate a need for life history information as well as management information. Up-to-date information is needed to guide these individuals in their management endeavors to ensure the long-term sustainability of our natural resources. Technical information outlining the methods of control for wildlife damages also is greatly needed. 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. Accomplishments – Accomplishments were made in many areas of this program including numerous publications and curriculum materials written on wildlife management education techniques. A manuscript was developed for a general audience on wildlife survival in desert environments and was published in the *New Mexico Journal of Science*. A poster on ungulate distribution and forage utilization in the Sacramento Mountains was presented at the 2001 Society for Range Management Conference. An audio release was produced dealing with elk hunting by NMSU CES. Several newspaper articles were written including scaled quail habitat management and deer hunting in New Mexico.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Multistate (AZ, MT, UT)

Key Theme - 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. Accomplishments - This program is evaluated through the NRCS comprehensive nutrient management planning team. Publications that assist growers are also an indication as to the success of the programming. This past year four publications were written.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Key Theme - Pesticide Application (Pest Applicator Training)

- a. Pesticides need to be used in a precise, safe and judicious manner. The PAT program is the only one available that instructs in the basic information required to pass examinations for obtaining a certified pesticide applicators license. 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. Accomplishments -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. In 2001, there were five Ornamental and Turf workshops that were attended by more than 300 individuals. Of these approximately 125 took examinations to become licensed as a pesticide applicator. Specialists are guest lectures at pesticide applicators conference throughout the year. Also, there is an on-going master gardener training program that is taught by county agents and specialists.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - Riparian Management (Riparian Management)

- a. The Riparian Management Program at New Mexico State University is designed to work with producers, natural resource managers, state and federal agencies, and other interest groups to promote and teach sustainable riparian area management while simultaneously maintaining their value to producers. The Extension Riparian Management Specialist is responsible for teaching and promoting state-of-the-art techniques for riparian area management. Where the current scientific literature fails to provide adequate guidance for riparian area management, research is conducted to develop the knowledge-base necessary to make informed management decisions.

- b. Accomplishments - The Riparian Management Program is a new program for New Mexico. Since 1998, significant steps have been taken to educate producers, natural resource professionals in the private and public sectors, the general public, and youth in New Mexico about sustainable riparian management technologies. Through educational efforts, these individuals have gained a more thorough understanding of the history, current status, importance, and potential of riparian areas in the southwest. In the absence of such an effort, it could be speculated that the appreciation for the importance of riparian areas in the landscape might be lost. It could also be speculated that the absence of a cohesive, directed riparian ecology and management educational effort in New Mexico could result in a shortage of scientific information to guide the management of these valuable resources.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Multistate (CO)

Key Theme - Sustainable Agriculture (Soil & Water Conservation)

- a. Conservation of both soil and water resources is a top priority for the entire state of New Mexico. The most important efforts in this area for the year were the establishment of an expanded drip irrigation program at the South Research Farm. This study utilized this year to evaluate peanut variety responses to applications of calcium (gypsum), cotton variety tests, and kenaf variety trials. This is a continuation of the three- year program sponsored in part by the USDA Georgia Agricultural Experiment Station (\$5,000.00), with the remaining funds for the ASC-Clovis and NMSU (approximately \$5,000.00).
- b. Accomplishments - Drip irrigation facilities were established with water conservation of up to 50% of normal use. In addition, a 1.3-acre drip irrigation project has been established on the South Research Facility of the Clovis Agricultural Experiment Station.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -Integrated Research and Extension

Key Theme - 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. Accomplishments - 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 – Multistate (TX)

Key Theme - 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. Accomplishments - 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

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 \$531,306.27 from Smith-Lever Act 3(b)(c) appropriated funds. The number of full-time equivalents engaged in research for this goal was 10.0.

Key Theme - Children, Youth, and Families at Risk (Expanded 4-H Programming)

- a. 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 are components of the 4-H Youth Development Program including "4-H Programming." The delivery modes for this programming are primarily "Special Interest" and "School Enrichment". The audience includes, but is limited to, higher at-risk youth. The "Expanded 4-H Program" in New Mexico is designed to involve youth ages 5-19 in hands-on learning through a variety of delivery modes. While all youth are at-risk, some youth have 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 expanded its programming to reach higher at-risk youth.

- b. Accomplishments - Over 575 children in seven of the 4-H After School Share/Care Programs received at least 10-25 hours of substance abuse prevention education. Following are some evaluation results: Site A: 30% of 5th grade youth completed pre & post knowledge gain surveys which showed a 30% increase in knowledge regarding substance abuse prevention. Site B: 76% of K-2nd grade youth completed pre & post knowledge gain surveys which showed a 10% increase in knowledge. Site C: Three locations of 3rd to 6th grade youth completed pre & post knowledge gain surveys which showed a 8% increase in knowledge. Six issues of a parent newsletter, "Partners in Prevention," were developed. The goal of the newsletter was to bridge the parent-child connection for discussing substance abuse topics and prevention. 4-H after school programs were conducted in nine counties during 1999-2000 that prior to the 4-H Share/Care Program had not existed. Over 1,700 children participated in the ten county 4-H Share/Care programs. An additional county with five school sites began conducting 4-H after school programs in Fall 2000 which is expected to reach 150 youth. "Babys First Wish" newsletters about child development were distributed to teen parents in Santa Fe and Bernalillo counties.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme - 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. The Small Farm Task Force/RAIPAP is a project of the New Mexico State University Cooperative Extension Service. This project presents a holistic approach through its intended goals, to provide the essential resources required for empowerment that would sustain rural family life. This is accomplished by training the local residents to carry out rural development that will improve the quality of life and increase economic opportunities in their communities.
- b. Accomplishments - The New Mexico Cooperative Extension Service received the National Range Conservation Award from the USDA Forest Service for their contribution to the Valle Grande Grassbank project. Nine new small businesses were stated this past year in Mora, Taos and Rio Arriba Counties through technical and educational assistance from the project. The project assisted La Jicarita Enterprise Community in planning and implementing a value-added small diameter timber business for Mora County. This venture will employ up to 20 county residents in the first year and provide a wholesale outlet for up to 50 county residents. The project assisted La Jicarita Enterprise Community in planning and implementing a natural beef and lamb

marketing program for Rio Arriba, Taos and Mora Counties. This program will increase the economic return for more than 50 county residents. The Project was awarded a \$278,000 grant from the USDA Office of Outreach to develop an outreach program, Northern New Mexico Outreach Project, which will target socially disadvantaged farmers and ranchers in north central New Mexico. This project will add four new Agent positions to the RAIPAP.

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

Key Theme – Consumer Management – Family Resource Management

- a. Not all New Mexico households are benefiting from the current booming economy. The following indicators relate to a state population of 1,739,844. New Mexico's per capita income of \$22,063 ranks 48th in the nation. Per capita income ranges from \$12,667 to \$28,040 among the counties. Unemployment rates for the state are 5.5% (June, 2000) but that varies from 3.6% in an urban county to 25.9% in a rural county. About 29% of New Mexico children live in poverty, 32% of children live in single parent homes. As the Baby Boom generation (those born between 1946 and 1964) reaches retirement age, the growth of the population 65 and over is projected to increase. In 1998, 11.4% of New Mexico's population was 65 and over and 15.7% of those were below the poverty level. The next 15 to 30 years will be the boomers last opportunity to save for retirement, yet the national savings rate for 1999 was 2.6% of income. The number of individuals who need to make decisions regarding their retirement savings both in and out of the workplace is increasing.
- b. Accomplishments – Money 2000 ended in July 2001. In the 2-½ years of the program approximately 40 participants who reported on their goals reported saving \$220,706 and reducing debt by \$383,784. A conceptual framework for the STEPS (Steps to Employment and Personal Success) life skills classes related to transitioning from welfare to work was developed and curriculum was provided to support it. From July to September 2001, approximately 20 students were enrolled in class. Six Habitat for Humanity clients were encouraged to develop a spending plan and were able to save the down payment and are in new houses. The High School Financial Planning Program was used by 32 New Mexico schools and reached 4,107 students.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme – Impact of Change on Rural Communities (Teleliteracy Assistance)

- a. The New Mexico Teleliteracy Assistance for Businesses and Communities program was funded by Qwest Communications International, Inc. This program is composed of four modules aimed at four rural audiences; the general public, business and community leaders, individual businesses, and local government. The intention in the entire

Teleliteracy ABCs program has been to stress the importance of the Internet and related technologies to the economic and social well being of rural communities and businesses in New Mexico.

- b. Accomplishments - In conducting one of the modules in each of six pilot communities in the winter and spring of 2001, audiences were generally small, but highly complementary about program materials. Low audience turnout emphasized the need for local activists to promote the Internet as essential to rural business and community economic survival in the Internet Age. During the pilot stage the second module was determined to be of greatest immediate importance, because of a reluctance of many rural residents to realize the importance of teleliteracy. This second module sends out a call for "Rural Internet Activists" among rural leaders at the community level. Subtitled "A Call for Rural Internet Activists," module 2 is an advocacy program. Telecommunications infrastructure, high-speed Internet access, and related expertise are limited in rural areas. Local advocates are needed to convince local businesses and community leaders of the importance of working together to overcome these limitations. Active leadership at the local level is crucial to bringing about change in a timely manner.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact -State Specific

Key Theme – Parenting (Child Development and Family Life)

- a. Baby's First Wish is an age-paced, developmental newsletter for parents of young children. It is currently being distributed to approximately 13,000 parents of children aged 1 month to 3 years in New Mexico on a monthly basis. The majority of recipients are ethnic minorities, and some of them are teen parents. The newsletter is mailed from NMSU in Las Cruces. The newsletter is free and a subscription form is included with each birth certificate. Costs of printing, distributing, and mailing the newsletter, translating into Spanish, and developing similar letters beyond age one, initially were a collaborative effort of many other public and private agencies and groups. Presently Cooperative Extension pays for the cost of the program.
- b. Accomplishments -The number of participants in the program increased from zero in 1993 to 8,500 in 1998 to 12,000 in 1999 to 13,000 in 2001. Impact Report-Making a Difference: Baby's First Wish (1998). Disseminated to county Extension personnel and state legislators. Also appeared in Science and Education Impact: Benefits from the USDA/ Land Grant Partnership, a national database (1999). An article on the program was published. Baby's First Wish- A Successful Monthly Newsletter (1994). Journal of Extension by Dr. Diana DelCampo and Dr. Wendy Hamilton.
- c. Source of Federal Funding -Smith Lever 3(b)(c)

- d. Scope of Impact -State Specific

Key Theme - Leadership Training (Volunteer Development)

- a. 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. These individuals must be recruited, selected, oriented, trained, supervised, evaluated and recognized for a sustaining volunteer program. Currently New Mexico has 4,817 adult volunteer leaders in the 4-H Youth Development Program. These individuals serve as organizational leaders for clubs/groups, project leaders, activity leaders, and resource leaders. These 4-H Leaders provide a significant amount of direct contact with 4-H youth and are essential partners in the New Mexico 4-H Youth Development Program. Adult 4-H leaders provided leadership, encouragement and guidance to 44,813 youth this past 4-H program year in 709 clubs, special interest groups/daycamps, school enrichment classes and after school programs.
- b. Accomplishments - A variety of 4-H leader education programs were conducted including topics such as: This is 4-H, Organizing and Conducting Club Meetings, Planning the 4-H Year, Enrollment Procedures, Public Presentations, Teaching Methods, Leadership, Youth/Adult Partnerships, 4-H Recognition Model, 4-H Life Skills, Ethics, New Projects, Recordkeeping, and 4-H Opportunities. Agents provided support to countywide Leader/Parent Associations and educational activity/event committees. Written support materials to accompany the orientation video for new 4-H leaders is present in each county office. A statewide 4-H Leaders' Forum was held in a central location and provided 17 workshops, 5 speakers, and an experiential learning session for 82 volunteers from 17 counties. A statewide 4-H Leader recruitment campaign is being conducted. Each county has video, brochures, buttons, posters, press releases and public service announcements for use in recruiting additional volunteers.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Multistate (UT)

Key Theme - Tourism (Rural Economic Development Through Tourism)

- a. REDTT provides education, training and technical assistance to 13 New Mexico counties. It works through county tourism councils set up in each of the counties it serves. Each council meets monthly, with a member of the paid REDTT staff attending as technical assistant, to determine tourism goals for the coming year, increase council participation and improve tourism countywide and regionally. REDTT also conducts a yearly rural tourism conference, open statewide, to help tourism volunteers and professionals learn more about successful tourism techniques and programs.
- b. Accomplishments - Although specific dollar amounts are difficult to judge, REDTT has had economic impact on the counties it serves through festival evaluations, which help improve local festivals and, through the festival evaluation document, help festival committees obtain increased funding. REDTT has awarded nearly \$200,000 in grant funds to member counties since the project began in 1992. The money has been used as matching funds for grants from other funding agencies and also has been used as seed money for a wide range of tourism projects, including educational billboards, brochures,

banners and maps; festival development; familiarization and writers tours; trade show development. REDTT also has awarded more than \$150,000 since 1992 in funds to county CES offices to help pay for tourism-related expenses. And, REDTT had paid more than \$100,000 for part-time Extension program aides to work in counties served on tourism initiatives.

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

Key Theme - Youth Development/4-H – (4-H Youth Development)

- a. 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. These individuals must be recruited, selected, oriented, trained, supervised, evaluated and recognized for a sustaining volunteer program. Currently New Mexico has 4,817 adult volunteer leaders in the 4-H Youth Development Program. These individuals serve as organizational leaders for clubs/groups, project leaders, activity leaders, and resource leaders. These 4-H Leaders provide a significant amount of direct contact with 4-H youth and are essential partners in the New Mexico 4-H Youth Development Program. Adult 4-H leaders provided leadership, encouragement and guidance to 44,813 youth this past 4-H program year in 709 clubs, special interest groups/day camps, school enrichment classes and after school programs.
- b. Accomplishments - A variety of 4-H leader education programs were conducted including topics such as: This is 4-H, Organizing and Conducting Club Meetings, Planning the 4-H Year, Enrollment Procedures, Public Presentations, Teaching Methods, Leadership, Youth/Adult Partnerships, 4-H Recognition Model, 4-H Life Skills, Ethics, New Projects, Recordkeeping, and 4-H Opportunities. Agents provided support to countywide Leader/Parent Associations and educational activity/event committees. Written support materials to accompany the orientation video for new 4-H leaders is present in each county office.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact – Multistate (AZ, UT)

Key Theme - Youth Development/4-H (School Enrichment)

- a. New Mexico schools offer an audience for 4-H programming. With the growing for experiential curricula and limited school resources to fill that demand, 4-H is a logical source and partner for schools. The New Mexico 4-H School Enrichment Program is designed to 1) involve youth in an in-school 4-H experience, and 2) offer teachers a variety of classroom curricula that meet the New Mexico State Department of Education content standards. Teachers request curriculum through their local County Extension office and County Extension faculty provide the materials as well as an introduction what 4-H offers youth.

- b. Accomplishments - Youth gained knowledge/skills in the following areas: importance washing their hands and personal hygiene, growth and development, wildlife and the environment, where agricultural products come from, conflict resolution, nutrition, leadership, citizenship, safety, water conservation and natural resources, Kids, Kows and More, embryology, parliamentary procedure, insect collecting, What is 4-H?, sun and bicycle safety, lawnmower safety, farm safety, 4-H Cloverbuds, substance abuse prevention, entomology, sewing, baking, clowning, manners, interrelation between land, food production and people's actions and child care and development. New program materials were added as follows: Proud to Be Polite - 3 age level programs each with teachers' guides, games and videos (appropriate for K through high school). This was requested by counties and has been used extensively.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Management Goals

Key Theme - Information Technologies (Distance Education Delivery System)

- a. This distance education system will respond to the needs of citizens at the local level for life-long, practical education related to agriculture, community development, 4-H and youth development, and family and consumer science. This system will greatly increase Extension's potential to reach formerly unserved groups. By offering "asynchronous education" (education available to clientele any time and any place), citizens formerly unable to participate in Extension programs can now do so via the Internet, even when Extension office is closed and/or they live a great distance from an Extension office.
- b. Accomplishments - Each county office was assessed to determine the need and infrastructure capability to use distance educational technologies to serve their Extension clientele. Free or low-cost internet connections were negotiated for 10 offices. Field tests have been conducted in 10% of the county offices. Plans to develop and pilot test distance education training programs for state and field staff are underway and will be conducted on the NMSU campus.
- c. Source of Federal Funding -Smith Lever 3(b)(c)
- d. Scope of Impact - State Specific

Key Theme - 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. Accomplishments -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

Key Theme - Multicultural and Diversity Issues (Affirmative Action)

- 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. Accomplishments -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

Key Theme - 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. Accomplishments - Extension educators will have the capability to prepare and present electronic materials to meet the educational needs of their multicultural (primary 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 (HI, IL, IN, UT)

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

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 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

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

Institution 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>Water Quality</u>	<u>6,817</u>	<u>8,000</u>			
<u>Pecans Nut Development</u>	<u>12,724</u>	<u>14,000</u>			
<u>Turfgrass, Soil, Water</u>	<u>11,361</u>	<u>15,000</u>			
<u>Costs & Returns for Crops & Livestock</u>	<u>8,180</u>	<u>10,000</u>			
<u>Excess Property</u>	<u>6,817</u>	<u>7,500</u>			
<u>Dairy</u>	<u>11,361</u>	<u>13,000</u>			
<u>Soil, Water, and Ag. Productivity</u>	<u>3,636</u>	<u>25,000</u>			
<u>Agricultural Economics (discontinued)</u>	<u>8,407</u>	<u>0</u>			
<u>Food Safety and Nutrition (discontinued)</u>	<u>2,954</u>	<u>0</u>			
Total	<u>227,222</u>	<u>270,724</u>			

 Director

 Date

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 *Apthona* 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 million, peanuts average over \$800 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.