[1]Annual Report of Accomplishments and Results: FY 2000

Texas Agricultural Experiment Station

Texas A&M University System
Agriculture Program

For Federal Reporting Year
2000

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A. Planned Programs.

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

Overview

The Texas Agricultural Experiment Station (TAES) is conducting research to keep Texas producers of crops and livestock competitive. The worldwide market for agriculture products is becoming more integrated, and the competitive edge of producers is narrowing. Research investments in the Texas agricultural economy seek to maintain or improve crops and livestock industry viability, especially (1) farm-level impacts of agricultural policy, (2) precision agriculture, and (3) genomics of major animal and plant systems programs.

Farm-level Impacts. For farm-level impacts of agricultural policy, producers and consumers would benefit from research that analyzes the impacts of agricultural programs on farms in key production regions of the United States. This research estimates how regional production, commodity prices, farm incomes, and consumer food costs are economically affected by U.S. farm programs. By studying the effects of agricultural policy, we are assessing how U.S. economic relationships impact individual representative farms, and then extrapolating this to assess the viability of the U.S. food and fiber industry. Though this effort includes a focus on regional impacts nationwide, 16 Texas farms are featured in the study so that Texas' agricultural interests can formulate position statements, effect policy changes, and restructure their businesses to remain competitively viable. This program is in collaboration with the Food and Agriculture Policy Research Institute (University of Missouri - Columbia) and the Farm Sector Financial Analysis Branch of CSREES/ERS. The effort supports the agriculture legislative committees in assessing more than 100 policy options.

Precision Agriculture. Precision agriculture technologies offer an opportunity to both help producers survive economically while protecting the sensitive natural resources. Dryland crop production in the arid and semiarid Southwest includes more than 60% of the cultivated land and millions of acres of rangeland used for livestock production. This region is subject to high levels of risk in markets (global economy) and production (vagaries of weather, e.g., drought). The FAIR Act deletes commodity price support programs, and is expected to cause some crop land to be converted to grazing lands. This creates both economic risk and resource risk as conversions occur. Major gains in crop production have been achieved in development and application of precision agriculture to high rainfall crop production regions and irrigated crop lands. However, little attention has been devoted to bringing precision agriculture to areas like Texas with dryland crop production in arid and semiarid environments.

Animal and Plant Genomics. Molecular genetics research concerns the technological and research enhancements for animal and plant systems. Land grant institutions and agencies across the United States are increasingly concentrating on the genomics of major animal and plant systems. Researchers are improving the health and productivity of livestock and crops by understanding the role of genetics in controlling resistance to pests and environmental stresses, enhancing food products, and improving and sustaining the environment and natural resources.

Source of Funding and FTEs

Hatch Funds($ x 1000): 4,572.2
State Funds ($ x 1000): 18,153.2
FTEs: 115.72

215 projects worked on Goal 1 programs and reported 1110 publications.

Key Themes: Agricultural Competitiveness/Agricultural Profitability

A. Planned Programs.

a. Description of Activity

The TAES Agricultural and Food Policy Center works to keep Congress and U.S. agriculture stakeholders informed of the economic health of U.S. feed grain, wheat, cotton, rice, beef, hog and dairy farms -- and the effects national policies have on their economic viability. Through this research, economists can assess how U.S. economic relationships impact individual representative farms, then extrapolate this to assess the overall viability of the U.S. food and fiber industry. Such research provides estimates of how regional production, commodity prices, farm incomes and consumer food costs are affected by farm programs. Analysis of the impacts of farm policy on future structure, viability, and competitiveness of alternative crops has enabled Texas producers to be more proactive on farm policy issues. This has amounted to their being better equipped to facilitate policy changes in Congress and to better manage their farm and ranch operations in an increasingly risky economy.

As NAFTA fosters continued economic integration with Canada and Mexico, key issues have developed relating to food safety, pest management, food marketing and distribution, and the environment. The Center for North American Studies is addressing these issues by promoting agricultural ties among the three countries, facilitating open trade growth, maintaining U.S. competitiveness and fostering greater cooperation.

b. Impact of Program

Research of the Agricultural and Food Policy Center continues to emphasize regional and farm-level effects of alternative agricultural policies on crop and livestock producers. Monitoring performance at the farm level remains critical as the U.S. agriculture industry adjusts to reduced government roles mandated by the 1996 Farm Bill. Congressional Agricultural Committees turned to this project many times during the past ten years for assistance in quantifying economic impacts of representative farms in major production regions of the nation. Since the analytical capabilities developed by the Center in the area of farm-level policy are not available to Congress from the USDA or other research centers, the Center's role remained key to agriculture policy decision making on Capitol Hill. Following is a brief recap of the initiative in fiscal year 2000.

Each year the Agricultural and Food Policy Center works with the Food and Agricultural Policy Research Institute at the University of Missouri and Iowa State University to develop a 10-year baseline for farm-level operations that is used throughout the year as a reference point for policy analysis. The baseline is cited the world over as the best projection of U.S. and foreign agricultural economies. The baseline was reviewed by more than 100 economists and policy analysts at a two-day meeting in December, and the results were then presented to the Congressional Agriculture Committees, USDA,

farm organizations and congressional staff members. During 2000 the Policy Center was requested, by Congress, to analyze the impacts of 17 alternative proposed farm programs. One such study involved analyzing four policy options that each spent $3 billion per year and ranking them as to which one helped crop farmers the most. Another study involved quantifying the economic impacts of Congressman Stenholm's and the 21st Century Commission's proposals for risk management. The Policy Center was asked to develop and analyze a whole farm revenue insurance program for consideration by Congress and the Risk Management Agency in USDA. Reports of these analyses were presented to the Agriculture Committees, USDA, the Texas Congressional delegation, and farm organizations in Texas and at the national level.

The Center for North American Studies(http://cnas.tamu.edu) has established long-term cooperative agreements with the Instituto Technologico de Estudios Superiores de Monterrey-Centro Internacional de Agronegocios in Monterrey, Mexico, and the George Morris Centre-University of Guelph, in Ontario, Canada. It also has established a working relationship with the International Policy Council to assist with the development of policy initiatives which support the competitive position of U.S. agriculture. Other activities include conducting a video conference with agribusiness leaders, state government officials and extension agents from Chihuahua, Mexico, on impacts of NAFTA and trade liberalization on livestock and meats, grains and horticultural industries; providing analytical support and training for Texas, New Mexico and Mexico producers and managers at meetings of the West Texas-Chihuahua Alliance; developing analytical tools for monitoring agricultural trade issues in support of American Farm Bureau Federation efforts. These materials are being used to help our nation's leadership be as informed as possible about the impacts of trade issues on U.S. agriculture; implementing "AgroInfo Americas," an Internet-based information system to support private and public decision making in food and agricultural industries of the Western Hemisphere; continuing development of a comprehensive NAFTA and agriculture database, with 3,500 articles available on the Internet for use by private and public decision makers; providing analytical support for the Texas Produce Association and the Texas rice industry to study the impacts of imports from Mexico on Texas prices and emerging market opportunities in Mexico. Materials were used by congressional representatives and industry leaders; analyzing the impacts of NAFTA on Mexican livestock, meat and feed industries, as well as the U.S. and Mexican fresh vegetable industries, and distributed information to industry leaders through educational programs, and conducting or assisting with training programs in Texas and Mexico for producers and agribusiness managers, reaching more than 3,000 individuals. Topics ranged from the impacts of trade liberalization and U.S. requirements for food imports to international strategic alliances.

Studies completed included monitoring the effects of alternative market loss assistance payments (double AMTA's), disaster payments, risk management strategies, revenue and crop insurance programs, wool and mohair price support programs, fuel and input inflation rates, and supply control programs on representative crop, livestock and dairy farms. Congress was interested in the impacts of these policies and requested these studies. In addition, the Policy Center collaborated in the analysis of the impacts of regulations on pesticide use in the Texas Blacklands and on poultry waste in a watershed in Missouri. These studies all utilized the Policy Center's data base of representative farms. Representative crop, livestock, and dairy farms developed by the Policy Center and used for policy

analyses were located earlier by Congress and include representative farms in the following states: Washington, North Dakota, Iowa, Nebraska, Missouri, Arkansas, Mississippi, South Carolina, California, Colorado, Kansas, Louisiana, Florida, Georgia, North Carolina, Tennessee, Illinois, Indiana, Nevada, Wyoming, Montana, Wisconsin, Michigan, New York, Vermont, New Mexico, and Texas. The farms used for analysis are representative of moderate and large farming operations in most regions. The Center continued to maintain and update its database of more than 80 representative farms.

Over the past year, the Policy Center also has strengthened its partnership with the Food and Agricultural Policy Research Institute and the USDA, including the development of software that provides the ability to cross-reference data from both research centers. FAPRI at the University of Missouri-Columbia has established a farm level unit which analyzes farms in Missouri using the Texas Policy Center's model. This activity has broadened the Center's capability and access to farm information in Missouri. FAPRI's interest in farm level modeling has focused on analysis of environmental policy for pesticide use and animal wastes.

Policy Center researchers published more than 20 journal articles, reports, and briefings during the past fiscal year. Policy Center analysts conducted more than 80 presentations and briefings to policymakers and their staff members, commodity groups, USDA administrators and economists, consumer interest groups, farm organizations and environmental groups last year in its efforts to disseminate the most current information to the stakeholders who needed it most. Copies of the Center's baseline reports were mailed to all crop, livestock, and dairy producers involved in data development, as well as more than 250 extension specialists, policy analysts and congressional staff members. The Center's World Wide Web site(http://www.afpc.tamu.edu), which offers instant access to much of the research and policy analysis, was visited more than 100,000 times and transferred more than 1.9 billion bytes of data. The Web site has increased the Center's ability to reach interest groups in the fastest and most efficient way possible.

c. Source of Federal funds

Funds for this research are provided by Hatch and state matching.

d. Scope of impact:

Integrated Reserach & Extension

Multistate Integrated Research & Extension - MO, IA

Key Theme: Precision Agriculture

a. Description of Activity

Global competitiveness, environmental regulations, and absence of traditional farm support programs are causing increased economic risk for producers. Precision agriculture is an exciting approach for helping producers better manage risk, and it links space-age technology with practical management practices. Precision agriculture uses satellites, computers, and other new technology tools to assist producers make informed decisions on when and where to apply inputs such as fertilizer, pesticides, and water. Producers can thus maximize efficiency and profits and reduce environmental pressures. Researchers and educators have joined forces to concentrate their efforts on the High Plains, an area that requires substantial agricultural inputs to grow crops.

b. Impact of Program

Crop production factors such as soil depth, fertility, and textures are not uniform across a field, yet farmers uniformly apply inputs such as chemicals, water, and fertilizers despite these variations. In the process, they waste production inputs and unnecessarily invest money. TAES researchers have demonstrated that farmers should not change or vary the amount of one input alone to adapt to variations, but should deal with the entire production sequence. Researchers are studying which factors are most important to the final yield. For example, water, topsoil depth, plant population, and some forms of tillage are factors that most influence corn yields. From this work, they are devising whole crop management systems that will permit producers to cost-effectively manipulate multiple inputs, and reduce the effects of weather- and pest-related stress in their fields.

Researchers have determined that yield mapping monitors on combines, which measure yields for each second of travel, are an effective and accurate tool for assessing a field's overall production. This technology produces a picture or map of yield and moisture variations in the field. Using this technology, researchers identified sprinkler nozzles that were plugged incorrectly on center pivot systems, and caused inefficient irrigation and reduced yields. Using yield mapping, scientists also detected extreme variations in grain yields across fields that were visually uniform. Yield mapping also is helping farmers recognize specific areas of their fields needing more or less production inputs. By varying inputs, rather than uniformly applying them, farmers can increase net profits.

Some of the variations in crop yields are due to large variations of soil profile depths within fields. Currently, the general practice is to take soil samples from the top 6 inches to create a soil profile. Researchers found that soil samples in the High Plains should be taken deeper than 6 inches because sandy topsoil typical of the area has less nitrogen than clay subsoil and gives false readings for soil capacity to supply nitrogen. They also have determined that infrared and other multi-spectral remote sensing can detect different types of crop stresses such as nitrogen deficiency, diseases, insects, and drought. While working with satellite imagery, they learned that both aerial and satellite images requires extensive interpretation by trained personnel to determine what the images mean. Field equipment and procedures are being refined so that producers can readily use them in their operations, and to make these technologies cost effective. These complex techniques hold great promise for detecting nutrient deficiency, diseases and damage before they are visible and cost growers money.

More than 80 on-farm demonstrations of precision agriculture technology have been conducted through a network of individuals, corporations, organizations, and agencies that support demonstration technicians for farms in most of 42 counties of the High Plains. Scientists and agents trained technicians as "agripartners" who have demonstrated precision agriculture technology and methods, and assessed existing yield variability on farms. They surveyed insects weekly across the Panhandle to help researchers evaluate the effects of precision agriculture practices on insect populations, and they conducted demonstrations, workshops, meetings, and tours as well as disseminate publications and news releases. This program is working with eight farm equipment companies to ensure that current and developing precision agriculture technologies can fit with unique production concerns of High Plains agriculture, including water stress, availability of soil moisture, diseases, insects, and nutrient variability.

High Plains research personnel are helping farmers integrate knowledge obtained from precision agriculture technologies to implement site-specific production practices that will increase their profits and

reduce water and pesticide use. They also are determining factors that are most important to production and which can be corrected.

c. Source of Federal funds:

Funds for this research are provided by Hatch and state matching.

d. Scope of impact:

Integrated Research & Extension

Key Theme: Animal Genomics

a. Description of Activity

Genetic susceptibility to disease is a problem of animal production, as is lack of knowledge about genes affecting other traits such as meat quality also hampers improvements in the health, meat quality and production. TAES researchers are participating in the National Animal Genome Research Program (NAGRP) which is contributing to the editing and maintaining of the bovine genome database for the USDA and coordinates bovine genomic research activities in the U.S. They also are examining the structure and function of the bovine MHC to find homologous genes associated with disease susceptibility in humans and/or mice, and are using comparative maps of mice and humans to find candidate genes for economically important traits in cattle

b. Impact

The genetic integrity of the inbred mouse stock is maintained by periodic genetic monitoring of allelic composition at defined chromosomal loci. In several strains, inadvertent outcrossing, or contamination, was detected and thus prevented serious damage to ongoing and new research programs using this resource. Studies with the comparative maps of mice and humans have demonstrated that rearrangement of gene order within segments of conserved synteny will be important in trans-species shuttling of genomic information.

c. Source of Funds

Funds for this research are provided by Hatch and state matching.

d. Scope of impact

State and Multistate Project (NRSP-8) OK, VA, KY,MN,CA,MI,UT,IA,LA

Key Theme: Plant Genomics

a. Description of Activity

Integrating genetic, physical, and cytogenetic maps of crop plant chromosomes will improve efficacy of genetic resources in plant breeding. TAES programs are expanding efforts to develop Cotton DB and Sorghum DB, and integrate new tools for data delivery, integration, and analysis for crop genome and germplasm databases. Other scientists are developing an integrated genetic, physical, and a cytogenetic map of the rice genome.

b. Impact:

Large-insert BAC libraries are essential for genomics research, and 10 new large-insert BAC and BIBAC libraries have been developed. We now have 50 BAC and BIBAC libraries, the largest collection of the BAC libraries in the world. Currently, more than 540 laboratories world-wide are using our BAC libraries in research. Researchers have extensively tested the reliability of the rice and

Arabidopsis BAC-BIBAC physical maps; integrated the BAC physical maps and genetic linkage maps for rice chromosomes 8, 11 and 12; created a new database especially for integrated genetic and physical maps of agricultural genomes; and developed a new, web-based genomics information system (GIS) for physical map manipulation and use. They also initiated genome-wide integrated physical mapping of the soybean and chicken genomes, and completed about 1/2 of the laboratory work for constructing the soybean BAC/BIBAC physical map.

Research results from the cotton program are placed in the publicly available ARS plant genome database (CottonDB) because publicly available resources in this area are limited, and a few private biotech giants control most available resources, especially in the markets of transgenic cottons.

c. Source of Funds

Funds for this research are provided by Hatch and state matching.

d. Scope of Impact

Multistate (Multistate Project, S-258) SC, (Southern Regional Information and Exchange Group, SRIEG-61) CA, AR, NC, LA, NM, TN, MS, SC, AZ

Goal 2: A safe and secure food and fiber system

Overview

The food industry is vulnerable to crisis situations such as a recall or foodborne outbreaks. Situations like these can take a company by suprise, but if a company is well prepared, it can manage through the crisis with relatively few setbacks. Food Companies worldwide need to stay ahead of the competition with the risk of investing heavily in research and development. Help ing companies meet this challenge is the goal of TAES via the Texas Science Partnership which offers the private sector opportunity to collaborate with TAES scientists conducting research in food technology. Faculty represent diverse academic disciplines and research interests, and are addressing critical issues such as fundamental mechanisms of chemical interaction and appropriate responses to spoilage/foodborne disease outbreaks. This type of technical knowledge is being made available to industry. Through collaborations, companies pursue novel ideas that hold promise but represent an expensive or risky investment, and discuss ideas and solutions. The knowledge base and research is extending the technical resources of companies, and providing a competit ive edge.

Source of Funding and FTEs

Hatch Funds($ x 1000): 80.1
State Funds ($ x 1000): 756.5
FTEs: 5.1

Twenty projects worked under Goal 2 programs and reported 90 publications.

Key Theme: Food Safety

a. Issue

Safety. Technologies that increase shelf-life and improve meat product safety are of major interest to food companies and consumers. Regarding pathogens in food, researchers have focused on important factors regarding the ability of cattle, beef and swine to transmit *Helicobacter pylori* to

humans. Alternatives are needed for reducing bacterial levels in environments of newly hatched chicks, as egg shells are a major source of bacterial contamination of food products, and alternative sanitizers for shell egg producers will enhance pathogen-reduction programs. *Salmonella* associated with poultry products has historically been the most frequent cause of food borne illness in humans. Thus, federal and state regulatory agencies mandate that U.S. poultry producers follow *Salmonella* reduction guidelines. Currently, few tools or methods are available for producers to use. Contamination during production of domestic and imported cabbage and cantaloupes. Concerns over the safety of produce have raised questions about the effect that production practices ultimately have on the incidence of disease-causing microorganisms in ready-to-eat or minimally processed fruits and vegetables. TAES is assessing practices currently used in the production of cabbage and cantaloupes in Texas, as well as Mexico, in order to evaluate their impact on contamination levels of these commodities with human pathogens, identify the best practices that minimize contamination, and test possible intervention strategies in the washing of the produce to minimize or eliminate these hazards.

Quality. Also, new food products are being developed to fill needs of consumers for increased nutrition. On food quality, researchers are incorporating non-meat ingredients such as sodium lactate, permits engineering products for specific flavor, shelf-life or safety. Economic pressures challenge the meat industry to produce meat products that provide consumers with maximum palatability at lowest cost. This research is examining postmortem factors that influence the palatability, composition and safety of beef products. Research is moving ahead as a component of the Quality Lean Growth Modeling Project of the National Pork Producers Council, using new processing technologies in food preservation and product development. This project is studying the effects of novel processing (HHP - high hydrostatic pressure, and irradiation) on objective quality, as measured by various objective analyses, and sensory quality, as determined by various sensory evaluation procedures, of specific food products. These technologies and new products affect the quality of foods, and this research is assessing changes to quality that occur to food products exposed to new processing technologies, such as irradiation, high hydrostatic pressure, etc.

b. Impact

Safety. This project has assisted the beef industry in setting optimal procedures for reducing bacterial contamination for improved shelf life and safety. Studies over the past year have contributed to a growing body of knowledge regarding the characteristics and ecology of *Helicobacter pylori*. Today, many beef carcass pathogen intervention systems used by the beef industry are a result of this research. As beef slaughter inspection is reorganized under the Hazard Analysis Critical Control Point, these interventions make it possible to produce beef products that meet regulatory performance standards and mandatory criteria using cost-effective technology. Food borne illness and contamination of newly hatched chicks are major concern to the poultry industry and consumers, and current methods of reducing bacteria on hatching eggs are under increased worker safety constraints. Egg shells are a major source of bacterial contamination of food products, and alternative sanitizers for shell egg producers will enhance pathogen-reduction programs. To date, this research has made significant progress on improving sanitation processes for egg shells. When competitive exclusion cultures are administered to chickens under commercial rearing conditions, the incidence of *Salmonella* are reduced up to 75 percent. Contamination during production of domestic and imported cabbage and cantaloupes. Concerns regarding safety of produce raise questions about effects of production on

incidence of disease-causing microorganisms in ready-to-eat or minimally processed fruits and vegetables. TAES scientists are assessing practices currently used in the production of cabbage and cantaloupes in Texas, as well as Mexico, to evaluate their impact on commodity contamination with human pathogens, identify the best practices that minimize contamination, and test possible intervention strategies in the washing of the produce to minimize or eliminate these hazards. Early results indicate that *Listeria monocytogenes* contamination of cabbage may be sporadic and unpredictable, and not attributable to specific farm production practices. Research on effects of packing shed practices are underway. Recent outbreaks of food poisoning from microorganisms such as *E. coli* and *Listeria* in meats make it desirable to develop packaging film with antimicrobial properties. A film which incorporates chlorine dioxide inhibited microorganisms in packaged top round steak, but it adversely affected the color of the meat tissue through oxidation or other chemical means. An antioxidant was only temporarily and partially successful in preventing the color change.

Quality. They have documented decreased microbiological growth in cooked beef top round roasts containing three to four percent sodium lactate. Researchers also found reduced growth of four major food borne pathogens in beef with three to four percent sodium lactate. Research also found that positive beef flavors were enhanced and off-flavor development was suppressed when two to four percent sodium lactate was added. Currently, researchers are assessing use of potassium lactate in fresh beef cuts for the retail market to improve food safety, shelf-life and palatability. Improved pork quality and consistency are influenced by genetic line and slaughter weight. However, as long as swine diets either meet or exceed NRC requirements for lysine, ham composition and lean meat quality are not affected by diet. Elastography has potential as an automated grading techno logy for pork, but additional image analysis techniques are needed before implementation.

Sodium lactate has been incorporated into almost all precooked meat products produced for delicatessen markets and luncheon meat markets. Results are being used extensively by the manufacturers and suppliers of sodium lactate to document safety and shelf-life extension. Meat producers use the research to develop new consumer products with assurance of safety.

c. Source of Federal Funds

Funds for this research are provided by USDA Small Business Association's Innovation Research Program, state and Hatch funds.

d. Scope of Impact

Integrated Research & Extension

Key Theme: Food borne Illness

a. Issue

Texas annually produces more than 4 percent of all broilers and eggs in the U.S., and these commodities are valued at more than $1 billion. Poultry products also are leading sources of *Salmonella* poisoning. If a solution is not found, demand for safer products could negatively impact the poultry market and the Texas economy. Food borne pathogen reduction in poultry by an integrated approach for controlling Salmonella at the early stages of production. Researchers are looking at the immune response of hens by developing a research program to define egg yolk antibody production to bacterial antigens, developing better disinfectants for hatching eggs, and assessing anaerobic metabolism

of *Salmonella* to better understand factors required for colonizing chicken ceca. For a control effort to be effective, accurate and sensitive methods for early detection of *Salmonella* positive birds is essential and requires an ability to rapidly screen birds and their environment. Thus, as a second component of this project, researchers are comparing and developing diagnostic tests to facilitate rapid detection of *Salmonella* contamination in poultry. They also are looking at molecular and immunological methods to greatly reduce the lag time between the poultry farm and actual confirmation of *Salmonella* contamination. This approach also will help industry design a preventive strategy at the quality control level rather than a confirmatory response to an already documented outbreak. Monetary costs associated with salmonellosis in the United States is estimated at 4 billion dollars annually. Poultry constitutes the most important animal reservoir of asymptomatic *Salmonella* excreters in the human food chain. Because the supply of eggs and chicks from infected parent breeder flocks can lead to a pyramidal increase in the degree of infection of progeny, control of *Salmonella* at early stages of production is critical. Specific research plans reflect an integrated approach for controlling Salmonella in the early stages of production.

b. Impact

Salmonella contaminating food products, especially poultry products, is a significant public health hazard. The new protocol provides the poultry industry with a preventive strategy at the hatchery and breeder flock stage rather than a trace-back response to an already documented outbreak.

This research will contribute to understanding of virulence mechanisms of *S. typhimurium*, and may provide a scientific basis for developing more optimal strategies to control the food borne pathogen.

c. Source of Federal funds

Funds for this research are provided by Hatch and state matching.

d. Scope of impact

Integrated research and extension.

Goal 3: Healthy, Well-nourished population

Overview

Diet-related diseases such as certain kinds of cancer, coronary heart disease, stroke, atherosclerosis, and diabetes, cause two-thirds of the more than 2 million annual deaths in the U.S. The long-term costs associated with their treatment is enormous. Researchers are creating vegetables that contain more nutrients that prevent these diseases.

Source of Funding and FTEs

Hatch Funds($ x 1000): 60.9
State Funds ($ x 1000): 777.8
FTEs: 8.6

Seventeen projects worked on Goal 3 programs and reported 52 publications.

Key Theme: Human Health and Human Nutrition

a. Issue

Abundant consumption of processed foods and increased avoidance of fatty foods in American diets have essentially removed healthy fatty acids from our food supply. A new approach is needed since most people weekly eat less than one meal of fish, a noted source of healthy Omega-3 fatty acids. Moreover, the Texas Hispanic population is expected to be a majority by 2020. This means the demand for ethnic staples such as tortillas will increase with the Hispanic population but with non-Hispanic people as well. In Mexico, tortillas are usually made fresh and eaten immediately, whereas in the U.S., delayed purchases of tortillas require shelf-stability. New methods to produce tortillas with extended shelf-life are being developed. Other ethnic groups in the U.S. struggle finding staples they prefer eating, such as white sorghum. Also, people allergic to wheat flour products are also seeking alternatives to wheat flour. Improved understanding about the link between the development and progression of colon cancer, second leading cause of cancer death in the U.S., could help improve the fight against colon cancer. More information is needed about fiber's connection to cancer, especially the changes that occur depending on the type of fiber and the circumstances under which it is consumed. Discovering which kinds of fiber act as weapons against the disease and which act as enhancers could help consumers make wiser choices in their diets.

b. Impact

TAES researchers Egg yolks have a fatty acid profile that offers Omega-3s, but not in amounts that make a difference in nutrition. Researchers have developed an alternative Omega-3 source--and the lagging shell egg industry will get a much-needed boost. The tortilla industry has grown significantly, with many restaurants using tortillas as wraps for other foods. This is attributed to uniform ingredients established by the tortilla industry. Sorghum food processing also is increasing because of ethnic populations and people allergic to wheat use sorghum as a substitute. Sorghum also contains less fat and more protein than corn. A sorghum food processing plant is marketing flour (similar to Bisquick), chips, and bakery mixes from processed white sorghum. The food sorghum hybrids were developed by Texas researchers and are grown under identity-preserved marketing systems for milling. Food sorghum are gaining acceptance rapidly by celiacs (intolerant to gluten in wheat) and ethnic groups. The white food-type sorghum can reduce the cost of wheat flour in baked goods. The maroon carrot is expected to bolster carrot sales and generate millions in revenue for seed companies and producers. Because of the carrot's sweetness, it's expected that more children will eat the maroon carrots--promotions are being planned using cartoon characters. The food for health research on onions, peppers, citrus, melons and other crops has created an awareness among consumers of the importance of research on foods for health. Their support for food for health research and the concept that better diets assist in disease precention will have a great impact worldwide. Release of the first carrot designed for appearance, flavor, high carotene and with anthocyanins has had an impact as a new vegetable with additional health benefits for the consumer. It has also provided a new product to assist in teaching children the importance of consuming more vegetables and fruits in their diet. TAES scientists found that a combination of the kind of fiber found in, for instance, oranges (pectin), together with fish oil, protects against cancer development. The research has also discovered a new, non-invasive method to detect changes in colon cells before an individual gets colon cancer. A patent application has been filed for the new procedure. New food sorghums are being processed into value added products for ethnic and dietary niche markets. This source of good quality sorghum is available for use in food and feed

products. Applications in bakery products, snacks, ready to eat breakfast cereals are being evaluated domestically and internationally. Additional new earlier maturing food hybrids are in advanced stages of development.

Pilgrim's Pride, based in Pittsburg, Texas, introduced EggsPlus in 1997 in supermarkets in Dallas-Fort Worth, Oklahoma City, New Orleans, parts of East Texas, and will introduce these into Southern California soon. Pilgrim's Pride reports that consumer response has been good. The overall result of this research is that the poultry industry and its consumers now have a premium shell egg that actually improves the nutritional quality of consumer diets. The 'BetaKing' maroon carrot is being sold as 'BetaSweet' throughout the US, Canada and Australia. Approximately 160 acres were grown in South Texas and Mexico this year. BetaSweet maroon carrot will impact the consumption & expand production as it is appealing to health conscious consumers as a good source of carotene & anthocyanins. Regarding the benefits and drawbacks to various types of fiber, results have also been widely published in journals as diverse as Cancer Research and Prevention Magazine, and are likely to decrease colon cancer incidence within 10 years.

c. Source of Federal funds

Funds for this research are provided by U.S. Department of Health and Human Services, state matching, and Hatch Projects.

d. Scope of impact

Integrated Research & Extension

Goal 4 Greater Harmony between agriculture and the environment

Overview

The droughts of 1996, 1998, and 1999 have heightened Texas' awareness concerning the state's water supply and the distribution of water resources. The demand for water has exceeded the water supply in some areas of the state and has resulted in legal battles between the various holders of water rights. Water resources must be efficiently manage d and conserved to ensure that future demands will be met, and that the environment is sustained.

Source of Funding and FTEs

Hatch Funds($ x 1000): 2,084.8
State Funds ($ x 1000):9,935.1
FTEs:66.65

132 projects worked under Goal 4 programs and reported 547 publications.

Key Theme: Water Quality, Natural Resources Management, and Agricultural Waster Management

a. Issue

A pilot project in 18 Texas counties is using maintenance plans that included the best irrigation practices, scheduling, and equipment; soil testing for type, nutrient availability, and hardness; field design and drainage, mowing frequency, height denseness and variety of turfgrass; and pesticide and fertilizer use. As a result, the sports fields monitored in the study reduced water use by 60 percent during a

normal rainfall season and by 25 percent during seasons with no rainfall. Additionally, many people living in the Lower Rio Grande Valley waste a lot of water due to not installing water-saving shower heads and faucets and using sprinklers that result in excessive water evaporation, water runoff, and ineffective watering of landscapes.

Mariculture and shrimp farming practices contribute to pollutant loads in effluent waters, and wild and farmed animal stocks are affected by pathogenic viruses. TAES scientists are exploring cost-effective technologies to minimize negative environmental impact in live bait and marketable shrimp production operations, and to bio-secure production management strategies to reduce the risk of disease outbreaks in wild & captive shrimp stocks.

Scientists from TAES and collaborators have teamed up to investigate how well constructed wetlands remove viruses commonly found in domestic wastewater. The project, began late in FY2000, and will incorporates field studies and laboratory experiments.

b. Impact

Studies done with *Litopenaeus vannamei* and *Farfantepenaeus aztecus* are developing more sustainable, cost effective and biosecure shrimp practices. Grow out studies evaluated the effect of diets, density and vertical netting (VN) on shrimp performance and water quality (WQ) with no discharge. Preliminary analyses suggest no sigificant differences in daily and weekly WQ among treatments, and statistical significant differences were not found in weight or suvival among treatments. A yield of 9 tons/ha was achieved with Litopenaeus vannamei without water exchange, with good survival and FCR in 111 d using a 40% protein diet. Evaluation of this management practice on commercial shrimp farms is underway. The studies with Farfantepenaeus aztecus showed that live bait brown shrimp can be produced without water discharge. Under these conditions, shrimp-growth on a low protein diet (30%) was as good as with a high protein diet (45%).

On Colonias, the project is addressing concerns about the alarming rate at which people are moving to colonias, areas without proper drinking water or wastewater treatment and are becoming infected with viral diseases like hepatitis. In many colonias, the chance of suffering from these diseases is 300% higher than in the rest of the United States.

Homeowners in San Antonio participated in a pilot program where they called a hotline to obtain information about whether they needed to water their lawns and if so, how long did they need to water to give their lawns the minimum amount of moisture needed to stay healthy. As a result, they reduced their water use by as much as 50 percent. Master Gardener volunteers have designed and built five "water smart" demonstration gardens that served as examples of water-saving landscapes. The gardens are conveniently located for class field trips and public access. AmeriCorps volunteers have educated thousands of elementary students with a curriculum called "The Water Wise Guys," and with a portable model that compares shower heads and faucets that use high and low amounts of water. High school teachers were trained on using the curriculum, "Investigating Water." As a result of these and other efforts, Valley residents are conserving more water.

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c. Source of funds

Funds for this research are provided by U.S. Department of Health and Human Services, state matching, Hatch Projects, and funds from a USDA-CSREES Special Grant..

d. Scope of impact

Integrated research & extension

Goal 5 Enhanced economic opportunity and quality of life for Americans

Overview

Market demand continues for longer lasting floral crops as well as new and unique plants for public use and greater grower profitability. The project conducts scientific research to understand the physiology of floral and nursery crops, resulting in new technologies to improve production, profitablity, and consumer satisfaction. The project is also a leader in introducing and testing new, high-value crops.

As most producers in other agricultural industries, sheep and goat producers are being squeezed to produce at higher levels which often requires higher risk activities. Scientists at the Texas A&M University Agricultural Research and Extension Center at San Angelo have created large amounts of data, discovered important biological phenomena, and developed useful technology. The data and expertise are available presently to construct decision support systems that will provide producers with reasonable outcomes of various actions. These tools are not available currently for most situations in the sheep and goat region of West Texas.

Source of Funding and FTEs

Hatch Funds($ x 1000): 153.7
State Funds ($ x 1000): 636.6
FTEs: 6.38

Sixteen projects worked under Goal 5 programs and reported 79 publications.

Key Theme: Agricultural Financial Management, Promoting Business Programs, and Supplemental Income Strategies

a. Issue

Orchids have always been a popular flower for the prom set, but surprisingly there was little research on the physiology, production techniques, and crop scheduling to support orchid production as a popular potted plant. Moth orchids stay in bloom for three to four months and tolerate low light conditions in households. A TAES scientist has developed a new potting soil and production techniques to produce mature blooming potted plants in the shortest possible time. He also discovered a simple inexpensive technique to extend the blooming season from spring to mid-summer. In combination with cooling the air, moth orchids can now be induced to bloom year round. Texas bluebonnets, the state flower, have enjoyed a protected place on the pedestal in native pastures, along roadsides, and in home landscapes. They weren't to be picked or cut, so appreciation of the unique wildflower was limited largely to Texas in the springtime. Cut flower production in the state has historically been very low, and so a bluebonnet suitable for floral arrangements and available for a more extended period of time would help renew interest in Texas' cut flower industry. There was also a critical need in the floral industry for blue-colored flowers, a rare color in the plant world.

On sheep and goat research, research is working to develop several innovations that can enhance the profitability of the industry, including a new sheep production system, an indoor production management system, and use of Angora female goats and Boer goats to produce crossbred kids for meat during periods of low mohair prices.

b. Impact

The national value of potted orchids reached an all-time high of $63 million in 1997, up from $43 million in 1996, and growers planned a 30% increase in production in 1998. In the Rio Grande Valley, new production technologies resulted in the construction of a new 44,000 sq ft commercial facility to produce potted orchids. New orchid greenhouses have also been built or are currently under construction in other locations across Texas, such as Houston, Dallas, and San Antonio. These potted orchids are being marketed throughout the U.S., bringing millions of dollars to the Texas economy and creating countless new jobs. Requests for visits to the research greenhouses and information on orchid growing practices have increased significantly in the past two years.

Recent experiments were initiated to determine the effect of a low N, high P and K fertilizer applied during the flowering season on a hybrid moth orchid (Phalaenopsis TAM Butterfly).Several conclusions were reached. The high P treatments, regardless of the frequency of application, had no effect on the date of emergence of the flowering stem (spiking), anthesis, or flower size. All plants treated with the high P fertilizer had fewer flowers (15 to 19) than the control (24 flowers). Continuous application of adequate N appears to be more important than low N and increased P for optimal flowering. Flower longevity was reduced by 12 d when fertilization was terminated on Sept 1 as opposed to a later date. Flower size was unaffected by any treatment in either experiment. Discontinuing fertilization prior to late November reduced flower count. Withholding fertilization for extended periods resulted in red leaves, loss of the lower leaves, and limited production of new leaves.

TAES scientists found a Texas-sized bluebonnet in the state's arid Big Bend region, which they used to breed a long-stemmed variety suited for floral arrangements and the commercial cut flower market. Lack of clonal propagation methods limit introduction of superior plants. Blue colored flowers are only occasionally available in cut flower industry. Many ornamental plants are not adapted to Texas climate. Project develops tissue culture techniques for clonal propagation of superior plant selections. Study examines Lupinus havardii as a cut flower crop to fill blue color niche. Plants evaluated for performance under various climatic conditions. Current studies are aimed at refining medium requirements for production of somatic embryos and determining optimal time for harvest of explants (immature embryos). Field plots of micropropagated Cercis canadensis, Ungnadia speciosa, and Berberis trifoliata are continuing to be monitored for any phenotypic differences from parent material. Breeding projects continue as follows: 1) Oleander breeding for cold hardiness continues. Five clones that exhibited no freeze damage were selected and asexually propagated. These clones are currently being evaluated at 5 locations. 2) Improvement of Lupinus havardii as a new cut flower crop continues. Work is in progress on the development of a pink cultivar, a new coral pink cultivar and the improvement of other color lines. Experiments were conducted to evaluate alternative postharvest treatments to silver thiosulfate (STS). 1-MCP was found to be efficacious in blocking ethylene action. Four other species of lupines were examined for the their response to ethylene and ethylene action inhibitors. These studies have shown that flower dessication (death) and flower abscission are both

affected by exogenous ethylene but are under separate control. Further studies are underway to further elucidate these mechanisms.

For Bluebonnets, commercial production of the flowers has begun in We st Texas, and flowers are being shipped throughout the state and nation. Texans and people around the nation can now enjoy bluebonnets from December to May instead of just a month in the spring. Since sales to florist retailers began in 1997, more than 200,000 stems have been sold. The state comptroller estimated that if Texas bluebonnet growers could produce just 10% of the current total number of cut flowers purchased, there would be 1,100 new jobs and a total economic impact of more than $100 million. A maroon flower color cultivar of L. texensis, `Texas Maroon', was released this last year. Identification of landscape plants for Texas. Test plots were expanded, and included annuals, perennials, and woody ornamental shrubs and trees. Preliminary evaluation of roses for tolerance to alkaline soils, diseases, and pests was begun. Breeding efforts resulted in the release of a new Texas bluebonnet (Lupinus texensis) cultivar for use as a bedding plant. An increased understanding of ethylene action on cut flowers of lupines was gained. Evaluation of plants for their adaptability to Texas landscapes resulted in the identification and promotion of superior ornamental plants for Texas consumers increasing sales for the nursery industry and decreasing the need for chemical inputs by the consumers.

Texas is the largest producer of sheep and Angora goats in this country. Expansion of these industries would have a positive impact on the employment in these regions. Researchers have evaluated the effects of a new sheep production system (animals being housed in a specially designed building with raised/slatted floors and fed a special ration: "indoor management" system) versus traditional production systems (production in a feedlot or on the range) on muscle fat conten t and fatty acid profiles of intramuscular fat and subcutaneous fat. The fat content and fatty acid composition of meats are important diet/health concerns to consumers. Meat fatty acid composition is also a primary factor that determines product shelf-life/storage stability and flavor. Intramuscular fat content of lambs was higher when animals had received the indoor production treatment. Fatty acid composition of intramuscular fat and subcutaneous adipose tissue varied among the production treatments, but breed type (Rambouillet or Merino) had no marked effect on lipid profiles. Overall, the indoor production management system seemed to improve fatty acid profiles from a standpoint of the storage stability of the meat, but not from a nutritional point of view.

The changing goat population in Texas and large reductions in Angora goat numbers threaten the survival of the breed. Angora producers need flexibility in production to increase income from Angoras during years of low mohair prices or, in some cases, no market at all. Data collected for three years of production trials with Angora, meat, and Angora/meat goat crosses were used to generate production coefficients for the use of Angora females to produce crossbred kids for meat during periods of low mohair prices. On fertility, year, age, and percent of Boer parentage were all significant sources of variation for early breeding season fertility. Older does were more fertile than younger does in the early breeding season. Increases in body weight at breeding resulted in slightly increased probability of kidding early ($P = .06$). A 10 lb difference in body weight at the start of the breeding season resulted in a difference of 2.1% in probability of kidding early. The does having 75% Boer parentage were more likely to conceive in the early breeding season compared to does having 0 or 50% Boer parentage (83% versus 64%; $P < .01$). The product of the current project will be a computer enhanced decision

aid to assist goat producers in determining breeding programs that include the Angora in a dual role of producing both mohair and meat.

On sheep and goats, our research has provided important nutritional information on meat produced with a new (indoor) sheep production management system versus traditional production systems. The results will also be useful to predict flavor and oxidative storage stability of meat as related to sheep production system differences. Evaluation of these new systems for producing animal fibers and meat will provide sheep and goat producers with technical and economic data with which to make more informed production decisions while possibly alerting them to new technological and marketing options.

c. Source of funds

Funds for this research are provided by Hatch and state matching.

d. Scope of impact

Integrated research & extension

B. Stakeholder input process

The TAES Administration, Department Heads and Resident Directors variously met with industry leaders over the course of FY 2000. Groups met with included the Cactus Feeders Association, Inc., National Cotton Council, Plains Cotton Growers, Rio Grande Valley Sugar Growers, Texas Appaloosa Horse Club, Texas Arabian Breeders' Association, Texas Beekeepers Association, Texas Cattle Feeders Association, Texas Citrus Mutual, Texas Citrus & Vegetable Association, Texas Corn Producers Board, Texas Cotton Breeders Association, Texas Cotton Ginners Association, Texas Cotton Producers Association, Texas Grain Sorghum Board, Texas Nursery & Landscape Association, Texas Paint Horse Breeders' Association, Texas Peanut Producers Board, Texas Quarter Horse Association, Texas Rice Improvement Association, Texas Rice Producers Board, Texas Rice Research Foundation, Texas Seed Trade Association, Texas Sheep & Goat Raisers Association, Texas & Southwestern Cattle Raisers Association, Texas Soybean Board, Texas Thoroughbred Breeders' Association, and the Texas Wheat Producers Board among others. TAES also co-sponsored major summit activities on forestry, biotechnolgy and beef cattle. Finally, TAES co-sponsored a visioning process that invited leadership from many public sectors to participate in setting the TAES agenda for the 21st century. In all listed events, TAES encouraged the public to participate in helping TAES set priorities, assess current program and process effectiveness, and determine future directions. These processes were open, fair, and accessible to encourage individuals, groups, and organizations to have a voice, and treated all with dignity and respect. Stakeholders were initially identified by membership in listed organizations, though all events were public and were announced in the press and other written notice. Input from these events was captured by TAES participants, and in some cases was published for further public use. Stakeholder input has always been critical to TAES processes and programs, and listed events and organizations continue as essential partners in setting the TAES agenda and recognizing and addressing emerging issues.

C. Program Review Process:

Significant changes have not been made in the program review process.

D. Evaluation of the Success of Multi and Joint Activities. The Projects listed under Part A (Planned Programs) are evidence of the TAES participation and productivity in multi-state, multi-institutional, multi-disciplinary, and joint research-extension projects. Each program addressed the critical issues identified as strategically important by stakeholder input. They also addressed the needs of under-served and under-represented populations in Texas, in particularly those program reporting areas addressing food security, safety and nutrition. Program progress varied among programs due to the major adjustments required to conform with the federal plan, and to adjust to levels of appropriated funding available and to grants and contracts secured by faculty. These should improve with time. The planned programs improved program focus, and this should improve further as TAES moves to more fully engage all faculty who work in the program areas. Under goal 1, TAES scientists participated in the following multi-state, multi-institutional, multi-disciplinary, and joint research-education programs:

- NRSP-8, National Animal Genome Research Project.
- NC-107, Bovine Respiratory Disease
- NC-119, Management Systems for Improved Decision Making and Profitability of Dairy Herds
- NC-208, Impact Analysis and Decision Strategies for Agricultural Research
- NE-127, Biophysical Models for Poultry Production Systems
- NE-138, Epidemiology and Control of Emerging Strains of Poultry Respiratory Disease Agents
- S-9, Plant Genetic Resource Conservation & Utilization
- S-183, Phenology, Population, Dynamics and Interference: A Basis for Understanding Weed Biology & Ecology
- S-274, Integrated Management of Arthropod Pests of Livestock and Poultry
- S-277, Breeding to Optimize Material Performance and Reproduction of Beef Cows in the Southern Region
- S-283, Develop & Assess Precision Farming Technology & its Economic & Environmental Impacts
- S-287, Impacts of Trade Agreements and Economic Policies on Southern Agriculture
- S-288, Nutritional Systems for Swine to Increase Reproductive Efficiency
- S-289, Factors Associated with Genetic and Phenotypic Variation in Poultry: Molecular to Populational
- S-290, Technical and Economical Efficiencies of Producing, Marketing and Managing Environmental Plants
- S-291, Systems for Controlling Air Pollutant Emissions and indoor Environments in Poultry, Swine, and Dairy Facilities
- S-292, The Poultry Food System: A Farm to Table Model
- W-112, Reproductive Performance in Domestic Ruminants
- W-173, Stress Factors of Farm Animals and Their Effects on Performance
- W-177, Enhancing the Global Competitiveness of U.S. Red Meat

Under Goal 2, TAES scientists participated in the following multi-state, multi-institutional, multi-disciplinary, and joint research-education programs:

- NC-213, Marketing and Delivery of Quality Cereals and Oilseeds

Under Goal 3, TAES scientists participated in the following multi-state, multi-institutional, multi-disciplinary, and joint research-education programs:

- NC-167, Role of N-3/N Polyunsaturated fatty Acids in Health Maintenance
- S-278, Food Demand, Nutrition and Consumer Behavior

Under Goal 4, TAES scientists participated in the following multi-state, multi-institutional, multi-disciplinary, and joint research-education programs:

- NRSP-3, The National Atmospheric Deposition Program
- NRSP-4, National Agriculture Program to Clear Pest Control Agents for Minor Use
- NC-205, Ecology & Management of European Corn Borer & Other Stalk Boring Lepidoptera
- S-271, Solid-Phase Extraction Techniques for Pesticides in Water Samples
- S-273, Development and Application of Comprehensive Agricultural Ecosystem Models
- S-275, Animal Manure & Waste Utilization, Treatment, & Nuisance Avoidance for a Sustainable Agriculture
- S-276, Rural Restructuring: Causes and Consequences of Globalized Agricutlural & Natural Resource Systems
- S-280, Mineralogical Controls of Colloid Dispersion & Solid-Phase Speciation of Soil Contaminants
- S-281, Dynamic Soybean Insect Management for Emerging Agriculture Technologies and Variable Environments
- S-282, Managing Plant-Parasitic Nematodes in Sustainable Agriculture with Emphasis on Crop Resistance
- S-286, Herbicide Persistence in Southern soils: Bioavailable Concentration and Effect of Sensitive Rotation
- S-293, Improved Pecan Insect and Mite Pest Management Systems
- W-128; Microirrigation Technologies for Protection of Natural Resources and Optimum Production
- W-170, Chemistry and Bioavailability of Waste Constituents in Soils
- W-184, Biogeochemistry and Management of Trace Elements in Soils, Sediments and Waters
- W-189, Biorational Methods for Integrated Pest Management (IPM): Bioorganic and Molecular Approaches.
- W-190, Agricultural Water Management Technologies, Institutions, and Policies Affecting Economic viability and Environmental Quality

Under Goal 5, TAES scientists participated in the following multi-state, multi-institutional, multi-disciplinary, and joint research-education programs:

- NC-221, Financing Agriculture & Rural America: Issues of Policy, Structure & Technical Change
- S-162, Rural Economic Development: Alternatives in the New Competitive Environment
- NE-165, Private Strategies, Public Policies, and Food System Performance
- NE-177, Impacts of Structural Changes in the Dairy Industry

E. Multistate Extension Activities

Not required of State Agricultural Experiment Stations.

F. Integrated Research and Extension Activities

See Form CSREES-REPT(2/00) for Integrated Activities

Certification:

_____ _____

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Appendix C

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

Institution Texas Agricultural Experiment Station

State____Texas_____

Check on:_____**Multistate Extension Activities**
___X__**Integrated Activities (Hatch Act Funds)**
_____**Integrated Activities (Smith-Lever Act Funds)**

	Actual Expenditures			
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2003**	**FY 2004**
An agricultural system that is highly competitive in the global economy	398,511			
A safe & Secure Food & Fiber System & Well Nourished Population	7,269			
Greater Harmony between Agriculture & Environment	128,691			
Enhanced Economic Opportunity & Quality of Life for Americans	8,570			
Total	534,041			

Director **Date**

Form CSREES-REPT (2/00)

Brief Descriptions of Integrated Activities

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

Researchers are working with extension personnel to evaluate precision agricultural tools and educate farmers so they can make more knowledgeable decisions while dealing with variability in production conditions and outcomes. Integrated work continues in the area of Agricultural Food Policy to conduct analysis of impacts of government policy proposals and implementation.

Program 2: A safe and secure food and fiber systems and a healthy, well-nourished population.

Scientists continue researching food technology, addressing issues such as mechanisms of spoilage and food borne disease outbreaks and then through extension programs make this knowledge available to the workers in the industry and the public. Work is continuing on an integrated plan for food safety issues in the food industry, and on developing food with enhanced nutritional value and promoting these products within the marketplace.

Program 3:Greater harmony between agriculture and the environment.

Research continues to find ways to reduce the contamination of our water supplies and to find ways to reduce water consumption. The integrated projects involve both the evaluation of methods and education of the public.

Program 4: Enhanced economic opportunity and quality of life for Americans.

Projects under this program are focused on enhancing growth and development through increased value -added activities and on new product identification and enhancing social, economic, and related characteristics of Texas' communities. Integrated programs are developing new floral crops and will continue. Research in the sheep and goat industry is developing innovations to i ncrease the profitability of the industry, and is working in education programs to make the producers aware of research results.