FY 2002 Annual Report of Accomplishment and Results

Colorado State University

Agricultural Experiment Station

A. Overview

CSU programs made significant progress this year in meeting the following goals:

USDA Goal 1: An Agricultural Production System that is Highly Competitive in the Global Economy

CSU Program 1*: Plant and animal improvement and new agricultural development*

Summary

In the area of plant breeding and gene expression technology: The Dry Bean Breeding Project released three lines of a special market class cultivar, Anasazi. These lines should provide breeders and consumers with a cultivar in the Anasazi market class that possesses resistance to bean common mosaic virus. A new hard red winter wheat cultivar named 'Ankor' was released in fall 2002. Ankor was derived by backcrossing Russian wheat aphid (RWA) resistance into the popular winter wheat cultivar 'Akron'.

CSU Program 2: *Plant and animal production systems*

Summary

In the area of plant production efficiency: It is recommended that limited irrigation grain sorghum seeding rates be based on irrigation method. For example, a low seeding rate similar to a dryland rate, 12,200 to 24,300 seeds per ha (10,500 plants per ha minimum), is recommended for furrow irrigated fields, and a higher seeding rate of 28,400 to 46,600 seeds per ha (19,400 plants per ha minimum) is recommended for limited sprinkler irrigation.

In the area of plant production efficiency: Fungal diseases continued to be key yield and quality limiting factors in the 2002 Colorado potato crop. In trials and across the industry, early blight suppression was enhanced by 70 to 80% with azoxystrobin over traditional fungicide programs. Rhizoctonia black scurf was suppressed by 90% in trials where ozoxystrobin was applied at planting.

In the area of ornamental/green agriculture, urban gardening: Over 1,165 varieties of annual flowers were grown and evaluated for adaptability to the High Plains environment. Over 510,000 of the 2002 Plant Select plants were tagged and sold in 2002.

CSU Program 3: *Safe and effective management of pests*

Summary

In the area of weed management: Based on research results from a multi-year project that evaluated potato variety and weed response in Colorado's two potato production regions, a Section 18 label for sulfentrazone was granted in 2002. Only a limited number of acres were

treated with sulfentrazone in 2002 because EPA approval was late in being granted. However, growers were pleased with the results and cost of the product, so we anticipate that more acres will be treated in 2003.

In the area of pest management: Based on research results spray schedules were modified to concentrate sap beetle sprays into a four day period, about seven days prior to harvest. Once this change in the spray schedule was made, sap beetle infestations in treated fields dropped to the lowest levels experienced in years.

USDA Goal 2 and Goal 3: A Safe and Secure Food and Fiber System and a Healthy, Well Nourished Population

CSU Program 4: *Food Safety and Nutrition*

Summary

In the area of food safety: Foodborne pathogenic microorganisms such as Escherichia coli O157:H7, Salmonella and Listeria monocytogenes are estimated by the Centers for Disease Control and Prevention to cause major health and economic problems in the United States. The results of the studies conducted allow for a more realistic estimation of risks associated with use of decontamination technologies for foods and will be used to optimize application of decontamination and sanitation intervention treatments that avoid generation of stress-hardened and difficult to control pathogens.

Dried food products such as jerky have been implicated as vehicles of transmission of pathogenic bacteria such as Escherichia coli O157:H7 causing illness in humans. The results of studies conducted last year demonstrated that currently used marinade formulations may not be very effective in enhancing destruction of pathogenic bacteria during the drying of beef jerky. The modified marinades studied, however, included more anti-microbial hurdles and enhanced death of the pathogenic bacteria during jerky drying and storage. The results of the studies should be useful in developing drying recommendations for use by the industry and consumers preparing jerky.

In the area of nutrition and health: Osteoporosis affects 15-24 million Americans, including half the women over 45 years of age, and results in annual health care costs of $7-10 billion. Critical influences on calcium intake, identified in the focus groups, included low family expectations to drink milk, especially among older girls and Asians. Hispanics had the most negative attitudes towards milk, but all groups were positive about pizza, ice cream and cheese**.**

USDA Goal 4. Greater Harmony between Agriculture and the Environment

CSU Program 5. *Agriculture and environmental quality*

Summary

An ecofriendly herbicide: An exudate ((-)-catechin) of spotted knapweed (C. maculosa) roots has been determined to be phytotoxic and to inhibit seed germination and root growth. Two pesticide companies have signed confidentiality agreements with CSU regarding the potential licensing of (-)-catechin as an environmentally friendly herbicide.

USDA Goal 5. Enhanced Economic Opportunity and Quality of Life for Americans

CSU Program 6. *Rural and community development*

Summary

In the area of caregiving: There is a pressing need for comparative research in order to examine possible ethnic and cultural differences in family care of the frail and dependent elderly. Analyses of data from this project indicate that ethnicity (culture) affects several aspects of caregiving: norms of reciprocity, level of involvement, use of family/friends as sources of social support, gains/satisfaction derived from caregiving.

B. Program specifics

CSU Program 1: Plant and animal improvement and new agricultural development

Key Themes: Plant Production Efficiency

Short Description **-** The Dry Bean Research Program at Colorado State University participated in the annual evaluation of national and regional bean nurseries for yield, adaptation, and reaction to diseases. In addition to evaluation of bean cultivars, the breeding program develops commercial cultivars in the pinto and black bean market classes for use in the western US and High Plains. Cultivars are developed that possess stable resistance to rust, common blight and root rot.

Impact **-** The breeding program released three lines of a special market class, Anasazi. These lines should provide breeders and consumers with a cultivar in the Anasazi market class that possesses resistance to bean common mosaic virus. Disease forecast models were enhanced and made available on-line at an interactive web site: www.csuag.com. Disease forecasting programs were enhanced with expanded knowledge of plant pathogen biology, and improved timing of pest surveys. This has reduced the number of pesticide applications (by 1 - 2 sprays), grower costs (by $300 - $500 per hectare) and environmental exposure (by 10 - 20 % less pesticide) for producers of vegetable crops such as dry beans.

Source of Federal Funds – Hatch Multistate

Scope of Impact – Multi-State Research

With States: CA, FL, GA, ID, MI, NE, NYC, ND, OR, PR, WA, WI

CSU Program 2: *Plant and animal production systems.*

Key Themes – Ornamental/Green Agriculture, Urban Gardening

Short Description – This program selects, introduces, and evaluates landscape plant materials suitable for the High Plains. Over 1,165 varieties of annual flowers were grown and evaluated by the program during the 2002 season, and a performance report was published and sent to all cooperators and industry personnel.

Impact - As a result of these trials, sales of New Guinea Impatiens and vegetatively propagated verbenas as well as petunias and dahlias continue to increase. Seven plant species were recommended or introduced to the trade and public by Plant Select in 2002. Over 510,000 of the 2002 Plant Select plants were tagged or sold in 2002. Bedding plant growers

and consumers throughout Colorado and the region look to Colorado State for evaluation of both seed and asexually propagated bedding plant varieties.

Source of Federal Funds – Hatch Act funds

Scope of Impact – Regional

Key Themes – Plant Production Efficiency

Short Description - Most seeding rate recommendations for limited irrigation grain sorghum are between dryland and fully irrigated rates ranging from 22,300 to 40,500 seeds per ha. Currently there is no grain sorghum seeding rate recommendation distinction between limited furrow irrigation and limited sprinkler irrigation. For this study, limited furrow irrigation was defined as receiving a pre-irrigation (if winter moisture was lacking) and one in-season irrigation at heading, and limited sprinkler irrigation was defined as a similar amount of water used for furrow irrigation but applied with a sprinkler. Typically, the amount of irrigation applied ranged from 0.152 ha-m per ha (if only the in-season irrigation was needed) to 0.304 ha-m per ha (if both the pre-irrigation and the in-season irrigation were needed). We tested four seeding rates under limited furrow and sprinkler irrigation: 12.4, 20.3, 27.5, and 31.6 X 1000 seeds per ha. This resulted in 10.7, 14.8, 18.6, and 20.4 X 1000 plants per ha. The furrow site received one in-season irrigation of 0.175 ha-m per ha of water. The sprinkler site received 0.127 ha-m per ha of water. In this study, the highest yielding seeding rate for limited furrow irrigation was the lowest seeding rate tested, 12,400 seeds per ha (10,700 plants per ha). Conversely, the highest yielding seeding rate for limited sprinkler irrigation was the highest seeding rate tested, 31,600 seeds per ha (20,400 plants per ha). We conducted this limited irrigation seeding rate study for two years.

Impact – We recommend that limited irrigation grain sorghum seeding rates be based on irrigation method: for furrow, a low seeding rate similar to a dryland rate, 12,200 to 24,300 seeds per ha (10,500 plants per ha minimum) and a high seeding rate similar to a fully irrigated rate, 28,400 to 46,600 seeds per ha (19,400 plants per ha minimum) for limited sprinkler irrigation. If sorghum growers are using improper limited irrigation seeding rates in the range we studied, then by adhering to our seeding rate recommendations they could increase their grain sorghum yields from 320 to 1320 kg per ha, or $3.80 to $16.10 per ha (using the loan rate as the expected price). Increasing grower profitability adds to economic stability in rural communities where agriculture is the economic base.

Source of Federal Funds – Hatch Act funds

Scope of Impact – Regional

Key Themes – Plant Production Efficiency

Short Description – Fungal diseases continued to be key yield and quality limiting factors in the 2002 Colorado potato crop. In order for disease management technology to be adopted quickly by potato growers, it must have direct adaptation by growers and solve existing problems. The goal of the technology demonstrated in this project is to reduce potato yield losses due to disease. Input costs of the technology should be reduced and the quality of the crop should be increased to enhance the economic disposition of the Colorado potato grower.

Impact - Thirty-four season-long fungicide programs were evaluated for control of early blight. In trials and across the industry, early blight suppression was enhanced by 70 to 80% with azoxystrobin over traditional fungicide programs. Powdery scab incidence increased again in 2002. Efficacy trials showed that fluazinam and azoxystrobin can suppress disease by 80%. These chemical controls may be adopted by the industry in 2003. Rhizoctonia black scurf was suppressed by 90% in trials where ozoxystrobin was applied at planting. It is expected that commercial use of azoxystrobin will be widespread in 2003.

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

Short Description - Evaluations of new herbicides for weed control in potatoes have identified two compounds that have selectivity for weed control in potatoes. Sulfentrazone and flumioxazin have activity on weed species important in potato production and provide a new management tool for herbicide resistant weed management. Based on research results from this project, which evaluated potato variety and weed response over several years and in Colorado's two potato production regions, a Section 18 label for sulfentrazone was granted in 2002. Since EPA approval was so late, only a limited number of acres were treated with sulfentrazone in 2002. Growers were pleased with the results and the cost of the product so we anticipate that more acres will be treated in 2003.

Impact - The impact of this new pest management technology will be to significanly reduce the cost of broadleaf weed control for growers. Current weed control costs per acre are approximately $30. New technology identified by this project can reduce that cost to $16 per acre. The savings to the Colorado potato industry would be approximately $1.1 million per year. In addition, this product provides a new herbicide mode of action that is not currently used in potato production, providing a new tool for management of herbicide resistant weeds.

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

CSU Program 3: *Safe and effective management of pests*

Key Themes – Pest Control Strategies

Short Description - Sweet corn is an important component of the agricultural economy of western Colorado. Acreage has grown consistently since 1990, and local marketing companies negotiated national distribution contracts in 2001. Olathe grown sweet corn now has a reputation of being superior in quality to other sweet corn. Sweet corn is sold under a Market Order which has strict quality guidelines, and corn from each field is inspected before shipment is allowed. Dusky sap beetle is a pest which attacks and contaminates ears. If infestation levels exceed those specified by the Market Order, the field is rejected and the grower faces a financial loss. If sweet corn shipments have consistent contamination that is under the Market Order specifications but detectable by grocers and consumers, extension of national marketing contracts is jeopardized. This is what occurred in 2001. Spray programs were effective against corn earworm, but sap beetles infested much of the sweet corn crop. Almost 10% of the crop was rejected because of sap beetle contamination, which caused a

loss to growers in excess of $500,000. The future of national contracts was jeopardized, and their loss would cause significant economic damage to the region. For 2002, a research program was designed with the input of producers, marketers, aerial applicators and chemical company representatives. The goals of the research were to investigate the field biology of sap beetles under local conditions and to evaluate insecticides and spray schedules for sap beetle control. The studies were designed so that results could be incorporated immediately into management programs to minimize infestations in the current production season.

Impact - The traditional spray schedules treated fields every 2 days, which left newly grown silk (the entry site into the ears) unprotected for a period of time. Using this information, spray schedules were modified to concentrate sap beetle sprays into a four day period, about seven days prior to harvest. Once this spray schedule change was made, there were no more rejected acres, and sap beetle infestations in treated fields dropped to the lowest levels experienced in years. The modified spray schedule did not increase the number of insecticide applications and could actually reduce the total number of sprays. This is the first successful management program aimed at sap beetles in sweet corn in the nation. Growers have accepted the program and are enthusiastic about expanding research programs so they can integrate modified cultural practices and pheromone trapping into an overall sap beetle management program.

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

USDA Goal 2 and Goal 3: A Safe and Secure Food and Fiber System and a Healthy, Well Nourished Population

CSU Program 4: *Food Safety and Nutrition*

Key Themes – Food Safety

Short Description - Foodborne pathogenic microorganisms such as Escherichia coli O157:H7, Salmonella and Listeria monocytogenes are estimated by the Centers for Disease Control and Prevention to cause major health and economic problems in the United States. Specifically, the estimates indicate that Escherichia coli O157:H7 is involved in approximately 62,000 cases of illness, 1,800 hospitalizations and 52 deaths annually. Corresponding numbers for Salmonella and Listeria monocytogenes are 1.3 million, 15,000 and 550, and 2,500, 2,300 and 500, respectively. These estimates, as well as the numerous recalls from the marketplace of products potentially contaminated with these pathogens, demonstrate their significance and the need for control of the pathogens in food products. Another concern is the potential for pathogenic bacteria to become stress-adapted and of increased resistance to preservation processes and potentially of higher virulence when exposed to stressful conditions associated with treatments used for their control in foods. Among stresses that may harden pathogenic bacteria are those associated with spray washing decontamination and sanitation treatments used to reduce contamination on meat animal carcasses and in processing plants.

Impacts - The results of the studies conducted allow for a more realistic estimation of risks associated with use of decontamination technologies for foods and will be used to optimize application of decontamination and sanitation intervention treatments that avoid generation of stress-hardened and difficult to control pathogens. Specifically:

1) bacterial pathogens may survive in acidic and proliferate in water meat decontamination runoff residues, and, thus, they may serve as cross-contamination sources, if pathogen niches are established in the processing plant;
2) acid-containing washings are selective for growth of lactic acid bacteria and yeasts, indicating that organic acid meat decontamination may alter the microbial ecology of meat plant environments and meat;
3) it may be riskier for a meat processing plant to be colonized by low numbers of acid-hardened pathogens than by higher numbers of acid-sensitive cells,
4) a more intense use of water-based meat decontamination technologies may induce acid sensitization in Escherichia coli O157:H7,
5) sanitizers are more effective in reducing populations of cells in suspension than those forming biofilms on equipment surfaces,
6) overall, there is no difference in sensitivity to sanitizers between previously acid-adapted and nonadapted Listeria momocytogenes,
7) peroxyacetic acid and pH-adjusted (6.80) sodium hypochlorite generally kill cells in biofilms faster than other sanitizers,
8) sanitizers should be applied in proper rotation, as inactivation is dependent on sanitizer type, microbial species, pH, bacterial growth phase and cell attachment,
9) the predominant gram-negative meat spoilage flora in plants may become resistant to quaternary ammonium compounds and sodium hypochlorite with time, necessitating the periodic use of peroxyacetic acid.

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

Key Themes – Nutrition and Health

Short Description – Osteoporosis affects 15-24 million Americans, including half the women over 45 years of age, and results in annual health care costs of $7-10 billion. The greater the bone density prior to inevitable bone loss, the lower the risk for osteoporotic fractures. Over 95% of bone mass accrues by the end of adolescence; thus, calcium intake during this time is critically important for maximizing bone mass and reducing risk. However, calcium intake among adolescent girls and many boys is well below recommended amounts.

Impacts - Critical influences on calcium intake, identified in the focus groups, included low family expectations to drink milk, especially among older girls and Asians. Hispanics had the most negative attitudes towards milk, but all groups were positive about pizza, ice cream and cheese**.**

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

USDA Goal 4. Greater Harmony Between Agriculture and the Environment

CSU Program 5. *Agriculture and environmental quality*

Key Themes – Ecofriendly Herbicide

Short Description - A group of related invasive plants called knapweeds (Centaurea maculosa Lam., Centaurea diffusa Lam., and Acroptilon repens (L.) DC.) are some of the most destructive invasive plants in western North America. Since 1842, ecologists have known that knapweeds achieve their competitive advantage through the secretion of phytotoxic allelochemicals into the soil. However, no such chemical had been identified until a chemical from C. maculosa was recently identified. It has been shown that the flavanol (-)-catechin, is the compound responsible for the allelopathic activity. Centaurea maculosa Lam. (spotted knapweed) is one of the most invasive and destructive introduced weeds in North America, particularly in fields and pastures of the northwest U.S. Although it has long been proposed that C. maculosa achieves its dominance through secretion of a phytotoxic allelochemical, no such chemical had been previously discovered. We have determined that an exudate of C. maculosa roots is indeed phytotoxic, that it inhibits seed germination, and that production of the exudates is dramatically increased upon elicitation. The active fraction of the exudate was found to be composed of racemic catechin, a 50:50 mixture of (+)-catechin and (-)-catechin. Although (+)-catechin is widespread throughout the plant kingdom, both (-)-catechin and the racemic form have only rarely been isolated. Further, we found that the phytotoxicity and germination inhibiting action of the exudate was entirely due to (-)-catechin, while (+)-catechin was inactive. Conversely, (+)-catechin had antimicrobial properties, while (-)-catechin did not.

Impact - An exudate ((-)-catechin) of spotted knapweed (C. maculosa) roots has been determined to be phytotoxic and to inhibit seed germination and root growth. Two pesticide companies have signed confidentiality agreements with CSU regarding the potential licensing of (-)-catechin as an environmentally friendly herbicide.

Source of Federal Funds – Hatch Act funds

Scope of Impact – National

USDA Goal 5. Enhanced Economic Opportunity and Quality of Life for Americans

CSU Program 6. *Rural and community development*

Key Themes – Community Development

Short Description - By 2028, the Hispanic population age 65 and older is projected to outnumber the non-Hispanic black population in that age group. Although the increasing numbers of older Hispanics persons will likely place greater long-term care demands on Hispanic family caregivers, only minimal attention has been given to the issue of caregiving

in this group. There are very few studies of the experience of providing care for dependent elders in Hispanic families and much of what is known is from the perspective of elders. There is a pressing need for comparative research in order to examine possible ethnic and cultural differences in family care of the frail and dependent elderly and especially to identify ethnic differences in the dynamics of filial caregiving among Hispanic vs. non-Hispanic families.This study is guided by a conceptual model of caregiving wherein both positive and negative caregiving outcomes are examined, as are primary and secondary stressors.

Impact - Analyses of data from this project indicate that ethnicity (culture) affects several aspects of caregiving: norms of reciprocity, level of involvement, use of family/friends as sources of social support, gains/satisfaction derived from caregiving.

Source of Federal Funds – Hatch Act funds

Scope of Impact – National

C. Stakeholder Input

The Colorado Agricultural Experiment Station (CAES) annually utilizes multiple means of obtaining stakeholder input on programs conducted and solicits input on changes in program direction. The CAES supports research in 20 academic departments on the Colorado State University campus as well as at 11 off-campus research centers. Programs at the research centers are administratively responsible to the Director of the CAES and coordinate their programs with one or more academic departments. This year, each of the off-campus research centers held a public meeting where research results were presented and proposed programs were discussed. Additionally, research and outreach advisory committees at each research center reviewed ongoing and proposed research and made recommendations on long term research direction and goals. Stakeholder meetings were also held with farm and community organizations to solicit input on research programs.

D. Program Review Process

All projects conducted by the CAES are subjected to a peer review process. Each College at Colorado State University has adopted a process for conducting a peer review on all CAES projects submitted for support by state and federal funds. Documentation is available upon request for the specific process adopted by each College and approved by the CAES Director.

E. Evaluation of the Success of Multi and Joint Activities

The CAES conducts a number of activities in coordination with CSU Cooperative Extension (CSUCE). Some of these activities are related to precision farming, animal agriculture (soil and water contamination, manure management), water quality issues (salinity, non-point source pollution) and food safety and human nutrition. We feel that these activities are highly successful, and this year we are highlighting work related to precision farming as well as the continuing work related to food safety and human nutrition.

Precision Agriculture -

In the area of Precision Agriculture--which we define as the art and science of utilizing advanced technologies (Global Positioning Systems, Geographic Information Systems, Remote-sensing, Spatial Statistics, Information systems, etc.) to enhance the efficiency, productivity, and profitability of agriculture production systems in an environmentally friendly manner—we have had a very active and productive joint research and extension program for the past five years. This program involves a team of 18 scientists, several graduate students, and three extension agents from Colorado State University and the USDA/ARS Water Management Unit.

The technology transfer thrust of this program has been implemented on several fronts: Focus Group meetings, hands-on workshops, development of a network of farmers interested in precision farming, grower meetings facilitated by various scientists, and articles published in popular farm magazines and newspapers. The research group has made presentations to over 75 groups in previous years. Last year the group gave 14 presentations at field days and was part of four workshops on precision agriculture. Based on the participation of farmers and consultants in two of these workshops, over 92,000 acres were impacted by this work. Information gleaned from one workshop's evaluations indicated participant monetary benefit to be approximately $160,000 from the workshop.

Popular press articles have appeared in Colorado Farmer-Stockman, Fort Morgan Times, Colorado Rancher and Farmer, Irrigation Journal, and The Burlington Record. The research team has generated eighty-seven refereed publications, abstracts, and meeting presentations in the previous years. In addition, last year the team generated six extension publications related to precision agriculture and seven publications in the popular press.

In part due to the research and extension work being conducted by this project, the adoption of precision farming continues to grow. This project is developing a network of farmers with on-farm trials that include training in the design, implementation, and analysis of field scale farm trials using precision farming technology. The network will be valuable in documenting the adoption of precision technologies. Farmers can utilize data from other participating farmers in making more efficient production decisions that will improve their economic well being. These data sets will provide a competitive advantage for the participating farmers and be an invaluable resource for researchers. Training of extension educators, farmers, and industry professionals will transfer precision technology to the user community.

Food Safety -

Agriculture, in its broadest sense, is a food-producing industry. Every effort must be made to ensure a healthy and safe food supply for the nation and the world. The work being conducted in the food safety has led to numerous collaborations with other scientists, extension specialists and agents, and agency personnel in Colorado and other states.

Last year program activities in food safety resulted in a number of training materials including three fact sheets, three posters at Colorado CE annual forum/in-services, and two training sessions around the state on food safety. A listserv is regularly used to provide information to extension agents, health department officials and other interested professions in Colorado. In addition, *SafeFood News* (a quarterly newsletter) is published and goes out to more than 200

professionals in Colorado and neighboring states, as well as being available on the web (www.colostate.edu/Orgs/safefood).

During the last year, 27 abstracts or papers have been presented at professional meetings, 52 weekly columns on food and nutrition topics were published in The Denver Post, The Coloradoan, The Collegian, 41 other Colorado papers, and two radio stations. Because of this work, participating researchers were also invited to give four presentations at national professional conferences.

F. Multistate Extension Activities

The Dry Bean Research Program at Colorado State University participated in the annual evaluation of national and regional bean nurseries for yield, adaptation, and reaction to diseases. In addition to evaluation of bean cultivars, the breeding program develops commercial cultivars in the pinto and black bean market classes for use in the western US and High Plains. The breeding program released three lines of a special market class, Anasazi. These lines should provide breeders and consumers with a cultivar in the Anasazi market class that possesses resistance to bean common mosaic virus. Participant states included *CA, FL, GA, ID, MI, NE, NYC, ND, OR, PR, WA, WI, in addition to Colorado.*

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Integrated Research and Extension Activities
Five Year Fiscal Plan Summary

Institution Agricultural Experiment Station
State Colorado

Check one: ____ **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 2002**	**FY 2003**	**FY 2004**
Plant and animal improvement and new agricultural development.	$266,695	$177,681	$150,358	$150,358	$150,358
Plant and animal production systems	$53,358	$100,476	$146,393	$146,393	$146,393
Safe and effective management of pests	$68,759	$95,173	$108,109	$108,109	$108,109
Food Safety and Nutrition	$88,657	$65,911	$ 76,027	$ 76,027	$ 76,027
Agriculture and environmental quality	$46,625	$76,823	$143,801	$143,801	$143,801
Rural and community development	$398	$81,699	$ 17,272	$ 17,272	$ 17,272
Total	$524,492	$597,763	$641,960	$641,960	$641,960

Director **Date**

Form CSREES-REPT (2/00)