Utah FY 2002
Report of Accomplishments and Results

March 2003

Utah State University Agriculture Experiment Station
Utah State University Extension

Issued in furtherance of Cooperative Extension and the Utah Agricultural Experiment Station work, in cooperation with the U.S. Department of Agriculture and Cooperative Extension Service and Agricultural Experiment Station, Utah State University, Logan, Utah.

A. PROGRAMS

Goal 1. AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Utah State University Extension
Progress Report on Plan of Work Goals: 2002

Overview

Goal 1 encompasses all USU extension programs that seek to create and support an agricultural system that is highly competitive in the global economy. Agriculture is defined in the broad sense, in that it includes the ornamental and "green" industries, as well as the significant acres in small farms and "backyard" gardening operations that are very prevalent in the State. Utah has one of the largest percentages of gardens per homeowner/renter in the United States. Many of these approach commercial scale.

Utah farmers and ranchers faced major challenges during the period covered by this report. Farmers and ranchers were faced with very low prices for many traditional farm commodities, with little prospect for improvement. Federal and state government payments helped avert catastrophe; however, these are often "short-term" solutions. Long-term solutions are needed by the States agricultural sector. Other issues affecting agricultural competitiveness and profitability included the development of new environmental (AFO, CAFO, etc.) regulations; the divisive issue of genomics and biotechnology; emerging technologies such as precision agriculture; the ever-changing structure of agriculture; and, continued pressure from urbanization.

State Assessment: The programs offered within Goal 1 address critical issues in Utah. Extension faculties on campus and in the counties are responding very well to local and statewide needs. The impacts reported here reflect a very successful program of work.

Total expenditures and FTE:
Smith-Lever $477,678
State Match $436,301

FTE: 16.45

Program Title: Agronomy/Crop Production

Key Theme: Agricultural Profitability

Description: Applied Soils/Fertility Research is needed to quantify the proper combinations of various fertilizer sources (liquid and dry phosphorus, for example) for various crops and the varied soils in the State. The Extension Soils Specialist and County Agents conducted twelve field trials in six counties on over twelve farmer/rancher plots with alfalfa, onions, and turf.

Impact: Adopting recommended sources and rates impacted over 60 growers.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Crop & variety testing in one county showed that the highest yielding varieties out performed usual varieties planted by farmers.

Impact: 3,300 acres of corn silage grown in Weber County, the increase in profitability to farmers could amount to $297,000. On the 631 acres of grain corn, the increase profitability would be around $20,730.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Proper fertilizer recommendations are essential to profitable farming operations. The extension soils specialist compared USU results with a private lab to show that USU-recommended fertilizer rates cost $26.44 per acre vs. $154.05 for the private lab. No agronomic difference in yield was shown for either treatment.

Impact: $127.61 saved per acre may mean an impact of over $400,000/year.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Managing Change in Agriculture

Description: An alliance of federal agencies (NRCS, FSA, & EPA); state agencies (DEQ & UDAF); and, agricultural organizations (UFBF) joined together with Extension to address new AFO (Animal Feeding Operations) and CAFO (Confined Animal Feeding Operations) guidelines. The State Soil Specialist and other Extension personnel joined in this effort.

Impact: Extension received over $158,500 that assisted over 120 farm/ranch operations to meet federal guidelines.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Proper soil testing saves time, money and protects the environment. County Agents provided soil testing (through USU's USUAL (lab) and recommendations that saved one county $23.45 per acre on 5,792 acres.

Impact: $134,644

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Invasive Species

Description: Numerous noxious weeds are invading wild lands, cultivated land, and urban areas at an ever-increasing rate.

Impact: Over 54 research and demonstration sites were treated with either biological or chemical weed control measures. Over 6,000 homeowners, farmers or ranchers were positively impacted. Over 1,500 acres of rangeland were treated in one county alone.
Estimated financial impacts included $712,003 in increased profitability or decreased pollution (no value assigned).

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Invasive Species

Description: Invasive black crickets are causing serious damage to croplands and rangelands.

Impact: 60 farmers and ranchers were trained in sustainable control strategies.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Crop farmers note increased problems with noxious weeks. The state crops specialist and state weeds specialist held training schools in six different counties.

Impact: 187 program participants increased their awareness and changed practices. Over 1672 crop acres were treated and over 456 right-of-way acres were treated.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Alternative Agriculture and Markets

Key Theme: Agricultural Competitiveness

Description: Testimony and analysis provided by Extension helped farmers and ranchers pay less for irrigation.

Impact: The testimony resulted in a yearly decrease of $1.6 million that local farmers and ranchers had to pay.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Competitiveness

Description: A futures workshop was held by the local extension agent to teach growers about futures contracts and options. Other principles about buying and selling were discussed and attendees were excited to try these new methods.

Impact: Three grain operators told the local agent that they had made in excess of $20,000 each for a total of $60,000 using the principles taught in the class. A dairyman indicated that the only money he made in 2000 was from the purchase/sale of futures contracts and options he had learned about and that was the only reason he was still in business. Another dairy manager explained that he had save thousands of dollars by using the concepts taught in class.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Competitiveness

Description: A Utah Department of Agriculture and Food, Marketing Assistance Grant is being used to enhance current marketing efforts relative to the UBIA Bull Test and Sale. The project has three phases. First, to develop a Marketing Strategy for the UBIA Bull Test. Second, to develop new marketing materials including multi-media and multi-lingual materials and enhance the traditional auction. Third, to develop and produce marketing videos in English, Spanish and Portuguese for use by UDAF personnel to market UBIA cattle in Central and South America.

Impact: The Spanish translation of the educational brochure is being used by UDAF marketing specialists to promote the genetics of Utah bulls during trade missions throughout Central and South America.

Source of Funds: Smith-Lever and UDAF

Scope of Impact: Utah

Key Theme: Agricultural Profitability

Description: Workshops on Futures markets have been held in recent years to educate producers on how to use these tools to manage financial risks.

Impact: Three grain operators in Millard County told the local agent that they had made in excess of $20,000 each using the principles taught in the futures workshops they attended. A Cache County dairyman indicated the only money he made in 2000 was from the purchase/sale of futures contracts and options he learned from attending the workshops. They were a major reason why he was able to stay in business. Another dairy manager indicated the concepts he learned and used had saved his operation thousands of dollars. These examples have been multiplied many times by other Utah producers.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Extension assisted a county Lamb Pool that shipped 1477 lambs. Most of the lambs in the Lamb Pool came from small flocks. Growers received a higher price for their lambs by pooling the lambs together.

Impact: The producers received $.80/lb. thus receiving $.05 cents more per pound than they would have received selling at a local auction, at that time. The lower selling charges and higher price received amounts to $10,735 in additional income for this group of producers.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Utah ranchers are selling permits for deer and elk hunts and wildlife photography tours on the private lands of their ranches. Extension has assisted and provided information as they established these enterprises.

Impact: Hunting permits for access to private lands is generating supplementary income for some ranchers, as they seek to cope with the current economic slowdown.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Horticulture-Commercial Fruit and Vegetable Production

Key Theme: Agricultural Profitability

Description: Variety trails were conducted in a specific county. The highest producing variety of corn produced an average of 175 bu/acre. The average corn yield in the county is 150 bu/acre. The highest producing silage crop averaged 2.5 tons more per acre than the average crop.

Impact: With 2000 acres of corn production, that would be earnings of $120,000 for the farmers and ranchers. For silage production, farmers could earn $218,000 per year

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: A Tree Care workshop was held in Cedar City designed for professional landscape managers. Participants learned about caring for trees.

Impact: Sixty-one people attended the training and an estimated 16,250 trees may be managed better due to the workshop.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Livestock

Key Theme: Rangeland/Pasture Management

Description: The resources of the National Cattlemen Beef Association, Fort Dodge Animal Health and the Utah Cattlemen were utilized by Extension to provide educational experiences and information materials on Beef Quality Assurance. The combined efforts have greatly increased the awareness of producers and veterinarians about BQA. Especially in regard to prevention of injection site lesions and the proper use of animal health products both to prevent lesions and enable proper handling of products and animals. A team of Extension personnel participated in BQA Certification Workshops throughout Utah. Fort Dodge Animal Health provided an on-site demonstration of actual injection site lesions. Participants learned how to manage their production practices to increase food quality and safety. An additional BQA workshop was held in Kayenta, Arizona for Navajo ranchers and was attended by 136 people, some of which were from the southern Utah portions of the Navajo Reservation. The annual Utah Beef Cattle Field Day emphasized a similar BQA theme with invited speakers from across the U.S.

Impact: 123 ranches and 175 producers were certified through the workshops. In a post-course survey, participants made the following rankings: 98% said they would often or almost always keep vaccination records compared to only 16% prior to the course; 95% would often or almost always maintain other records on their herds compared to only 49% prior to the course; 59% would often or almost always practice ranch biosecurity, where only 8% were prior to the school; 81% plan to use the BQA Certification as a part of their marketing program for their cattle compared to only 10% before the schools, 94% said the course would benefit them economically. Many other producers increased their awareness of BQA.

Source of Funds: Smith-Lever, State, NCBA, and Fort Dodge Animal Health

Scope of Impact: UT, AZ

Key Theme: Agricultural Competitiveness

Description: A two-day course, title Intermountain Beef 3910 was provided to beef producers for an in-depth, interactive program on beef and carcass evaluation and product preparation. Of special note were the "educational meals" used during the course to teach producers about consumer acceptability, new product development and the NCBA Beef Quality Audit.

Impact: 40 producers / students participated in the two courses offered (full capacity each time). But, the impact has spread far beyond those as they have discussed their experience with other producers. They gained considerable new information on grading criteria and live animal evaluation, use of ultrasound as a management tool, the wholesale packing industry, value-added beef products, carcass breakdown and evaluation, and price discovery in the beef industry. Additionally, participant attitudes on seven of eight best management practices listed, changed from using them sometimes or almost never prior to the school, to using them often or almost always following the school. Finally, the classes rated the quality of teaching materials, beef food events as teaching labs, overall course instruction and the overall rating of the course at 4.5 or higher (5=Superior).

Source of Funds: Smith-Lever, State, NCBA, and the Utah Cattlemen Association.

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: Agreements are established with Wyoming, Montana and Nevada for USU to provide Extension Programs to dairy producers in those states. Time is spent in each state by the USU Dairy Specialists, on a pre-planned basis. Producer consultation is also provided by these and other Extension Specialists by telephone and email. The local Ag Agents often accompany the USU Specialists on farm visits, when possible. Producers in all three states receive the USU Dairy Newsletter.

Impact: Information and private consultation has been provided to individual dairy farms in nutrition, animal health, use of records, waste management and general management.

Source of Funds: Smith-Lever, State

Scope of Impact: UT, WY, MT, and NV

Key Theme: Agricultural Profitability

Description: A demonstration feeding trial at the USU Turkey Research Center showed that when a group of hens were fed a recommended program but just moved through the changes in feed steps at a slower rate, their feed conversion was improved by 6 to 14%. Feed additives were tested to show which ones were effective. A new grow-out building was constructed and is in use.

Impact: Depending on the feed costs this could save $60,000.00 per 1 million pounds of hens processed. The turkey cooperative has changed their recommended feeding program to reflect the results of this test. The use of two feed additives was discontinued and another was instituted after its value for improving feed conversion was shown. The new building will allow production of 500,000 pounds of turkey now instead of the previous 320,000 pounds per year.

Source of Funds: Smith-Lever, Private

Scope of Impact: UT

Key Theme: Agricultural Profitability

Description: An economic feasibility analysis was conducted with Moroni Feed Company to evaluate the change to year-round rather than seasonal production and processing of turkeys.

Impact: Since the initial study in late 1998, production of processed turkey has increased from 78 to 90 million pounds annually. This increased production generates approximately $7.2 million annual increased revenue. Several turkey producers have built new facilities to allow year-round production. They are continuing to use the analysis and are planning to gradually increase production to 110 million pounds.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Animal Production Efficiency

Description: Bring Your Cows To The Feed - an economic development effort has been made to assist dairymen to locate in Utah rural counties where there are good forage supplies.

Impact: Ten dairymen with 14,300 cows have relocated or are in the process of relocating to Millard and Iron counties since the program was initiated in 1989. Attracted investment and economic activity for 1998-2002 is estimated at $51.4 million. In 2002, a relocating dairyman from Stephensville, Texas completed site work for a 3,500-cow dairy in Iron County. The projects estimated value is $4.9

million. Another previously relocated a 1200 cow dairy to Millard County is just completing a second dairy of 2500 cows valued at $3.5 million. Cow / Calf

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Animal Production Efficiency

Description: Wildlife predators cause significant losses to sheep flocks, especially in some areas. A county Extension office and the local Woolgrower association applied for a predator control fund grant through the Utah Department of Agriculture and Food. The state legislature appropriated money for counties to use for predator control programs within the county. They received the maximum amount available $20,000. The Woolgrowers generated $8,000 with an additional $2000 from the county.

Impact: The extra funding allowed much better predator control than in previous years and reduced sheep death losses.

Source of Funds: Smith-Lever, UDAF

Scope of Impact: UT

Key Theme: Bio-terrorism

Description: Due to the threat of bio-terrorism or other introduction of a foreign animal disease, multiple efforts have been made to increase producers' awareness of bio-security measures that they could implement. Information has also been presented on composting of dead animals to dispose of them in a more sanitary manner. All of this information is maintained on a web page.

Difficult or unusual animal health problems are referred to the Utah Animal Disease Diagnostic Laboratory or the Extension Veterinarian makes a farm visit to investigate, or refers the information to the regulatory State Veterinarian. A list server has been established and is maintained with all the known email addresses for Utah veterinarians. It is reserved for use to provide information on specific disease outbreaks.

Impact: Few producers are currently implementing bio-security measures. The information is now readily available, when they begin to feel the urgency of using it. The list server was used to alert veterinarians and Ag Agents for the progress of West Nile Virus toward Utah, in 2002. It was also used to provide information on the outbreak of Exotic Newcastle Disease in California. It is a very effective means for rapid communication and can get immediate information to over 180 Utah veterinarians. They are now accustomed to using it.

The USU Weed Specialist Represented the Weed Science Society of America as one of four agricultural scientists invited to brief US House and Senate Agriculture Committee staff members on the threat of invasive species (plant, animal, and disease organisms) that might be used as biological terrorism tools against our nation's agricultural and natural resources. Testimony provided by the

panel, combined with input from many other agricultural scientists nation-wide resulted in the addition of bio-security elements to the nations overall Homeland Security program.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Grazing

Description: There are many challenges to continued grazing on federally owned lands managed by the BLM and Forest Service. Some of these challenges come from the general public and some from within the agencies themselves. Often the problem is that those making the challenge are from areas beyond the mountain west where much greater amounts of precipitation are received or the plant species are different. These challengers look at Utah ranges and think these ranges should look like the ones they are used to seeing - and because the ranges do not, they conclude that the cause of the difference is overgrazing, rather than just their own perceptions. Many of these are desert ranges that are far different than those many are acquainted with.
Tools are available for use on specific ranges for monitoring them over many years that enable science to be used in making decisions rather than "perception". Producers are becoming more aware that in many instances they must take the initiative and do this monitoring themselves, or it just doesn't get done. That is a means they have to show the past history and status of the rangelands. These methods will document misuse or proper use of rangelands. Continuing education efforts are needed to update producer-grazers on the newest techniques for range monitoring as well as methods of range and pasture improvement.

Impact: A two-day Pasture and Range Workshop was held to inform participants of methods for improving and monitoring of ranges and pastures. Topics of discussion included: plant physiology in relation to grazing, animal grazing behavior, how economics influence grazing decisions, photo monitoring range and practical forage estimation.

Extension cosponsored with the Escalante Center, the Canyon Lands SCD Board and Garfield County Farm Bureau a Grazing Stakeholders Workshop. Topics included: My New Role, New Forest Plan Revisions: What it Means to Permittees, New Environmental Impact Statement on the Monument, and Livestock Ranching in the West: Where's the Future and Where's the Challenges? Comment summary: "a needed workshop; education and interaction between federal land management agencies and the locals are essential."

Extension, in conjunction with the Forest Service, put on a stubble height monitoring workshop. Thirty-four producers attended the four-hour field trip. They were provided forms and rulers and walked through the process in three locations. They were taught the importance of randomization and photo points. It is important for the ranchers to have documentation on range status. Seventy six percent of the producers said they would start stubble height records and 94% said they would keep photo points records on key range areas.

Working with the USDA- ARS lab an Extension Agent received an $800 grant to assist in establishing a dry land range grass variety trial.

Three education activities, including two tours and one lab, were held to educate landowners about the Aspen decline on Cedar Mountain and proper forestland management principles.

Data from Pasture plots was presented and published by an Extension Agent in the proceedings of the First Annual Grazing Land Conference in Las Vegas Nevada. Data has been used with 30 landowners to help them select proper varieties for pastures. Data has been shared with Utah agents and the Natural Resource Conservation Service. The following testimonial was provided ... "your plots are providing excellent information. I use this information in my annual Utah Field Planting Report. It is distributed to all NRCS offices in Idaho and Utah. In addition, I have provided this information to individuals dealing with nutrient management plans and those interested in irrigated pasture alternatives. It provides excellent information on production and livestock preference that our field people and clients can clearly understand. Thanks for your good work and willingness to share this with others!"

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Grazing

Description: A plan was proposed for one area of grazing to "permanently retire" (stop) grazing on four allotments. This impacts a number of rural families as well as the rural economy of these areas. Letters from the Ag Agent were sent to the GSENM, BLM Environmental Association. The letters addressed the influence of grazing on vegetation, recreation, socio-economics, nutrient cycling, wildlife, historical, cultural and research activities in southern Utah. My recommendations were to continue well-managed livestock grazing on these allotments. My conclusions were "if livestock grazing was discontinued it would negatively impact the culture and economy of the local communities without increasing desirable impacts to wildlife populations or recreational activities."

The cattleman's associations of Kane and Garfield Counties also protested the BLM planning actions.

Impact: A Department of Interior Solicitor, William Myers, advised the Interior Secretary, Gale Norton, that the BLM could not "permanently" eliminate grazing from these public lands. That was definitely positive news for sustainable agriculture in southern Utah.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Grazing

Description: Concerns about potential nitrate toxicity came from a number of areas in the state related to grazing of sorghum, sudan hybrids or oats, which had been affected by drought. Directions were provided to producers through Extension Agents on how to sample in testing for nitrate.

Impact: "The samples showed the drought was not increasing the toxicity and the producer could harvest the 120 acres without worrying about poisoning."

The samples showed the frost did not increase the toxicity and the producer was able to graze the 40 acres of frosted oats. USU Extension offers forage testing to concerned ranchers with quick turn around and accurate results and explanation.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Managing Change in Agriculture

Description: Most citizens know little about current agriculture practices and often have misperceptions about animal rearing. A number of farm field days have been held to help educate young people and teachers about modern farming and ranching.

Impact: Farm or Ag Field Days were held in a number of locations throughout Utah with excellent attendance by school children and youth. The post survey reports of both students and teachers were excellent. For example: "4.7 out of 5 for overall education. One hundred percent of the teachers liked the curriculum provided for education before and after the event, and all of them used it." The numbers attending varied with the local population and the ages invited to participate - e.g. 400, 435, 587, 1400, 1437, and 4628. In one county, it was a two-day event but for most it was a one-day field trip. Another novel example was of a small (17 children) third grade class using their math in the cornfield. They counted corn plants on a specified distance on selected rows, estimated numbers of plants per acre, collected ears from 10 plants to weigh and then calculated the estimated bushels of corn per acre.

Other comments and benefits:
"It has had a major impact on teachers who have gained respect for agriculture and have also learned of sources for teaching material."

"At the hand washing station, glow germ was put on the student's hands prior to them washing. The students were then taken into a darkened trailer and a black light was used to determine how well they washed their hands. It showed that around the fingernails and on the back of the hands was not washed as well as the rest of the hand. Students learned the importance of washing their hands correctly to prevent the spread of germs."

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Managing Change in Agriculture

Description: Extension conducted a study to determine the water consumption by Orlopp Turkeys.

Impact: The information generated from this study has served as a benchmark reference for the local turkey industry this year as they discuss water use issues with government agencies. This document makes clear that turkeys do not utilize as much water as currently recorded in Utah government sources dealing with water rights. This information aids growers in presenting reasonable farm water needs/use data when dealing with these agencies.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Managing Change in Agriculture

Description: Agriculture Secretary Ann M. Veneman announced a new program, the Livestock Compensation Program. The program was for beef and dairy cattle, sheep, producers and was made available to those counties that have received primary disaster designation due to the droughts of 2001 or 2002. In Utah, the entire state qualified. Extension Agents across the state helped facilitate getting the information to livestock producers on the need and deadlines for application.

Impact: In one county, producers applied for $1.5 million through the livestock compensation program and this was multiplied by varying amounts across the state in every county. That will make a significant difference in economic survival during this serious period of drought and struggling state economy.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Managing Change in Agriculture

Description: As the numbers of full-time ranchers continues to decline, many of the agricultural organizations also struggle. Sometimes a key leader leaves an area and the entire organization becomes dormant. This reduces their public voice and ability to respond to further local challenges. Ag Agents have made a concerted effort to aid some of these organizations in becoming re-established or improving their functions.

Impact: Agent organized and held a meeting to elect a new president, Vice-president and secretary. Developed a new mailing list, and helped organize a summer meeting. Due to these efforts over 130 people attended the summer meeting. It is important to have this organization active in a time of unpredictable markets, drought and increasing urban developments.

This group has not functioned well for the past few years and they would like to get more programs and events going for their education and support of the industry in the County. Six programs were scheduled for January through July of 2003. This group has had a membership of about 200 producers. The intent is to get together to discuss issues facing the industry locally and nationally and provide educational programs to help producers address those issues.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Gardening and Ornamental Horticulture

Key Theme: Home Lawn and Gardening

Description: Presentations were given to 19 participants on issues relating to turf-grass care. Participants improved knowledge of proper turf-grass maintenance techniques that can result in lower water use and costs, improved plant health, and improved environments.

Impact: This class could impact turf related expenditures of approximately $6,650

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Presentations were given to 23 participants on issues relating to weeds and pesticides around the home landscape and the garden. These principles may result in an improved environment.

Impact: This class could save homeowners $1,150 in expenditures for chemicals and fertilizers.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: A presentation on issues relating to vegetable production was given to 24 participants. Those attending were provided with information to improve vegetable produce production.

Impact: From the 24 people attending, it is estimated that the vegetable production could increase from between $7,200 to 14,400.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Twenty-four Master Gardeners contributed 80 hours of service during the 2002 season to county residents. Service included answering homeowner's questions and helping residents with gardening problems. Master Gardeners taught a total of 13 classes to church and community groups.

Impact: Volunteer service hours from Master Gardeners are valued at $800.00

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Forty-eight Master Gardeners were graduated out of a class of 78. This makes one of the largest active master gardener programs in Utah.

Impact: The sixteen individuals completed 40 volunteer hours, 25 completed 50 hours and 13 completed over 100 hours. Six Master Gardeners donated 250 hours, three with 500 hours, two with 750 hours, and four donated 1250 hours of volunteer time. The time was estimated at $16.05 per hour. Total hours were just over 4,600 hours for a total of just less than $73,830.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: The Horticulture Information Center is designed to interface home gardening practice at the University with homeowners around the state.

Impact: Total media contacts are 9,090,750. Two hundred and twenty radio segments were produced with 25,000 listeners apiece, 60 newspaper articles were generated in papers that reach 55,000, four garden class catalogs were published with 35,000 readers, and 30 tours were directed with 25 people per tour.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Master gardeners were trained to help the communities of Salt Lake, Tooele, and Utah counties. They trained other citizens, conducted garden walks and helped in greenhouses and county fairs.

Impact: Seventy Master gardeners were trained and conducted 50 formal workshops and 50 formal training sessions, contacting more than 15,000 individuals in the horticulture education process.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Four Master Gardener classes were taught. Master Gardeners were taught about websites, fact sheets, books, and workshops. This training will help the Master Gardener organization in Tooele County.

Impact: Gardeners contributed over 1000 hours of service to the community. This service at $10.00/hour would be $10,000 to the taxpayers.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: A group of Master Tree Stewards was taught about tree care and maintenance.

Impact: The program has resulted in training 60 volunteers and 7 Master Tree Stewards. An estimated 686 hours was donated with a value of $10,290 to 13 town or cities.

Key Theme: Home Lawn and Gardening

Description: A group of citizens were taught about home and lawn care and maintenance.

Impact: Nine students reported 295 hours of service to the community with an estimated value of $2,950.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Master Gardeners were trained and given opportunities to serve the community.

Impact: Twenty-four Master Gardeners contributed 80 hours of service to the community. Projects included plant clinics around the county, telephone calls to answer questions, and classes to church and community groups. The value of the service to the community was estimated at $800.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: A landscaping workshop in Kanab was held to instruct participants with concerns and teach innovative landscaping techniques.

Impact: Forty-six people showed up learned how to identify a weed prior to controlling, diagnose their own pest problems, trying new herbicides, and how to prune trees and shrubs. Workshop participants would have paid $1,200 to attend this workshop.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Two fruit pruning workshops were held in Weber County during the month of March. Participants learned how to properly prune, train, and maintain fruit trees and berry plants.

Impact: Those in attendance realized an estimated savings of $3,000.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home Lawn and Gardening

Description: Master Gardeners were trained and given opportunities to serve the community.

Impact: Nineteen Master Gardeners were awarded certificates upon completion of their 40 hours of service. Master Gardeners recorded over 1,500 hours of volunteer time, representing a value of over $15,000 to Weber county, Utah State University, and the surrounding communities.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Theme: Sustainable Agriculture

Key Theme: Small Farm Viability

Description: With the assistance of the USDA-SARE Program, a Small Farms Conference was held to instruct farmers how to become more competitive. Farmers were taught how to write a business plan, how to be environmentally conscious, and to consider the effect of actions on the quality of life of their family and their neighbors.

Impact: 121 farmers attended the conference. Some of he ideas implemented were; mailing 1,200 marketing letters, growing dried flowers, using a farmers market to sell produce, rotational grazing, cutting back on irrigation, and string a market garden business.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Diversified/Alternative Agriculture

Description: The USDA Western-SARE Program's headquarter is in the Cooperative Extension unit at Utah State University. The Western Region Sustainable Agriculture Research & Education (W-SARE) program seeks to identify methods that will help all producers continue to produce an adequate and safe food supply that can thrive through the next millennium. It integrates all elements of management pesticides, fertilizers, wastes, energy, economics, etc. A truly sustainable agricultural system requires relatively large amounts of technology and management inputs. Hence, growers making the transition to more sustainable systems require the latest in research-based technical information. Utah State University administers the Western Region Sustainable Agriculture Research and Education Program, a $3 million/year research & education grants program for Alaska, American Samoa, Arizona, California, Colorado, Guam, Hawaii, Idaho, Micronesia, Montana, Nevada, New Mexico, N. Mariana Islands, Oregon, Utah, Washington, and Wyoming. Western SARE is a federal competitive grants program with a regional orientation and leadership structure. Its mission is to expand knowledge and adoption of sustainable agriculture practices that are economically viable, environmentally sound and socially acceptable.

Impact: A recent survey completed by Washington State University of farmers/ranchers and agricultural professionals indicated a regional impact of over $28.8 million. The impact (additional profits earned) on Utah alone was approximately $1.2 million.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Utah Agricultural Experiment Station
Progress Report on Plan of Work Goals: 2002

The Utah Agricultural Experiment Station has a large number of projects in this goal area and we will continue to maintain those individual projects but the research effort is very diverse. Thus, we have not identified a clear "program" for this POW. Specific projects do address various issues related to production, processing, and marketing as noted later in the budget summary.

Goal 2: A SAFE AND SECURE FOOD AND FIBER SYSTEM

Utah State University Extension
Progress Report on Plan of Work Goals: 2002

Overview

USU Extension specialists and county educators address food safety issues on multiple levels. The county educators spearhead the training of consumers in safe food preparation, preservation and storage through pressure canner lid testing, workshops, newsletters, newspaper articles, radio and TV shows. Web sites, phone-in messages and satellite training are increasing in use.

Home Educators continue to be the primary source of information on home preservation methods in the state. More than a thousand calls per year is a conservative estimate of phone calls received pertaining to food preservation per year. Extension agents tested more than 600 Pressure canner gauges. Altitude adjustment information is included with gauge testing. Ninety-five percent of the counties in Utah must include altitude adjustments in order to process food safely. USU Extension provides the only home food safety program in the state. We have had no cases of food borne botulism in the last five years despite extensive home canning in the rural areas.

The USU Food Safety Managers Certification Course is offered as a home-study video course or taught by food safety certified county agents as needed locally. Food safety managers who participated in this course have a very high success rate (80%) in passing the food safety certification examination. During the last year, 361 food service managers were trained. This pool of trained people can impact the safety of millions of meals served in food service establishments each year. Salmonella and Hepatitis A cases have decreased.

Children are especially prone to catch and carry illnesses. Personal hygiene taught at a young age can benefit everyone. Teaching hand-washing methods to children using GloGerm, which 'glows' under UV light if hand washing is inadequate, is proven to be a well-received program. Extension has supplied the materials and training to several thousand children in the state. One follow-up study found major improvements in children's understanding of when they should be washing their hands.

Food safety issues in Beef Quality Assurance programs included the production of a video showing effects of injection site and training programs using this visual. The emerging needs of bio-security of animals on farms and ranches resulted in the development of guidelines, which were implemented on campus farms and shared with producers. The Utah Veterinary Alert system has been used to developed keep veterinarians informed about several disease outbreaks, including: viral hemorrhagic disease of rabbits (in Utah), Chronic Wasting Disease of elk (in Colorado), West Nile Virus (progressing across the eastern states), Scrapie of sheep (Utah regulations). Their awareness and experience with it enable rapid communication whenever needed.

Pesticide training and IPM
Applicators who successfully complete pesticide certification or re-certification training are more likely to calibrate sprayers properly and make pesticide applications at rates and times when a maximum number of pests can be controlled. The possibility for a pesticide residue on food is greatly reduced. Seventy-nine to 80 percent of applicators that complete the USU sponsored training program report that the program is good or very good and that it helps them realize the importance of becoming a certified applicator. Commercial and home gardeners in Utah are being provided with training and resources to facilitate decreased and/or wise use of pesticides.

State Assessment: The programs offered within Goal 2 address critical issues in Utah. Extension faculties on campus and in the counties are responding very well to local and statewide needs. The impacts reported here reflect a very successful program of work.

Total expenditures and FTE:
Smith-Lever $246,534
State Match $225,179
FTE: 8.49

Program Title: A Safe and Secure Food and Fiber System

Key Theme: Food Resource Management

Description: A large proportion of the Utah population stores food with the goal of having a two-year food storage supply. Extension improves access to an affordable, healthful, and culturally relevant food supply. Often this leads to waste due to storing food for excessive periods. Extension provides food storage training, bulletins and answers to direct consumer concerns. Another approach to assisting clients in maintaining a food supply is through food budget management training.

Impact: The three food storage bulletins on our web page are widely used by church groups in training on proper food storage techniques and the need of rotation. Four food storage workshops were offered in the state reaching about 175 people.

Through EFNEP/Food Stamp programs, 864 low-income clients in the state received training in managing food resources. Eight-seven percent showed improvement in food resource management.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Food Safety

Description: Food safety training involves a number of different approaches from direct training to providing resources/information. All county extension offices have been supplied with food safety "loaner-lessons". These are videos and written training materials that are loaned to groups wanting more information on food safety topics. The three sent out this year: Typhoid Mary or Good Samaritan (food safety when taking food to the vulnerable), Outfitter's Food Safety (food safety while camping out), Food Safety for the Occasional Cook (food safety for religious and civic groups preparing food for large dinner parties). All counties also have GloGerm and UV lights, which can be borrowed for training.

Impact: Through EFNEP/Food Stamp training programs, 864 low-income clients in the state received training in safe handling of foods. Sixty-four percent showed improvement in one or more food safety practices.

The Utah Coalition for Food Safety Committee, with Extension in the lead role, produced and disseminated a fact sheet on control of Campylobacter to health inspectors, restaurant managers, bed and breakfast, hotels, food processing companies and consumers. The effectiveness will not be known until next year. Two years ago the Coalition disseminated a fact sheet on S. enteritidis resulting the incidence dropping by more than 60% the next year.

In a WIC training, GloGerm was used by restaurant managers to train food workers, schools and day care centers, health professionals. This very personal hands-on experience has a major impact on future hand washing. Years after having had the GloGerm experience people comment on how they are much more careful in hand washing.

Food safety information/assistance was supplied to six food-processing plants (raspberry juice, 2 dairy processors, turkey processor, salad dressings, and honey processor). HACCP and Process Authority assistance to these companies increased the safety of the products sold throughout Utah and adjoining states.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Bio-security

Description: The need for bio-security is a new addition to Extension's education role. Information posters and fact sheets supplied by USDA on 'Keep Americas Food and Agriculture Safe' for producers, processors, and food service establishment was dispersed by the Extension representative at the Utah Food Safety Coalition meeting. The representative from the Utah Dept. of Health planned to give copies to the health inspectors to give restaurant owners. Utah Dept. of Agriculture and Food agreed to give it to food processors during their inspections. Trade representatives in the Coalition will share the appropriate materials with their groups.

Efforts have been made to insure safe water on a community level in two communities.

Impact: There are unknown impacts from dispersal of posters and fact sheets.
Two presentations to beef producers and others at Arizona Strip meetings were made. Articles have been published in newsletters on the topic.

The preparedness structure to insure safe water is in place for the two communities, down to the block level.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Food Safety, Home Food Preservation

Description: Home Educators continue to be the primary source of information on home preservation methods in the state. Over a thousand calls per year is a conservative estimate of phone calls received pertaining to food preservation per year. Food preservation training and pressure gauge testing are not available anywhere in the state except from the Extension service. Most counties had one or more classes on safe food preservation methods.

Impact: Extension agents tested over 600 pressure canner gauges. Altitude adjustment information is included with gauge testing. Ninety-five percent of the counties in Utah must include altitude adjustments in order to process food safely. We have had no cases of food-borne botulism in the last five years despite extensive home canning in the rural areas. Pressure lid testing found about 15% of the lids tested either need to be replaced or accuracy adjustments made. One Master preserver course was taught to 12 people representing 5 counties and 2 states. A survey at 6 months showed that 90% used the training either for training others or personally. The master food preservers serve as a valuable volunteer resource for county agents during harvest time.

Food safety training for food service establishments (Food Safety Manager Certification)

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Food Handling

Description: The USU food safety manager certification course and exam has been approved by the Utah Dept. of Public Health as meeting the state requirements for certifying food safety managers since the requirement that all food service establishments had to have a certified manager became law in 1999. The course is offered by satellite three times/year or as a time enhanced independent study course or agent taught and can also be challenged. In September 2002, Utah revised the Utah Sanitation Code, which necessitated changes in the textbook and the training tapes.

Impact: The Food Safety Manager Certification program had 369 clients from October 2001 through 2002. Of these 168 chose to take the course as time enhanced learning, 105 participated in one of the three satellite training series offered during the year, 86 took the exam on a challenge-basis, 5 as an agent-solo course and 5 were re-certifying. Clients represented 25 of the 29 counties in Utah. Forty-eight percent of the managers lived in rural counties. Satellite training resulted in the highest pass rate on the first attempt at passing the exam with an 80% pass rate as compared to 68% for independent studies and 49% pass rate for those that challenged the exam. Everyone was allowed two attempts to pass the exam. Including the retakes in the data brought the pass rates to 85%, 86% and 64%. Clients included Navahos, Utes, and Spanish-speakers. One client chose to take the exam using our Mandarin oral version of the exam. The versatility of the program facilitates food service people meeting the legal requirements regardless of location, ethnic group or preferred learning technique. It also has the hard to measure impact of decreasing the likelihood of food-borne illness.

The 3rd. editions of the FSMC manual and training tapes have been completed and copies sent to all counties.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Integrated Pest Management

Key Theme: Insect Monitoring

Description: USU has been an active participant in monitoring fruit pests under the national CAPS program and IPM programs. The Utah pest advisory program monitors 15-25 arthropod and disease pests on woody trees (tree fruits and ornamentals) each year and provides timely information to producers and the public on when and how to optimally manage these pests. Weather data is obtained from representative growing areas and pest phenology models run to predict pest activity and optimal timing for management. The pest advisory is disseminated by email (to over 60 direct recipients), posted on the Utah IPM web site, and posted on a Utah Co. Extension recorded phone message. County agents and others redirect the information to many other sites and using additional methods (newsletters, newspaper articles, radio). IPM pest management methods are provided in the advisories. IPM methods suggest multiple pest management tactics, including biological, cultural, mechanical and chemical.

Impact: This has resulted in a decrease in pesticide use on fruit trees.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Pesticide Training

Description: Pesticide training was provided to more than 8000 people in Utah through a variety of methods. With the approval of the Utah Dept. of Agriculture and Food, 16 workshops were offered and attended by 954 applicators. Literally 100's of hours of continuing education units were taught that could be applied to renewing licenses. These training programs were in conjunction with Utah Crop Production Association, Intermountain District Association of Operative Millers, and the Grain Elevator and Processors Society, specialists rewrote the vertebrate animal pest test management study guide with the Utah Dept. Ag & Food (used to pass state certification category to become certified to conduct pest control).

Impact: Pesticide training increases the proper use of chemical in and around food.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Beef Quality Assurance

Description: During 2002, over 250 people have taken the BQA training resulting in certifying about 200 farms/ ranches. The training covers 'calf to plate' and why everything has food safety relevance. Producers are made aware of their responsibility and carcass trace ability.

Extension received a grant to develop a Youth (14-18 years) BQA training program which will be implemented next year.

Adoption of recommended quality and safety practices will increase the value and safety of beef produced industry wide. Research indicates that as much as $3.00 per hundred weight of life animals could be gained by producers who can assure processors their animals were produced according to BQA standards.

A training booklet on BQA and a fact sheet titled "Beef Quality: Farm to Table" were also developed and are available to producers. All these efforts will provide economic and food safety benefits to the region.

Impact: Two cooperative programs with a Rich County Veterinary Clinic resulted in producers learning strategies to manage their production units under the current drought conditions. Producers learned that early weaning could be an option to help producers market cull cows earlier in the season and market calves earlier to conserve limited feed supplies. Such action helped producers market cull animals at a $5 to $10 per CWT premium over marketing later in the season when most cull animals flood the market.

Description: Twenty-two producers from Cache County brought their beef bulls to a central location where they were tested for trich and semen quality evaluations and breeding soundness exams were conducted. No bulls were identified as carriers of the disease. Three bulls were culled on the basis of other reproductive disorders. Beef producers in Rich County evaluated over 800 bulls for breeding soundness and trich testing. One producer had bulls identified as carriers of the disease. These carriers were culled and the remaining bulls were retested in accord with State Regulations. In addition 18 bulls were culled due to other reproductive problems and 6 others culled due to other health related concerns.

Impact: The impacts of such evaluations are difficult to measure since there are so many variables that influence reproductive efficiency. However, conception rates were reported to be higher by most producers in spite of drought conditions.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Utah Agricultural Experiment Station
Progress Report on Plan of Work Goals: 2002

Program Title: Plant and Animal Health and Safety

Key Theme: Other - Plant and Animal Health and Safety: Identification

The identification of plant and animal safety concerns is of critical importance to U.S. agriculture. This section describes various projects/activities which are being conducted by the Utah Agricultural Experiment Station which deal with the identification of plant and animal diseases and pests. This section is broken down into "Livestock" and "Plants" components.

Livestock -

Diagnostic Probe for the Spider Lamb Syndrome Gene in Suffolk Sheep
Description: Spider lamb syndrome (SLS) is a semi-lethal congenital disorder, causing severe skeletal abnormalities in sheep that include facial deformities, bent limbs, and scoliosis. The mode of inheritance for SLS is autosomal (e.g., unrelated to sex) recessive, making the culling of carrier animals difficult because of their normal-appearing phenotype. Due to traditional animal breeding methods, a genetic market for SLS is an important tool for eliminating the SLS defect from sheep populations. Population studies, including more than 1000 sheep of differing SLS genotypes, demonstratives that this is the causative mutation in SLS.

Impact: Isolation of a genetic marker for SLS is of great importance to the sheep industry. The genetic marker can be used to decrease the SLS gene frequency, thus allowing the black-faced breeds to be used more confidently as a terminal cross breed. Black-faced breeds enhance the production of meat in sheep and, hence, are an important economic factor. Work has not yet been completed that would allow a commercialization of this process, though the marker has been identified. It is anticipated that this technology could increase return a minimum of $200,000/year to Utah's sheep producers.

Seroprevalence of Mycobacterium Avium Subspecies Paratuberculosis in Utah Cull Dairy and Beef Cattle

Description: A comparison of the seroepidemiology of Mycobacterium avium subspecies paratuberculosis (MAP or Johne's disease) in cull dairy and beef cattle of Utah origin was made with two MAP antibody detection tests. While there was a moderate level of agreement between the two tests and the actual existence of MAP in Utah dairy and beef cattle, there was a statistical difference between the two tests.

Impact: The results from the two-test comparison suggest that one test (the ImmuCell Tip-Test) may underestimate the level of Johne's disease within a herd. Infection by Johne's disease causes a production limiting condition in cattle. It is estimated that the disease costs Utah producer's $26 million/year at the present time and that an education program is warranted to prevent spread of the disease.

DNA-Mediated Immunization to Produce Heterotype Protection Against Bluetongue Viruses in Sheep

Description: Research has been successful in developing a new bluetongue virus (BTV) diagnostic synthetic peptide-based immunoassay, e.g., SPIBE (Synthetic Peptide ImmunoBlot Assay).

Impact: The method identified for detecting the virus is more cost effective, less labor intensive, and can differentiate sheep and goats either infected with BTV or vaccinated with BTV. Using experimental methods, researchers have been able to identify the pathological damages caused by an unknown aquatic "bacilliform" virus in freshwater crayfish in Utah (with potential economic impacts on the global shrimp industry), still no dollar estimates of impacts are yet available.

Vaccinia Virus Recombinant Expressing the Major Non-structural Gene of Aleutian Mink Disease as a Vaccine

Description: Research is underway to develop a recombinant vaccine expressing the Aleutian disease virus (ADV) major nonstructural gene. The appropriate ADV sequences have been successfully cloned into the vaccina virus vector.

Impact: The development of a vaccine for this devastating disease could generate an additional $5-$6 million/year to Utah's mink producers.

The Management Style and Competence of Dairy Farmers as an Indicator of Profitability

Description: The Milk urea nitrogen (MUN) test can provide a quick, noninvasive indication of herd nitrogen (N) metabolism. Excess N in the ration can be expensive and may contribute to excess N excretion into the environment. Models suggest that as MUN increased, pregnancy status decreased. This is one of the first times that impaired reproduction has been demonstrated in commercial dairies (in contrast to control studies).

Impact: Production variables, such as milk yield and protein percent, were significantly related to MUN concentration and are important, especially milk protein percent, when evaluating MUN concentrations relative to nutrient requirements and costs of rations. Conservative estimates of the cost savings to the dairy industry in Utah are $5 million/year. Environmental impacts have yet to be determined.

Plants -

Interactions Between Cereal Aphids on Crop and Non-crop Hosts

Description: Plant responses to damage by herbivores may be very herbivore-specific. When comparing the effects of feeding by two cereal aphids on the subsequent quality of wheat for each species, one had a long-term effect, while the other did not. These results suggest specificity in both the plant response to the two aphid sp

Impact: This research demonstrated that plant responses to herbivore feeding can vary even when two herbivores feed in the same way and are closely related. Further research is needed to identify the means by which different chemical and physical changes are induced by the two aphid species used in this research. Such research can allow us to isolate different signaling pathways in response to different herbivores and pathogens.

Mechanism of Action of Antifungal Syringomycin

Description: Studies continued on the mechanism of action of the plant bacterial cyclic lipodepipeptide and antifungal agent, syringomycin E. The findings continue to show a major role for lipid head groups - particularly of sphingolipids (fats and related compounds widely distributed in animal tissues, particularly cell membranes) - in the antifungal action of syringomycin.

Impact: This project will determine how a class of bacterial metabolites produced by a post harvest fruit biocontrol agent works to suppress fungal disease. No dollar estimates of potential impacts are yet available.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

153	513
180	537
468	607

Funding Level: $230,059.49 **SY FTE: 1.58**

Scope of Impact: National and International

Key Theme: Other - Plant and Animal Health and Safety: Control

The control of plant and animal health and safety is of critical importance to U.S. agriculture. This section describes various projects/activities that are being conducted by the Utah Agricultural Experiment Station which deal with the control of plant and animal diseases and pests. In summary, attempts are underway to identify the effects of and clear, where appropriate, control agents for minor crop and livestock uses. In addition, we are developing integrated methods of parasite control for improved livestock production, as well as studying the natural enemy efficacy and ecological/physiological basis for interactions through biological control.

Livestock -

Control of Animal Parasites in Sustainable Agricultural Systems

Description: Cryptosporidiosis (i.e., diarrhea is the sign of infection) has medical significance for domestic livestock and humans. Infections are aggravated by the lack of clinically effective vaccination or treatment strategies. The existence of cryptosporidiosis reduces animal and human health and reduces the productivity of livestock significantly. Research has been completed to evaluate the immunosuppressed non-neonatal outbred pig as a diarrheic animal model for cyptosporidiosis.

Impact: Modeling the parasitic infection in swine will be useful in evaluating potential prophylactic and/or therapeutic measures for controlling this disease in animals and humans. Production losses (lack of rate of gain) can reach 10% of the animal's value, averaging nearly $30 million/year in Utah.

An effective treatment regime for cryptosporidiosis would have significant medical significance to AIDS patients, as well as to the general population.

In Vitro and In Vivo Antiviral Studies

Description: A major need continues for better drugs that can be used to treat respiratory virus infections in humans and veterinary animals. Research is underway in which 232 compounds were received for in vitro, antiviral evaluation. Viruses evaluated included influenza A and B, measles, equine encephalitis, yellow fever, West Nile virus, to mention only a few.

Impact: Work is not yet completed on these compounds, some have been shown to be effective, ranging from mildly successful to highly successful, depending on the virus being treated and the compound being analyzed.

Toxic Effects of Minerals, Plants, and Interactions of Plants with Minerals in Livestock

Description: Studies are underway in which mineral forms are being analyzed with respect to potential toxicity to livestock. Of special interest in this study is the effect on production that different forms of iron might induce.

Impact: These studies verify that a mineral's form significantly affects the toxic potential of the mineral. The resulting economic losses from high water iron could come in the form of decreased growth, decreased feed efficiency, and decreased milk production. Losses due to the toxicity of various minerals are estimated to be $2 million/year.

Gamete and Embryo Toxic Effects of Ammonium in Cattle

Description: Experiments have evaluated the effects of continuous exposure to ammonium throughout in vitro maturation (IVM), in vitro fertilization (IVF), and in vitro culture (IVC) on subsequent embryo viability and fetal development following transfers to synchronized recipients. The stage of the estrous cycle and diet influence ammonia concentration in bovine and ovine reproductive fluids.

Impact: It appears that exposure to ammonia in the doses administered in this study during early embryonic development does not adversely affect embryo viability or fetal development.

Animal Model Evaluations of Candidate Hepatitis Therapies

Description: Nineteen candidate compounds have been evaluated for anti-hepatitis B virus (HBV). Two of the compounds were found to have minimal effective doses of 1 mg/kg/day and 0.1 mg/kg/day, whereas the other compounds did not have anti-HBV activities. The drug 3TC, approved for treatment of human HBV infection, was not effective in this HBV transgenic mouse model.

Impact: The discovery of efficacious therapeutic substances will assist in the development of FDA approved treatments for hepatitis B virus infection. Progress is being made in identifying an effective treatment, but specific compounds are not yet ready for release.

Plants -

A National Agricultural Program to Clear Pest Control Agents for Minor Uses

Description: More than 35 minor food crops and a large variety of nursery and landscape crops are grown in Utah. A program to clear pest control agents for minor uses has helped in securing clearances for registration of certain pesticides uses on the following crops: alfalfa, apple, apricot, cabbage, cauliflower, sweet and tart cherries, field corn, cucumber, dry bean, dry onion, peach, plum, potato, pumpkin, raspberry, safflower, snap bean, winter and summer squash, sweet corn, tomato and watermelon.

Impact: The securing of pesticide registrations for minor crops increases grower yields and productivity (valued at over $15 million) and provides a varied and nutritious selection of foods for consumers.

Integrated Pest Management and Demonstration Fruit Orchard at the USU Kaysville Experiment Farm

Description: Testing and demonstration of new, lower toxicity chemicals for control of disease and arthropod pests of tree fruits is important to the viability of the state's fruit industry. Research and extension efforts are needed to assist growers in implementing new, more selective controls as EPA eliminates many of the historical pesticides for use in this area. The determination of alternative bactericides for fire blight control is critical now because streptomycin resistance has been detected in Utah strains of the pathogen, Erwinia amylovora.

Impact: Our studies on the role of injury and leaf age in fire blight infections will be used to develop methods to aid fruit growers to use the correct strategy to control fire blight following a rain or hailstorm. Control of various pests and/or diseases through the application of new and less toxic chemicals could increase returns to Utah fruit producers by more than $1 million/year.

Diversity of Bacterial Endosymbionts in Homopteran Insects (Hemiptera: Sternorrhyncha)

Description: Sternorrhynchan insects (insects with sucking mouthparts such as aphids) comprise many of the world’s most destructive agricultural pests. Because bacterial endosymbionts (bacteria which live in the host inset) appear essential to host nutrition, they are a potential target of biological control. First, however, basic information on their identity and biology must be gathered.

Impact: This research is still in progress.

Plum Curculio Behavior, Ecology, and Management in Northern Utah

Description: Plum circulio (PC), a quarantine insect pest in Northern Utah, occurs in approximately 50 square miles, centered near Brigham City, in Box Elder County. The main host of the PC is sweet cherry. The existence of PC precludes the exports of fruit to outside markets.

Impact: Delimitation of the insect's distribution to one county in Utah, and identification of the primary habitats and hosts, has assisted Utah's agricultural regulatory agency in suppressing this pest in Northern Utah. This pest suppression effort assists commercial fruit growers in other Utah counties in keeping their export markets open and is valued at approximately $2.4 million/annually.

Improving Tolerance to UV-B of an Insect-Biocontrol Fungus, Metarhizium Anisopliae

Description: The susceptibility of spores of insect pathogenic fungi to death from near-UV radiation sunlight limits their commercial use as biocontrol agents of foliar pests. Since sunlight is common for most optimal plant growth conditions, the potential use of insect pathogenic fungi are quite limited as a biocontrol agent.

Impact: Spores from media with low levels of organic nitrogen were more UV tolerant than ones from potato dextrose agar. Those fungi that were more UV tolerant were also more heat tolerant. Even though this work is only in its beginning stages, the research has provided a better understanding of genes necessary for protection from solar irradiation.

Puccinia Thlaspeos as a Biocontrol Agent for Dyer's Woad

Description: Dyer's Woad (DW) is one of a number of introduced noxious weeds that are problematic over large areas of the Western U.S. This weed often invades low-value land that is used for grazing and, therefore, cannot be treated economically using herbicides. Biological control is an excellent, if not the only, option for controlling this weed in such areas. However, even when DW can be controlled using herbicides in agricultural areas or along roadsides, it might be possible to integrate the use of a biological control agent with the herbicides.

Impact: Larger and larger areas of the Western U.S. are being covered by DW. The economic impact of the infestation of DW is estimated to be over $5 million/year in Utah. Control of this weed using biological controls, with or without herbicides, would prove very helpful in reducing the damage caused by DW.

Cultural, Biological, and Chemical Control of Weeds in Field Crops

Description: Jointed goatgrass (JG) is a common weed in winter wheat production in the Intermountain West. Procedures have been identified that can serve as effective control strategies for this weed.

Impact: The most effective management procedure for winter wheat growers in the Intermountain Region is to rotate from a winter wheat-fallow-winter wheat rotation to a winter wheat-spring crop-fallow regime. Of secondary importance is the use of herbicide-resistant winter wheat cultivars that can be combined with selective herbicides against JG. Even less important methods of control are earlier planting dates and taller stature wheat. These procedures can improve yield as much as 25 percent, which could result in an additional $4.25 million/year in added revenue to winter wheat producers in Utah. The management procedures developed is effective for other weed species encountered in wheat besides JG.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

103	622
133	624
400	626
415	636
466	743
618	

Funding Level: 2,893,461.81 **SY FTE: 3.48**

Scope of Impact: National and International

Key Theme: Other - Plant and Animal Health and Safety: Safety Assurance

The assurance of plant and animal health and safety is of critical importance to U.S. agriculture. This Section describes various projects/activities that are being conducted by the Utah Agricultural Experiment Station dealing with assuring the safety of livestock and plant products.

Livestock -

Mechanisms of Action of Agricultural Toxins and Antitoxins

Description: Pyrrolizidine alkaloids (PAs) are natural toxins common to many range plants throughout the Western U.S. Most PAs are potent hepatotoxins, and range-fed animals that graze on PA-containing plants are susceptible to the toxic effects of these compounds. Importantly, PAs carry over into milk and eggs and introduce risks to human health.

Impact: Heightened consumer concern over food safety has brought to the forefront the need to reliably and quickly detect PAs in animal products. Rapid detection is a necessary first step in reducing or eliminating transmission of PAs into the human food chain. Research is in the early stages.

Preventing Mycotoxin Disease in Poultry by Dietary Induction of Glutathione S-Transferases

Description: Toxic compounds in Utah plants are being identified and studied to determine their mode of action. The benefits and risks of pesticide use are being identified, evaluated, and disseminated as they become available.

Impact: Turkeys are the most susceptible food animal to the adverse effects of the mycotoxin aflatoxin B1 (AFB1). Even small amounts of dietary AFB1 cause a variety of health effects that reduce animal productivity. All turkeys are deficient in a specific AFB1-detoxification pathway. Reductions in AFB1 could mean an additional $5 to $6 million/year to Utah's Turkey industry.

Improve Food Safety Through Discovery and Control of Natural and Induced Toxicants and Antitoxicants

Description: Researchers are attempting to identify several treatment strategies that will benefit American agriculture through a) reductions in losses associated with mycotoxins in poultry feeds; b) helping the poultry industry to be more productive; and c) producing a safer food for consumers.

Impact: Plant and animal health is being improved through the development of these control processes. While much of the work is being done within single species, there is significant potential for action on multiple species, through the process involved or the actual agent developed. Estimates of the efficacy of these treatments are not yet available.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

126
445
476

Funding Level: $110,001.09 **SY FTE: .80**

Scope of Impact: National and International

Goal 3. A HEALTHY, WELL-NOURISHED POPULATION

Utah State University Extension
Progress Report on Plan of Work Goals: 2002

Overview

Eating behavior in our current society has shifted from an emphasis on getting enough of the right foods to an emphasis on choosing foods from abundant supplies of a wide variety of foods and food supplements in order to meet nutrient requirements but also controlling types and amounts to prevent over consumption. New scientific studies provide very specific information on nutrients and their interactions in the body. Skill is required to interpret these recommendations into food selection and recommendations for consumers and Extension clientele.

At the same time there are segments of the US population where economics and lack of knowledge limit the food available and consumed by families. Increased numbers of immigrants, elderly and low-income families have needs for innovative nutrition education. Special needs clientele can benefit greatly from Extension education.

The importance of nutrition to health and prevention and delay of chronic disease is well established. Many questions come to Extension agents in Utah concerning the best food choices based on

information in the public press. Much has been published about the recent increases in overweight individuals and incidence of diabetes. Agents have traditionally provided nutrition information about coronary heart disease and cancer but are now providing the public with ideas about food selection, serving sizes and increased physical activity to prevent overweight, obesity and diabetes.

State Assessment: The programs offered within Goal 3 addresses critical issues in Utah. Extension faculties on campus and in the counties are responding very well to local and statewide needs. The impacts reported here reflect a very successful program of work.

Total expenditures and FTE:
Smith-Lever $185,844
State Match $169,746
FTE: 6.4

Program Title: Nutrition and Health

Key Theme: Human Nutrition

Sufficient nutritional knowledge to choose appropriate foods and to form desirable eating patterns is necessary for a healthy population. Traditional Extension base educational programs in food and nutrition include a wide range of activities and presentations for diverse audiences. Two general goals guide the nutrition education programs: 1) to improve eating behaviors and 2) to increase nutrition knowledge. The Utah State University Customer Satisfaction and Futures Survey, 2001-02 indicates that safe foods, healthy diets, sound health practices are the issues identified as top priorities.

Description: Family Consumer Science Educators have:
Taught lessons on Portion Distortion
Taught lessons on Food Availability and Use Across Cultures
Taught Lessons on childhood obesity to WIC nutritionists in Davis County.
Taught Supermarket Psychology to 72 instructors in comparison shopping
Published 4 newsletter articles, Avoiding holiday stress, Twenty terrific eating tips for the new year, Think your drink, Make water your first choice
Published 10 tips for Trimming in local newspaper column, Message from Margie.
Published Cooking Vegetables in local newspaper column, Message from Margie.
Published Thirty Ways to Save Money and Eat Healthier in Message from Margie, local newspaper column.

Impact: Awareness and recognition of normal serving sizes.
Increased knowledge of caloric density of food choices (animal products vs. whole grains, fruits and vegetables).
Training and awareness of factors contributing to childhood obesity
2914 WIC parents increased awareness of methods to prevent childhood obesity.
72 instructors learned new approach to old shopping skills, understood the need for menu planning, preparing shopping lists and how to shop specials; became better prepared to use unit pricing and learned how to analyze nutritional return for dollars spent.
Increased knowledge of aberrant eating patterns during stress.

Increased knowledge and techniques for post holiday weight control.
Increased knowledge of cooking techniques to minimize nutrient loss and reduced appeal.
Increased knowledge of money-saving food preparation and shopping techniques.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Nutrition and Health

Key Theme: Human Health

Description: Diabetes, Step Up to the Plate is a series of lessons over ten weeks for families where diabetes has been diagnosed. The lessons incorporate information about the disease but stress food selection and preparation with great emphasis on portion sizes and controlling total amount of food.

Impact: A total of $113,00 in medical costs has been saved by participants in the program. Average weight loss was 12 pounds
Average decrease in waist circumference was 2.7 inches
Average decrease in waist to hip ratio was .04.
Average decrease in BMI was 2.0, from 35.1 to 33.1.
Average increase in portion size knowledge was 18.2 points (47% to 65% correct).
There were no statistical differences among participants in an accredited diabetes program taught by a registered dietitian and when taught by FCS agent

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Human Health

Description: Diabetes Cooking School was taught in a series of classes featuring a variety of menu items. Participants evaluated themselves on knowledge and behavior change using a Likert scale of 1 to 5 showing the following:

Impact: KNOWLEDGE
Foods and carbohydrate increased from 3.p to 4.3
Fiber increased from 3.5 to 4.4
Carbohydrate and vegetables increased from 2.5 to 4.1
Phytochemicals increased from 2.1 to 4.1
Plate method increased from 1.9 to 4.8
Calcium in the diet increased from 4.1 to 4.4
BEHAVIOR
Eating adequate fiber increased from 2.9 to 4.3
Eating adequate fruits/vegetables increased from 3.5 to 4.5

Controlling carbohydrate intake increased from 3.1 to 4.1
Choosing correct serving sizes increased from 3.0 to 4.2.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Utah Agricultural Experiment Station
Progress Report on Plan of Work Goals: 2002

Program Title: Agricultural Product Enhancement

Key Theme: Other - Agricultural Product Enhancement

This area of research involves the improvement, enhancement, or creation of agricultural products and/or marketing. It includes work in the fields of economics, livestock, plants, and nutrition and food sciences. This section is broken into four components: economics, livestock, nutrition and food sciences, and plants.

Economics -

Strategic Decision Processes, Competition and Alternative Marketing Strategies

Description: Research is underway on the relative market power for frozen potatoes, potato chips, and the processed onions. The research question is whether or not firms that purchase from producers are exercising undue market power, which could have a negative impact on producer prices.

Impact: The statistical estimates of the demand-supply-margin representations of the frozen potato, potato chip, and onion processing industries suggest that there is no apparent price-enhancing power exercised by firms in these industries on the retail markets. There might even be increased efficiencies induced by an increased concentration of the frozen potato and potato chip industries. Cost efficiencies are accounted for in the processed onion industry, suggesting that the so-called "superior efficiency" pricing strategy used by the onion processing industry is, in fact, superior.

Communication Networks and Decision Making Structures in Agricultural Organizations

Description: A study of the membership characteristics and cooperative pricing behavior in agricultural industries is presently underway. Analysis of the USDA Grain Inspection, Packers & Stockyards Administration (GIPSA) is now complete and findings are under review at the GIPSA office.

Impact: The alternative market power measures developed may be explained as a way for both customers and suppliers to reduce transaction costs involved in the sale of fed beef. In this sense, stable and exclusive market relationships may benefit both parties, rather than serving as a way for one party to exploit the other. Experimental evidence gathered thus far suggests that the provision of a suggested outcome increases the likelihood of settlement. This work is ongoing.

Examining the Dynamics of Cattle Supply and Demand

Description: Progress is being made toward building a complete model that is capable of explaining the dynamics of cattle supply and demand. The first mathematical model has been completed, calibrated, and used to generate artificial data on cattle variables. The model is successful in endogenously generating cattle cycles.

Impact: This project attempts to explain the dynamic nature of the U.S. beef cattle industry. Toward this end, we have built a fully articulated mathematical model of the cattle industry that allows for optimal responses by producers in making changes in their production and marketing environments.

Emerging Opportunities and Threats in Utah Agricultural Markets
Description: Descriptions of traceability, transparency, and assurance (TTA) systems in the U.S., U.K., Canada, Japan, and Australia/New Zealand have been completed for pork.

Impact: Work completed thus far suggests that the U.S. TTA system is lagging behind major competitors and customers. This could have important implications in the international red-meat markets if the U.S. meat exports are differentiated as not having TTA while competitors do.

Traceability: A Market Opportunity or Market Threat to the U.S. Red Meat Industry?

Description: Economic experiments to determine consumers willingness to pay for traceability, transparency, and assurance (TTA) have been completed in the U.S. (beef and ham) and the U.K. (ham). Experiments will also be conducted in Canada (beef and ham) and Japan (ham).

Impact: An analysis of TTA characteristics suggests consumers are willing to pay most for additional assurances for food safety, then animal welfare, then traceability. Results suggest that about one-half of consumers in both countries are willing to pay a positive value for TTA. Our analysis detects a more general concern about beef than pork on the part of U.S. consumers. A majority of consumers are willing to pay for TTA. We are also identifying characteristics that will develop marketing strategies for TTA products.

Enhancing the Global Competitiveness of U.S. Red Meat

Description: During this past year, an analysis was completed to examine the short-run supply response of cattle producers to price changes. The purpose for such an analysis is to help explain investments decisions by farmers and ranchers during cattle cycles.

Impact: Our findings suggest two things. First, that cattle price cycles are not mirror images of inventory cycles. Second, that if price shocks are not general, but rather segregated by fed beef and non-fed beef, no negative or perverse supply response is experienced. General price shocks appear to result in beef supplies tightening in the short-run, however. The results explain the contrasting conclusions of previous research dealing with cattle cycles.

Livestock -

National Animal Genome Research Project

Description: Identification of specific genes and genetic markers associated with economically important traits will have a significant impact on U.S. livestock production. In addition, many aspects of livestock genome projects will contribute to human genetic research. A collection of 450 ovine and bovine microsatellite primer pairs that have been mapped to specific ovine chromosomes have been selected for distribution to researchers in mapping traits in sheep.

Impact: Many researchers are establishing projects to identify economic trait loci (ETL) in livestock. The development of a genome map for sheep will greatly enhance the identification of genetic regions influencing economically important traits in sheep.

Identification of Genetic Markers Associated with Economically-Important Traits in Livestock

Description: The agouti signaling protein (ASP), encoded by the agouti gene, is thought to play a role in coat color, fertility, and seasonal breeding in sheep. In addition, ASP has been implicated in obesity, tumor growth, embryo death, and diabetes in other species. The pleiotropic (producing more than one genetic effect) effects of agouti make it biologically interesting and pharmacologically important.

Impact: Analysis of nucleotide sequence obtained with PCR primers designed from the published ovine agouti coding sequence revealed a second, agouti-like locus, which is different from the exon 2 of the agouti gene. The difference occurs between white-faced and black-faced sheep breeds and may be an important factor in identifying genetic differences attributable to tumors, diabetes, etc.

Characterization of the Ovine Genome; Positional Cloning of the Ovine Callipyge Gene

Description: In muscle, Calcineurin (Cn) transduces signals that determine fiber type, growth, and hypertrophy, and commitment to the myogenic lineage. Cn activity was determined in muscle extracts of normal and callipyge genotypes. Muscle type, age, and genotype (the three factors known to affect manifestation of callipyge hypertrophy) had an interactive effect on Cn activity. This suggests that the callipyge gene exerts its effects in muscle via Cn-mediated pathways, and that the callipyge model of muscle hypertrophy may provide a unique model to study Cn-mediated signaling in skeletal muscle. The callipyge mutation causes pronounced muscular hypertrophy in sheep. Animals expressing the callipyge phenotype produce leaner, higher yielding carcasses, though there is some concern with decreased tenderness of the loin.

Impact: As the understanding of the Cn signaling pathways increases, so will our ability to control and select for the extent of muscling and meat quality attributes in livestock.

Modifying Milk Fat Composition for Improved Manufacturing Qualities and Consumer Acceptability

Description: Conjugated linoleic acid (CLA) has been shown to have health benefits in animal models. Twenty Angus crossbred steers were used to study the effect of diet on the CLA content of

beef. Growing cattle on grass with no grain supplementation improved nutritive and therapeutic value of beef by enhancing the CLA content.

Impact: Cattle raised on forages had 550% more CLA, whereas steers receiving grain in backgrounding and grazed on pasture during finishing had 300% more CLA compared with beef from steers fed typical feedlot high grain diet. Whether this benefit can be (1) passed on to humans through meat consumption and/or (2) identified such that meat prices will reflect the benefits associated with CLA remains to be seen.

The Utilization of Technologies to Improve Economic Returns Through Retained Ownership of Calves

Description: The objective of this research was to evaluate the effect of various production practices on subsequent performance and economic returns through retained ownership of beef calves. The largest single input to the cost of gain for growing and finishing cattle is feed. If this cost can be decreased, then economic sustainability could be enhanced. In vitro dry matter was improved with treatment involving whey solids. Whey silage can be produced successfully and can increase production characteristics of growing Holstein heifers, but may not be effective in growing steers.

Impact: With over 40,000 dairy heifers produced in Utah annually, this could provide an additional $1 million in returns to dairy producers.

Improvement and Impact of Production and Management Practices in Utah Turkeys

Description: Studies are being conducted to determine optimal turkey production practices in Utah. Work has been completed and published on a study evaluating the interaction of sodium and chloride dietary levels and their effect on occurrence of spontaneous turkey cardiomypoathy (round heart). Acid/base balance is very critical in maintaining proper cardiac and respiratory function. Findings suggest that there may be a need for higher dietary chloride content than previously thought to counteract the alkalinity indirectly caused by excessive potassium (coming from an abundance of soybean meal in the turkey feed). A combination of low sodium and high chloride diet significantly reduced early poult mortality caused by spontaneous cadriomyopathy.

Impact: Spontaneous cardiomyopathy is an extremely prevalent cause of brooder mortality in Utah-raised turkeys. The ability to understand this abnormality and minimize associated losses is important when raising turkeys at moderate to high altitudes. With a properly balanced ration, poult mortality losses could be reduced 5% to 10%, thereby increasing returns to Utah's turkey producers $3 to $5 million/year.

Bovine Oocyte Activation

Description: An arginine-glycine-aspartic acid (RGD)-containing peptide (basic amino acid) has been reported to generate calcium transients in bovine oocytes similar to those observed at fertilization. The research objective of this study was to use known antagonists of calcium release pathways to identify the RDG-sensitive pathway in bovine oocytes.

Impact: Together with previous results, these data indicate that the sperm membrane may contain an RGD-containing (disintegrin or blood coagulation inhibitor) that interacts with the oocyte through an integrin receptor mediating an activation-associated calcium transient through the IP3-sensitive pathway. Understanding the signaling pathway associated with fertilization that results in activation will impact contraception and potentially augment the development of nuclear transfer embryos. This has important implications for commercial embryo transplants and cloning.

Increased Efficiency of Sheep Production

Description: St. Croix sheep breed all year round but are bred mainly in February for production purposes. Sheep in Utah are seasonal breeders and are bred in the fall of the year. The time when embryos were collected from St. Croix and transferred to recipients in Utah was during the transitional period when sheep in temperate zones go from the cycling to anestrus.

Impact: The estrus synchronization protocol was changed to compensate for the transition period and the response of the recipient ewes and the response of the donor ewes were quite good. However, good pregnancy rates were not achieved due to unknown factors associated with the traditional breeding period. No impact results are yet available.

An Accelerated Breeding Program Using the St. Croix and Barbados Blackbelly Hair Sheep to Increase Meat Production and Profitability

Description: Forty-two lambs were assigned to seven treatment groups according to genotype. Lambs were fed free choice whole barley and a commercial fattening diet that consisted of 16% protein, 20% fiber, and 2% fat. Feed was weighed into each pen daily, with the weigh back of unused feed done weekly. Lambs were weighed and body condition scored every two weeks. Target slaughter weights were 100-110 pounds for the smaller framed genotypes and 115-120 pounds for the larger framed genotypes. Target body condition scores were 6-7 for all groups. All lambs were slaughtered at the Utah State University abattoir and the data are now being analyzed.

Impact: Hair sheep have many advantages for small farm flock production (i.e., early maturing, increased prolificacy, extended breeding season, etc.); however, they are generally smaller and tend to have less retail value. This study will compare various hair-wool sheep terminal crosses under feedlot conditions and will evaluate feed efficiency, growth rate, carcass quality, and sensory preference to determine whether certain hair sheep terminal crosses are more profitable and have greater consumer appeal. The effective use of hair sheep could increase returns to Utah's sheep producers by $2 to $3 million annually.

Influence of Variation in Body Condition Score of Beef Cows on Their Utilization of Low-quality Forages

Description: In ongoing, studies related to factors that affect the ability of beef cows to sustain acceptable performance while consuming diets composed mainly of low-quality forages (LQF) are being examined. Improving the utilization of LQF by beef cattle will likely become increasingly important due to economic issues since LQF are typically much less expensive than other feeds.

Impact: Cows that had previous exposure to LQF exhibited superior performance compared to those without previous exposure, an effect that remained apparent for three consecutive years. Cows in good body condition (BC) at the beginning of a wintering period utilized LQF more effective than cows in poor BC. Environmental issues are also important since there will likely be increased production of agriculture-based fuel such as ethanol in the future, leaving even more LQF for livestock consumption. For those cattle that can effectively utilize LQF, there is a cost savings of approximately $35/head. This could result in an annual savings of $0.5 to $1.0 million for beef producers in Utah.

In Vitro Embryo Production

Description: This project is designed to enhance the development of in vitro produced embryos. Specifically, experiments have been initiated that are designed to improve the development to term of nuclear transfer embryos. Multiple approaches will be used to address this very complex and important area of research.

Impact: This research would allow the selection of production animals with important carcass or milk production traits of great economic importance.

Nutrition and Food Science -

Methods to Add Value to Agricultural By-Products

Description: The overall goal of this project was to develop technology for agriculture products/byproducts of low or no value, including production and processing waters. A number of anaerobic bioreactors were designed and operated for each type of waste. Industrial waste for this project consisted of cheese processing waste and cheese processing waste. The agricultural production waste used in this project was manure. An environmentally sound method of processing these by-products is through beef cattle diets. The anaerobic systems developed as part of this project enables anaerobic treatment of high strength organic wastes including undiluted manure in a relatively short time. Much of the organic matter in production waste (manure) and food processing waste is converted without significant release of odors to a usable energy form: methane, that can be burned in a boiler or engine generator. Nutrients are retained in the effluent from the bioreactors and can be applied to the soil without objectionable odor or concern for pathogens.

Impact: The potential for electrical generation is about 0.1 kW per animal unit (1,000 pounds). Two companies have shown an interest in licensing the induced blanket reactor (IBR) technology for commercial application. With concerns regarding the environmental impacts of waste discharge, either industrial or agricultural, this project could result in a reduction of environmental waste and an enhancement of net returns. For a 300 cow dairy, for instance, this could generate a minimum of $300 to $500/year, which could offset energy costs associated with the operation of the dairy facility. The cost effectiveness of this process of the initial investment has yet to be determined.

Influence of Processing on Structure and Function of Milk Proteins

Description: Nonfat cheese was made according to a direct-acid, stirred-curd procedure. Cheese samples were placed into glass bottles, that were sealed and heated. Once the cheese reached 10 C or 50 C, the bottles were placed on a scanner and color values measured. Applying heat increased cheese opacity. Apparently, applying heat alters protein interactions in the cheese matrix, and this is manifest as changes in cheese structure. Such changes in structure help provide an understanding of changes in cheese opacity.

Impact: Understanding the organization and structure of milk protein in coagulated milk and milk products allows food manufacturers to have better process control while meeting market expectations.

Improvement of Low-Fat cheese Through Characterization of Lactobacillus Enzymes

Description: The project seeks to identify and characterize Lactobacillus spp. and starter enzymes responsible for the production of flavor in Cheddar cheese. Identification and characterization of these enzymes will provide industry with information needed to develop starter systems that help to prevent or control flavor defects in Cheddar cheese. Many off-flavor compounds are thought to arise via microbial catabolism of aromatic amino acids. Our work has shown that lactobacilli are able to catabolize aromatic amino acids under conditions found in Cheddar cheese, and pathways involved in these reactions facilitate the production of off flavor compounds. We also found that the propensity for bitterness, a common defect in Cheddar cheese, is heavily influenced by starter proteinase specificity.

Impact: Fat removal has an adverse effect on cheese flavor and texture properties. The identification and characterization of microbial enzymes that are chiefly responsible for the production of cheese flavor defects will allow industry to develop starter systems that improve and accelerate flavor development in lower-fat cheese. This will increase consumer confidence in lower fat cheese and expand the demand for these goods to individual that avoid cheese because of diet and the absence of high quality, low fat alternatives.

Food Storage: Preserving Quality and Safety

Description: Dried food products stored in mylar bags undergo color changes that are product, temperature, and oxygen dependent. It appears that coloration pigments and the presence of pro- and anti-oxidants within the food interact to give individual food responses to storage atmosphere and temperature.

Impact: While none of the tested samples were considered unacceptable, there were clear consumer preferences. In another study, stored water taken directly from the tap of a chlorinated water supply, without further treatment, had a low microbial count at the end of the year. If the water data, indicating some microbial count in stored water drawn from a municipal water supply which had been chlorinated, is repeatable, the current recommendations on stored water will have to be changed.

Adding Value to Fresh Meats after Retail Display is Concluded

Description: Twenty beef loin steaks were selected from three local markets. These steaks had been marked down in price because the shelf life in the refrigerated case was exceeded. Some discoloration

was evident in every steak. All steaks had been packaged in styrofoam trays with polyethylene over wrap of limited oxygen permeability. Only steaks contained in intact packaging were selected. Steaks were removed from the original packaging and subjected to an oven temperature of 1200 degrees Celsius for 45 seconds. They were grill marked and transferred to polyethylene bags (3 mil.), heat sealed, and pasteurized in 82 degree Celsius water until they reached an internal temperature of 60 degrees Celsius. Standard plate counts, coliform, E. Coli, staphylococcus aureus, salmonella, listeria, yeast counts, and mold count tests were conducted during storage at 4 degrees Celsius for a 15-day period using BAM/FDA or AOAC methods. Salmonella and listeria tests were negative initially and at 14 days. Coliform, E. Coli, staphylococcus aureus, yeast count, and mold count all remained below less than 10 cfu/gram during the 14-day period. The standard plate count had increased to 50 cfu/gram by day 14. The finished product has a grilled appearance and could be consumed with minimum preparation. Ten to 15 percent shrinkage occurred during processing.

Impact: Technology to add value to fresh meats marketed directly to consumers will increase sales due to added convenience. The 15-20 percent waste experienced in most retail meat markets could be reduced. This could result in a savings of $26 million at the retail level in Utah, at least a portion of which should be passed on to either consumers and/or producers.

Development of Immobilized Proteins for Food Processing

Description: Research into various methods of immobilizing ligands (a group, ion, or molecule coordinated to a central atom in a complex) for use in food processing was continued. Current research investigated methods of purifying bioactive proteins from whey, a by-product of cheese production. Bovine lactoferrin (BLF) and bovine transferri (BTF) are major-iron transport and regulation proteins found in bovine whey. These two iron-related proteins were immobilized using different processes.

Impact: Bioactive proteins such as lactoferrin and transerrin can be affinity purified from food processing waste. Immobilized gagliosides (any group of glycolipids that yield a hexose sugar on hydrolysis and are found especially in the plasma membrane of cells of the gray matter of the brain) were used to purify lactoferrin and transferrin, which have biological activities including antimicrobial, iron transport, and wound healing.

Inhibition of Lipid Oxidation in Fresh and Cooked Meats

Description: This study was initiated to determine the optimum level of dried milk mineral (MM) to inhibit lipid (any of various substances that are soluble in nonpolar organic solvents such as chloroform and ether, that with proteins and carbohydrates constitute the primary structural components of living cells, and that include fats, waxes, phosphatides, cerebrosides, and related and derived compounds) oxidation in various ground meats.

Impact: The discovery that MM fraction of whey has antioxidant properties in cooked meats has two potential impacts. First, a new market may be developed for a whey derivative, with benefits to the dairy industry. Second, the demand for precooked meats (pizza toppings, taco meats, etc.) may be maintained or increased using MM to prevent rancidity of these products during distribution and frozen or refrigerated storage.

Role of K+ Channels in Nutrient Detection Mechanisms in Pre- and Post-Ingestive Chemosensory Cells

Description: This research is designed to determine the involvement of different classes of potassium (K) channels in taste transduction pathways for various stimuli. We have demonstrated that inhibition of delayed rectifying K channels appears to be a major downstream effect of taste cell activation by a number of bitter stimuli. Involvement of inwardly rectifying K channels in these responses appears minimal at this point. Our research suggests that differences in K channel expression contribute to the ability of taste cells to respond to nutrients.

Impact: Though in the initial stages of this project, our investigation of the role of K channels in taste transduction has already yielded results that help expand our understanding of how nutrients may be recognized by chemosensory cells. This has implications not only for the individual control of food intake, but may also impact pharmaceutical and food industries.

Plants -

Freeze Damage and Protection of Horticultural Species

Description: Pre-chilling, cycled day/night temperatures induced anthesis (opening of the flower) and growth variations in peach trees. Effects of pre-chilling treatments disappeared with longer chilling periods. Synergistic and antagonistic effects were found in the action of stratification of chilling temperatures applied in various sequences in peach and apple seeds and buds. Seedling emergence was approximately linear with water content during stratification. Computer software was written to download information from Campbell Scientific weather station dataloggers and process it to produce information concerning anthesis, bloom, codling growth, and insect and disease prediction of orchard trees.

Impact: Hydration threshold information will help dormancy experiments. Automated freeze forecasts will help farmers in freeze protection strategy. Computerized data downloading and production of phenological, insect, and disease predictions will help farmers in their cultural practices. No economic impacts have yet been calculated.

Rootstock and Interstem Effects on Pome and Stone Fruit Trees

Description: Rootstock effects on apple, cherry, and peach production continue to be evaluated as part of the NE-140 research project. Several microburst wind events occurred during the growing season. As a result of these extreme wind events. 6 of 8 replications of Redhaven Peach trees on the rootstock Pumiselect and 7 of 8 replications on Hiawatha rootstock were bent over at ground level. Observations on older trees need to be made to determine if this bending syndrome persists or if it is limited to young trees.

Impact: Rootstock effects are critical in high density orchards. Their numerous advantages make them highly desirable in increasing productivity, while decreasing cost per kilogram of fruit produced.

For Utah producers, this could mean an increase in net returns of $5 million/year. Growers need to know the favorable and unfavorable characteristics of potential rootstocks for their orchards.

Improvement of Winter Wheat Through Breeding

Description: Cultivar development of winter wheat through breeding was continued. The objective is to release winter wheat cultivars that have resistance to dwarf bunt, snowmold, and mildew; as well as high yields and excellent milling properties. The top two cultivars (Promontory and Weston) continue to express resistance to dwarf bunt in the nursery.

Impact: Cultivars developed from this project continue to be readily accepted and widely grown throughout Utah and the Intermountain region. This provides higher yield and more profits directly to growers as well as an increased grain supply to Utah's milling industry. It is estimated that through the increased level of yields, plus the resistance to dwarf bunt, means an additional $2 to $3 million/year in returns to Utah's producers, with additional benefits accruing to the state's millers.

Understanding and Synthesizing Angiosperm Apomicts

Description: The objectives of this research are to produce high yielding apomictic hybrids of typically sexual crop plants. We have produced synthetic apomictic plants from sexual plants in Tripsacum, Antennaria, and sorghum. These synthetic apomictics are the first produced from sexual plants by design.

Impact: Technologies that successfully induce, stabilize, and control apomixis in crops will revolutionize plant breeding by enabling the economic production of high yielding apomictic hybrid crops. Such crops will permit exploration of never before explored areas of crop heterosis via field testing of unique apomictic genotypes selected from among numerous highly heterogeneous progenies obtained through multicross hybridization.

Genetic Relationships and Gene Flow Potential Among U.S. Bluegrasses

Description: More than 1100 progeny from crosses with a glyphosate resistant Poa pratensis (Kentucky Bluegrass) were evaluated. Only one percent of the seedlings survived one glyphosate treatment, and none survived the second treatment.

Impact: This risk assessment research studying the fate of a particular resistance gene will yield key information to determine if transgenic Poa pratensis can be released for use. This work will also help build genetic information for Poa, a genus where genetic information is lacking and often hinders plant breeding efforts.

Organismal and Molecular Studies on Colonization Factors of Biocontrol-Active Pseudomonads

Description: Biological control of microbial pests requires that the organism establishes in the necessary environment and produces metabolites that are involved in limiting the growth of the pathogens. To control root pathogens, colonization of the rhizosphere and the root surface is desirable.

We have shown that pathways controlling bacterial metabolism under conditions of nutrient starvation and high cell populations are important in root colonization by biocontrol pseudomonads.

Impact: Alternative methods for control of plant diseases are desired because of the trend to lessen or even eliminate certain chemical pesticides in crop production. The utilization of beneficial microbes that through various mechanisms reduce pathogen effects is one strategy. Our studies show that the maintenance of effective colony numbers on plant roots to achieve biocontrol requires several genetic loci in the bacterial genome. Manipulation of the expression of these loci may enhance disease control.

Phosphoinositide Signaling During Plant Stress

Description: Plants respond to drought stress by modifying gene expression and metabolism. In order to make these fundamental changes inside their cells, plants must not only perceive the stress, but also transmit intracellular signals. We have shown that production of a cellular membrane phospholipid serves as a signal for drought stress, presumably to facilitate plant acclimation to the stress. Calcium mobilization has been shown to be necessary for changes in gene expression which are necessary for acclimation and our results reveal a mechanism for calcium mobilization in drought-stressed plant cells.

Impact: We found an intracellular signaling pathway used by plants during drought stress that very likely is necessary for acclimation. This information is beneficial because we understand plant stress responses better, and because we can potentially genetically engineer more drought-tolerant plants.

Nitrogen Fixation: Understanding Substrate Binding to Nitrogenase

Description: The ability of fixing nitrogen to plants is essential to all agricultural systems. Biological nitrogen fixation represents the single largest mechanism for the input of fixed nitrogen into the biosphere. Our goal is to understand the mechanism of the enzyme, nitrogease, that catalyzes biological nitrogen fixation.

Impact: Findings from these studies will provide insights into how nitrogen (N2) from the air is reduced to ammonia by soil bacteria. These findings could have a direct impact on alfalfa production and other crops.

Stomatal Responses to Humidity in Wheat

Description: We are investigating the stomatal response and photosynthetic capacity of several lines of barley. This project is designed to investigate stomatal response to humidity in determining water use efficiency in several cultivars of barley. For 6 of the 8 lines provided adequate water, we have found no substantial differences between the lines in photosynthetic capacity, stomatal conductance, or stomatal responses to humidity.

Impact: In a water-limited environment, the amount of carbon gained per water lost (water use efficiency) can be an important determinant of crop productivity.

Phosphoinosite Signaling in Plant Cells

Description: We have quantified the levels of phosphoinositide in tissues of whole A. Thaliana plants, and found that there are modest tissue-to-tissue differences in the concentrations of individual phosphoinositides. These results demonstrate that when challenged with salinity or osmotic stress, terrestrial plants respond differently than algae, yeasts, and animals cells that accumulate other phosphoinositides in response to similar stress.

Impact: Salinity is one of the most impacting abiotic stresses encountered in agricultural lands. Understanding the mechanisms by which plants acclimate to salinity is critical for producing genetically improved salt tolerant cultivars. Since salt stress elicits responses similar to those of drought and cold stress (i.e., the expression of several common genes), these findings will have even broader practical implications. They should enable us to engineer plants that are more tolerant to abiotic stresses.

Breeding and Testing Improved Varieties of Barley, Spring Wheat, and Oats

Description: We continued to make barley crosses between parental lines with high yield, high test-weight, as well as resistance to loose smut and lodging. A strong emphasis was placed on studying components of yield in water-limited conditions for spring barley and spring wheat. We found that top yield lines selected in irrigated conditions are also the top yielding ones when no irrigation is applied. A new physiologic trait (carbon isotope discrimination) seems to be correlated to yield potential in both irrigated and water-limiting conditions.

Impact: This breeding program aims at producing cultivars with high yield potential and high nutritive value as animal feed. Spring barley is an important crop in Utah and the Intermountain region for its direct on-farm revenue, but also for its value as an on-farm animal feed. Our efforts to select lines with yield stability in water-limited conditions should reduce the amount of water needed through irrigation, as well as increase yield potential in dryland farming. With two of the specific lines being tested, an additional $1 to $3 million in revenue could be realized by Utah's barley producers annually.

Plant Genetic Resource Conservation and Utilization

Description: A key to the current and continued productivity of the U.S. agricultural sector has been the development of improved cultivars through the use of genetic resources. The goal of this project is to collect, preserve, evaluate, and document the genetic diversity within native and introduced cool-season grasses.

Impact: The collection is the basis of the range and irrigated breeding program at Utah State University and is used by plant breeders worldwide as a gene source to improve cereal crops. The increased understanding of species relationships and genetic diversity within the grasses facilitates the development of new/novel and improved germplasm and cultivars within the wheatgrasses, wildryes, orchardgrasses, and meadow bromes.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

009	234	472
011	236	479
016	241	483
017	279	524
019	292	527
085	328	533
099	337	583
164	357	628
170	358	630
222	423	735
230	460	762
231	461	

Funding Level: 3,578,682.81 **SY FTE: 12.08**

Scope of Impact: National and International

Goal 4. GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Utah State University Extension
Progress Report on Plan of Work Goals: 2002

Overview

Goal 4 encompasses all USU extension programs that seek to create sustainable, long-term agricultural systems that preserve the environment and the natural resource base. Agriculture is defined in the broad sense, in that it includes the ornamental and "green" industries, as well as the significant acres in small farms and "backyard" gardening operations that are very prevalent in the State. Utah has one of the largest percentages of gardens per homeowner/renter in the United States. Many of these approach commercial scale.

Utah farmers and ranchers face an unending array of ever changing economic and market conditions. What was once a regional or national market structure is now a large global trade system with international events controlling local commodity prices. Concomitantly, the producer now faces an educated and informed consumer, primarily from the non-farm population, that has become increasingly aware of and concerned with food safety; food additives, chemical fertilizers, pesticides, and herbicides. In addition, the problems with agricultural chemicals that have been identified in various mid-western ground water supplies have heightened interest in reducing chemical and fertilizer applications. Growing concern about pesticide residues on food stuffs, contamination of groundwater by agrichemicals, degradation of soil resources, and high costs of crop and livestock production are calling into question the long term economic and ecological viability of a capital-intensive, energy-dependent U.S. agriculture.

State Assessment: The programs offered within Goal 4 address critical issues in Utah. Extension faculties on campus and in the counties are responding very well to local and statewide needs. The impacts reported here reflect a very successful program of work.

Total expenditures and FTE:
Smith-Lever $484,938
State Match $442,932
FTE: 16.7

Program Title: Fisheries and Wildlife

Key Theme: Wildlife Management

Description: Sage grouse populations on the Parker were originally estimated at between 5,200-9,200 birds in 1935-1936 at a period when livestock numbers were also higher than contemporary stocking densities. By 1969, populations had declined to an estimated 3,000 birds. The declines in sage grouse observed on Parker Mountain are happening all across the west. In response to these declines, the ranchers who live and work on the Parker formed a unique partnership with public resources managers, the Parker Mountain Adaptive Resource Management Working Group (PARM). A Statewide Sage Grouse Working Group was formed to identify sage grouse management issues and concerns, to serve as a network for disseminating sage grouse and sagebrush/sagebrush-steppe habitat management information and to complete a statewide conservation Plan for sage grouse. A Community-based Conservation Extension Program (CCES) was developed and a full time specialist was hired to manage the programs. Currently 11 local programs are functioning and there are requests for three more.

Impact: PARM discovered that the problem was not too little sagebrush, but too much. In response to these findings, the partners treated a 5,000-acre experimental pasture to reduce sagebrush canopy coverage in to hopes of increasing vegetation diversity. Based on the findings of these experiments, additional treatments will be conducted over the next 10 years. In another local area high predation by red fox is contributing to the decline. USDA Wildlife Services has been contracted to implement a predator control program. Project partners also are interested in transplanting birds from Parker Mountain to the area in an attempt to rebuild the population.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Wildlife Management

Description: Wildlife Damage Management Survey data suggests that human-wildlife conflicts are increasing. In Utah, economic losses to agricultural crops and livestock are estimated to exceed $6 million dollars annually. An evaluation was completed of the use of temporary signs to reduce deer-vehicle collisions.

Impact: The signs installed on 5 experimental sites were directly responsible in reducing deer-vehicle collisions by over 50% (n= 200) and a cost savings of $500,000. We have published a manuscript on a

survey conducted of state wildlife agencies and departments of transportation. The survey results suggest that over 2 million deer-vehicle accidents occur annually in the United States.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Statewide Water Quality and Educational and Technical Support

Key Theme: Water Quality

Description: Salt pollution of the Colorado River Basin is a serious concern. A seminar was held to train ranchers to be certified as efficient irrigation water users.

Impact: 45 ranchers were provided with the necessary training that will help to keep salt out of the Colorado River at a cost of $35 per ton instead of $700 per ton to remove the salt downstream.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Water Quality

Description: Pollution of the Logan/Little Bear River Basin is a serious concern. A seminar was held to train the public. An educational and informative program was held at the American Heritage Center in Logan Utah.

Impact: 1000 people attended the event and program participants learned about uses of the resources in the Bear River Drainage.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Water Quality

Description: Weeklong event for most of Cache Counties 4th graders was held along the Logan River. Kids participated in 4 one-hour sessions each day. The activities consisted of teaching the children about the water cycle, relay races, a trip through the water cycle, and other interactive games. Each teacher received a packet that correlated each activity to a state core and contained suggested activities.

Impact: A total of 650 students participated

Key Theme: Water Quality

Description: Teachers and students from seven middle and high schools participated in a water conservation project. Participants monitored seven sites on the Bear River and its tributaries.

Impact: 325 students and students learned about water conservation.

Key Theme: Water Quality

Description: 325 Teachers were instructed in water quality and how it affects their lives. They also tested different water samples for temperature, pH, dissolved oxygen, nitrates, and phosphorous. From the results of their tests they determined if their sample could be use for raising fish and if irrigations problems would result from the quality.

Impact: 22 teachers learned about water quality and how it affects the lives of everyone.

Key Theme: Yard/Waste Composting

Description: A presentation on issues relating to soils and composting was given to 24 participants. Those attending learned that soil issues relate to many plant problems and benefits. The benefits of soil testing and the use and manufacture of compost for amending soil were also discussed.

Impact: This group could reduce landfill waste by a minimum of 240 cubic yards.

Key Theme: Water Quality

Description: Students were instructed in areas that covered soils forestry, wildlife, and introduced species. They students tested water quality in 3 different ponds. Tests were done to quantify temperature, pH, dissolved oxygen, and aquatic insects. The students then determined what type of fish could live in each pond.

Impact: 47 students gained an increased knowledge of water quality and other environmental concerns.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Dairy Manure Lagoon Management

Key Theme: Agricultural Waste Management

Description: Management of animal waste is a major challenge for many livestock producers. The Clean Water Act will force some producers out of the industry as they are located so as to be incompatible with requirements of the Act. And, adjusting or moving to stay in production is economically prohibitive. A Utah committee has been operational for "Confined Animal Feeding Operations" to help as many producers as possible with the required transitions. Producer workshops

have been held on Comprehensive Nutrient Management Plans as well as engineering and technical meetings on animal waste management.

Impact: The Committee has developed a model voluntary program with the involvement of commodity groups (e.g. dairy). 90% of Utah dairies have been surveyed and informed of what they need to do to come into compliance with the Act. The 2002 Utah Dairy Seminars focused on waste management with speakers telling how to reduce phosphorus and nitrogen in rations and also in manure, explaining the Utah Waste Management Strategy and the deadlines for coming into compliance, and explaining where to get financial and technical assistance to build containment facilities. Comprehensive Nutrient Management Plans were also explained. A producer panel gave realistic recommendations based on their personal experiences. Extension Specialists work with individual dairy producers to help resolve problems.

Extension Specialists have been involved in workshops and training programs dealing with Odor Management. Livestock producers, agricultural professionals, engineers and technology providers learned how to develop Plans for themselves or their clients. Participants learned hands-on how to measure odors using a variety of field techniques and tools. This multi-day training focused on understanding how odors are generated, what best management practices are appropriate, how to conduct on-site odor assessments and how to write odor management plans.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Sustainable Livestock Production: Animal Feeding Operations and Environmental Quality

Key Theme: Agricultural Waste Management

Description: The concentration of turkey production in primarily one county of Utah produces a large volume of litter that must be managed and disposed. Much of it is being processed into compost. No published information exists on nutrient content of turkey litter produced in the Intermountain West. A survey was conducted from spring to fall 2001 to serve as an expected guideline for Utah turkey growers as they plan and implement their respective Comprehensive Nutrient Management Plans.

Impact: A report was made to turkey producers on what minerals/elements can be expected from a nutrient management standpoint from turkey litter generated through a typical Utah growing season. The local office of the Natural Resources Conservation Service subsequently requested permission to use the information generated by this study to more accurately determine the nutrient use status of turkey production in Utah.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Environmental Education: Agriculture, Grazing, Wildlife, and Water Quality

Key Theme: Natural Resources Management

Description: Continuing assistance, education and facilitation is given by Extension to other groups who are interested in environmental issues. The Weed Specialist taught GPS weed mapping skills to 3 Logan High School environmental and also involved them in field training and provided specific publications.

Similar skills were taught a group to aid them in mapping locations of Dyer's Woad in a local canyon area.

An Extension Agent worked with 7th Grade students (85) to teach them how to do counts of wildlife fecal pellets and then determine the concentration of wildlife in the area.

Grant funds of $12,741 was obtained by an Extension Agent to educate local owners of mountain forest lands about the current Aspen decline in that locale.

Fourth Grade youth Elementary Schools in the District participated in an all day outdoor experience. Youth learned soil and water conservation, Wild life sciences, Range and Forestry and other outdoor skills. This event was repeated over the course of a week and a half to accommodate all of the schools that wanted to participate.

A cooperatively planned Bear River Celebration was held at the American Heritage Center. Students provided poster presentations on a variety of topics. Participants learned about uses of the resources in the Bear River drainage area.

Impact: The assisted high school's environmental science club won the 2002 regional Envirothon competition and qualified them to participate in the national competition.

Mapping of Dyer's Woad plant locations will enable focused efforts for eradication.

The area used for the wildlife fecal pellet monitoring is planned for chaining, grazing and restoration in the near future. Annual counts will allow the students to see the effect of this process on the concentration of wildlife in the area.

Landowners were educated on the basics of aspen, aspen ecology and fundamentals of forest management and planning during tours of the areas having Aspen decline. All committed to make changes in their forest management procedures.

Teacher evaluations of the outdoor experience showed this was a valuable tool that enhances the subjects taught to their students in the classroom. All of the teachers plan to participate in the program in the future. Extension coordinated the participation of several agencies.

Well over 1,000 people attended the Bear River Celebration and learned from the variety of topics presented. Volunteers attending the event also conducted a service restoration project, despite rain, snow and cold temperatures that day.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Riparian Management

Description: Grant funding through the EPA 319 program was received to initiate a riparian restoration project on the USU Panguitch Experiment Farm. Riparian pastures were fenced to ensure management of livestock in the riparian area. Four rock barbs were constructed to help stabilize the banks. Banks were rounded and smoothed and planted with native sedges, rushes, willows, wetland shrubs and cottonwoods. Grass seed was planted in disturbed areas. Alternative stock water systems were purchased including: 2 types of nose pumps, a sling pump, and a hydro ram pump. A shallow well was dug for a winterized solar powered stock water system.

Impact: This project will be a key demonstration project in the Upper Sevier watershed to educate other landowners on what can be done in riparian areas.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Wetlands Restoration and Protection

Description: Although, Utah is 70 percent federal land, the role of private lands in natural resource conservation is paramount. While governmental policies affect land use, it ultimately is the private landowners' decisions that determine how natural resources will be managed on their own property. Society's increased interest in natural resource conservation often conflicts with the property rights of the individual landowner. Society's interest in how private land is managed stems from the fact that the public benefits associated with these areas extend far beyond property boundaries.

National policies may influence regional land-use decisions, but landowners have the ability to manipulate their land and to control trespass rights. Landowner attitudes toward wildlife impact the quality and quantity of the existing habitat base. Most landowners have little motivation to manage their land for wildlife because of the lack of economic incentives. The higher economic returns generated from private lands used for alternative purposes such as development, agriculture, and forestry have resulted in little landowner interest in preserving wildlife habitat or open space. However, as recreational demands on public lands exceed the supply, private lands will become economically more important as recreation sites and their value as wildlife habitat will likely increase. Although 72% of Utah is public land, many big game populations are dependent on privately owned land. This situation offers a free-market based approach to conserving open space and western culture.

Impact: A survey of public stakeholders in the western U.S. was completed regarding perceptions of livestock-wildlife interactions. The results of this survey are currently being prepared for publication. A project is in the final year of a multi-year study about livestock-wildlife interactions on aspen

rangeland. We maintain a web site www.grazingnet.org, which provides the public with information on the research and a searchable database about livestock-wildlife interactions.

In 2002 over 230 landowners were assisted to implement the CWMU on over 1.8 million acres of private rangeland. The program generated over $15 million in new income for the participants and improved over 50,000 of rangeland wildlife habitat. The program offered over 4,000 hunters in Utah access to high quality hunting opportunities on private land.

A special symposium was provided at the 9th Annual Conference of the Wildlife Society on wildlife management on private lands. Over 500 people attended the symposium. A special issue is being prepared for The Wildlife Society Bulletin on this topic. A web site is maintained on mule deer conservation issues. The site www.muledeernet.org receives over 30,000 visitors a year

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Grazing and Weed Control on Public Lands

Key Theme: Natural Resources Management

Description: Letters were submitted in response to the GSENM BLM Environmental Assessment and plan to permanently retire grazing permits on 4 allotments. The letters addressed the influence of grazing on vegetation, recreation, socio-economics, nutrient cycling, wildlife, historical, cultural and research activities in southern Utah. Recommendations were to continue well-managed livestock grazing on these allotments, with the conclusions that "if livestock grazing was discontinued it would negatively impact the culture and economy of the local communities without increasing significant undesirable impacts to wildlife populations or recreational activities." The cattleman's Associations also protested the BLM's planned actions.

Impact: The Department of Interior Solicitor William Myers advised Interior Secretary Gale Norton that the BLM could not permanently eliminate grazing from public. This was definitely positive news for sustainable agriculture in southern Utah.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Pesticide Application

Description: A demonstration treatment area was established on the control of Rocky Mountain Iris and Golden Pea on rangelands.

Impact: The project identified Escort herbicide used at the rate of 1.0 oz/A and costing $22.00 as the most cost effective option studied and provided 98.3% control of Rocky Mountain Iris and 90.0%

control of Golden Pea using traditional spray application methods. Wet Blade mower technology application method was also studied and only provided 28.3% and 23.3% control respectively.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Pesticide Application

Description: Efficacy data from field herbicide research conducted over the past 20 years was supplied to DuPont's Ag Chemicals Division.

Impact: This information/data was instrumental in EPA's recent approval of a new registration for use of Telar on rangeland for control of selected plants.

Source of Funds: Smith-Lever, State

Scope of Impact: UT and many other states

Program Title: Water Conservation: Culinary Water Use and Landscape Water Management

Key Theme: Drought Prevention and Mitigation

Description: 10 classes were held devoted only to water conserving landscapes. Attendees were trained to make usable landscape designs, group plants by water requirements, select water-wise plants and conserve water.

Impact: 200 people were trained and 95% of the people indicated they would be more water-conscious in the future. A 5-hour television broadcast was created and viewed by an estimated 25,000 people.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Drought Prevention and Mitigation

Description: Water measurement technical assistance was provided in 20 instances including design the redesign of ramps fumes for Logan City, and evaluation of Parshall flume accuracy for Panguitch water users. A ramp flume was designed for and installed by the Strawberry Canal.

Impact: The value of improved water measurement in that section of the Strawberry canal was estimated to exceed $14,000 per year.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Drought Prevention and Mitigation

Description: A water conference was held by Roosevelt County. Topics included Water Right laws, consumptive use of plants, soil water holding capacity, drought conditions, and irrigation sites on the Internet.

Impact: There were 60 producers that gained a greater understanding of water rights and irrigation practices. They also learned where to look for irrigation information on the Internet.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Drought Prevention and Mitigation

Description: Twelve workshops were held for the large water users of the state. Attendees learned about water conservation and planning.

Impact: A group of 244 people learned about water conservation and planning.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Theme: Rangeland Resource Extension

Key Theme: Drought Prevention and Mitigation

Description: The severe drought continued and extended its impact to more Utah families, especially those in rural areas, as farm and ranch families. Most of the range work this year for many Extension Agents centered on managing cattle during the drought. An issue of the Beef Newsletter was devoted to alternatives that producers could consider, other than just selling out.

A range tour highlighted water developments including a "guzzler" water catchment. The thing that impressed most tour participants was that even though there had been record drought conditions, the collector had caught over 5000 gallons of water just from a couple small storms and morning dew. During this period of drought, this was probably the thing

Extension Agents received requests from producers for information on baled corn stalks. Several purchased corn stalks to feed cows this winter to replace expensive alfalfa ($50 vs. $105-120 per ton). Information on possible rations using the corn stalks was provided.

Worked with one producer on obtaining feed sample for testing nitrates in their triticale field. They were able to use this field to feed around two hundred head of cows when they started calving. This saved them $5400 that it would have cost to buy hay to replace it.

Drought committees were organized to gather and provide information for producers. One of these compiled a list of hay producers and possible pasture resources that could be investigated by livestock producers.

Producers meetings were held to inform producers of other alternatives, such as early weaning of calves and earlier marketing of cull cows. These provided a conservation of grazing forages and also a premium price for earlier marketing of animals.

Letter of request and support were prepared to aid in securing funding for drought relief programs that released CRP lands for grazing. This resulted in 1,000 aum's of feed made available to local ranchers in one county and was multiplied in many others across Utah.

Impact: Alternative feed sources were identified for producers to use. Information was provided on rations to allow proper use. Instructions on testing for nitrate allowed for feed to be used safely. Water collection systems were planned for new areas to reduce concentration of animals around limited water areas. CRP lands provided a needed resource for grazing.

Source of Funds: Smith-Lever, State
Scope of Impact: UT

Key Theme: Natural Resources Management

Description: Current litigation by some groups threatens many BLM permittees use of their grazing allotments. Representatives of Extension, BLM, Forest Service, Division of State Lands, Division of Wildlife Resources, and other interested agencies are developing a coordinated resource management plan.

Impact: The group will gather information important to the litigation. It has also developed a cooperative management plan for use of the rangeland. And, will include proposals for funding to support range restoration and improvement projects. It is a work in progress but made important gains this year.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Natural Resources Management

Description: Utah citizens are very interested and willing to help with many efforts to conserve and improve the environment. Extension is in an excellent position to serve as a facilitator to bring productive groups, ideas and resources together.

Impact: One Extension Agent worked with the UACD to promote and administer a Conservation Tree and Shrub program. 6,000 trees and shrubs were sold in one week the entire stock completely sold out of approximately 14,000 trees and shrubs. The tree sales generated nearly $4000 dollars for the conservation district that will be used to fund conservation programs in the area. Dedicated Hunters provided approximately 200 hours to help sort and bundle the stock into individual orders. Conservation trees and shrubs are projected to provide a value of $275.00 a year in benefits. Assuming a 70% survival rate the value of the trees and shrubs planted this year is $2,695,000 dollars.

Another county Extension office worked cooperatively with the local SCD and UACD to help landowners obtain and plant trees, shrubs and other plant materials for conservation efforts. Over 50 landowners planted plants suited to the county's harsh environment

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Noxious Weed Control

Key Theme: Biological Control

Description: An introduced plant, Dyer's Woad, continues to spread on rangelands in Utah and displace more useful plants. Multiple efforts have been made in the past to control it. Youth groups families and individuals scoured areas to dig, chop and pull Dyers Woad in an attempt to keep it from spreading and increasing its presence. Participants received a financial reward for each bag of Woad they harvested. The impact of this program is measured in an increased awareness of invasive plant species and the devastating economic impact these plants have on the rangelands.

Impact: Woad rust - Efforts initiated in 1982 to study and develop a natural rust pathogen called Puccinia thlaspeos strain woad have finally culminated in registration of this microorganism by the EPA as a biopesticide for control of dyer's woad.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Natural Resources Management

Description: Book on weeds published.

Impact: Sales of Weeds of the West continues to average about 1000 copies per month, with a total of more than 110,000 books sold in its 12-year history. It has become perhaps the most popular weed identification book ever published, with worldwide distribution. Weed recognition skills of tens of thousands of individuals have been improved by this publication.

Source of Funds: Smith-Lever, State

Scope of Impact: UT, worldwide

Key Theme: Pesticide Application

Description: Weed control is a vital issue throughout Utah. The annual meeting of the Utah Weed Control Association was held in February and coordinated by an Extension Agent. The first day of the meeting was for County Weed Supervisors and was attended by 68 participants. The second day was the general meeting and was attended by 250 participants from Utah Idaho and Arizona.

Impact: Key individuals in noxious weed recognition and control were updated and made aware of resources available to them.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Utah Agricultural Experiment Station
Progress Report on Plan of Work Goals: 2002

Program Title: Pasture Development, Reclamation and Quality

Key Theme: Other - Intensive Pasture Management and Use

Description: The productivity of grazing lands currently being used by livestock operators that is not intensively grazed is being examined. The production of livestock and ecological status of three grazing systems are under study including rest-rotation, deferred-rotation, and season-long grazing. (The interaction between livestock and elk populations are also being examined as part of this study.) Work has been completed in identifying the seasonal distribution of dry matter forage production and its nutritive value under simulated pasture grazing. Conditions necessary for successful pasture grazing have been identified and the efficacy of intensive pasture rotation management for dairy heifers is under study. Finally, the responses of perennial forages to weather conditions and varying irrigation and fertility levels are being identified.

Impact: Second year's data on seasonal distribution of forage yield and quality trends on six harvests throughout the season were completed. PI-lines of meadow brome were identified that are superior to the commercially available cultivars. For 21 polycross progeny lines, forage yield of the polycross progeny exceeded the check cultivars. Several irrigated pasture grass and legume clipping studies were completed. Orchard grass/white clover mixtures had much higher nitrate concentrations in the leachate than the other grass-legume mixtures. Grass and grass-legume responses to nitrogen rates were evaluated and recommendations made. The spatial variability of inorganic nutrients under intensive rotational grazing was assessed and a nitrogen budget model developed. Several weed studies related to irrigated pasture were completed. Mixtures of grass and legume were established at the high elevation and uniformly irrigated and fertilized with season total dry matter yields of six mixtures ranging from 7.2 to 10.0 T/ha. Twenty-four cows averaging 190 days in milk were randomly allotted to 3 treatment groups during a 14-day standardization period. Average milk production for the 15-week trial represented an improvement compared to a similar experiment the previous year.

Growing dairy heifers were weighed on two consecutive days at the beginning and end of the 149 day experiment and on monthly intervals during the experiment. Heifers grazing perennial ryegrass/white clover gained more than those on orchardgrass/white clover. Beef cattle research included the establishment and grazing of several pastures. A statistical analysis of the production and quality characteristics of several grass and grass/legume mixtures for comparative purposes was made. Monoculture grasses provided higher levels of TDN, but grass-legume combinations provided higher levels of CP. Pasture establishment and maintenance budgets were further refined. A comparison of costs for three types of dairy feeding operations were made. The TMR was the costliest ration, averaging $4.22/head/day, with pasture and TMR the cheapest at $1.81/head/day. An economic analysis was also conducted for beef cattle. The feed cost was less for the normal weaned calves than the early weaned calves. Even though there was a statistically significant difference in the amount of feed consumed, there was virtually no significant difference in the production and quality characteristics.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

008	352
013	362
179	418
331	797
332	

Funding Level: $607,580.33 **SY FTE: 1.04**

Scope of Impact: Intermountain West

Program Title: Human, Wildlife, and Domestic Livestock Interactions and Compatibility

Key Theme: Natural Resource Management

Natural Resource Management is of key concern to Utah and surrounding states given the intense ongoing debate about the use of public and private lands. With some counties in Utah comprised of 90% or more public lands, the public-private land management interface becomes critical. Even in counties with smaller proportions of public lands, there is growing concern about the relationship between rural and urban environments. This section is broken into four groups: economics/social science, livestock/wildlife, plants, and water quantity and quality.

Economics/Social Science -

Rural Communities and Public Lands in the West: Impacts and Alternatives

Description: Static models that were developed for Rich County, Utah, to evaluate the impact of grazing reductions are being modified to fit into a dynamic framework, that will make the models consistent with those being developed in surrounding states. The theoretical model developed

indicates that in the long run, stocking rate (number of animals grazed per period of time) has a larger impact on the net returns obtained by a rancher than does the length of the grazing cycle. Several lawsuits recently filed would reduce or eliminate the use of federal lands for livestock grazing.

Impact: Small part-time and large operators are least affected by reductions in the use of federal lands while the smaller full-time operators are most adversely affected. Preliminary evaluation of community impacts suggest that reductions in livestock related activity will have relatively large impacts on this rural community, i.e., loss of up to 20% of its economic activity, since it relies heavily on range livestock for the largest share of its economic base.

Global Warming, Forest Carbon Flux, and Timber Harvests

Description: This research has the objective to study the impact of global warming on the supply of timber worldwide. A dynamic model has been developed that shows the relationship between timber supplies over time and the effects of global warming on that supply.

Impact: Global warming has a positive effect on the global timber market through an increase of timber production causing stumpage prices to be lower than they otherwise would have been. We also examined the feedback effect of the stimulated foliage production on atmospheric carbon, and effects were found to be negligible.

New Perspectives on the Study of Jointly Determined Ecological-Economic Systems in the American West

Description: This research relates the simulations of the Alaska fisheries bioeconomic model to that of the Great Salt Lake (GSL) ecosystem. The GSL ecosystem includes a number of variables, but the principle objective is to model the dynamics of the brine shrimp industry that is tied directly to the Great Salt Lake and indirectly to the GSL ecosystem.

Impact: Resource management failures can be attributed to a mismatch between individually rational decisions and socially desirable outcomes. Regulatory approaches to resource management constrain the expression of individual actions but do not address the underlying incentive system.

Individual, Group, and Public Rights-Based Management of Natural Resources

Description: This project involves the development of an empirically based simulation-optimization model to characterize the biological and economic effects of alternative management regimes in a fishery with commercial and sports fishers. (The results are generalized to the case of additional nonmarket use and nonuse values.)

Impact: Natural resource management systems based on individual or cooperative harvest limits or exclusive spatial harvest rights result in greater economic benefit and more conservative management than traditional strategies for the management of renewable natural resources.

Property Rights-Based Management of Natural Resources: Impacts on Industry

Description: Conflicts between conservation and economic objectives for the management of natural resources arise when ownership claims are contingent on possession established under a catch-as-catch-can mechanism.

Impact: Theoretical analyses suggest that rights-based management systems endogenize the future consequences of current harvest decisions and eliminate the incentive to adopt cost increasing harvest technologies.

Benefits and Costs of Resource Policies Affecting Public and Private Land

Description: Contingent ranking data were used to evaluate waste disposal options for Ogden, Utah. Cost benefit analysis showed that a waste disposal program was valued at roughly $0.03 per gallon of waste diverted from a landfill. Analysis of a national level data set concerning rock climbers' site choices was used to evaluate the proposed ban on fixed anchor use in areas designated as wilderness by USNPS, USFS, and BLM. The results suggests that economic losses to climbers is likely to be in excess of $100 million, establishing a prima facie case that the agencies should undertake a full cost-benefit analysis. A thorough review of the fish consumption advisory (FCA) literature was used to assess the economic impact of potential mercury-related FCAs on the Maryland portion of the Chesapeake Bay. Losses accrue to recreational anglers and those who produce or consume commercially caught fish. Benefits include foregone illness as a result of mercury poisoning.

Impact: The Ogden Public Works Department considered survey results when designing its newly established (May 2002) curbside recycling program. The results of the rock climbing study were shared with agency representatives and climber advocacy groups. The analysis has had no measurable impact to date. The FCA study was part of a project with the state of Maryland, through Resources for the Future. The results will be incorporated in state decision making regarding atmospheric releases of mercury. The Environmental Protection Agency has expressed interest in further study of mercury as a "cross-media" pollutant [i.e., released in one media (atmosphere) and then appearing in another (water)].

Social and Biological Aspects of Community Forests

Description: Started a project to study the practices and nature of community forestry programs throughout the state of Utah. We surveyed all communities in the state and are now compiling and writing-up results. We found that very few communities have active forestry programs, that they rely on extension and local nurseries for advice, and that they are interested in one-on-one assistance. Full results will be available in January 2003. A project to study effects of education on public acceptance of utility pruning practices was funded in 2002, but work on it has not yet begun.

Impact: Utah community forestry survey results will be used by extension, state forestry, and others to fine-tune educational efforts and identify communities in need of assistance.

The Economic Value of Open Space in the Intermountain West

Description: Earlier work described open space values and protection strategies, and the generation of alternative future growth patterns in the California Mojave Desert. During the past year, the project has

focused on an open space study of the Wasatch Front region. The Wasatch Open Space study covers a 5-county region of 10,000 square miles, and identified open spaces; existing development; and regional health, safety, and welfare factors. The study's primary output is a geographic map of the region that uses a 2x2 matrix to identify lands with high and low development and open space value. Using the matrix and accompanying maps, communities can spatially identify areas of high open space value that are likely to be developed in the near future. Conversely, the analysis identifies areas of low open space value and high development potential-areas best suited for development. The project is in the process of being expanded to the counties within the Mountainlands Association of Governments. In addition, supplemental funds are being pursued to expand the 8-county Wasatch Front region under study to include ecological areas beyond county boundaries. This will allow for us to study the impacts of transboundary factors like wildlife migration corridors, watersheds, air quality, etc.

Impact: The open space inventory and development/preservation matrix gives land managers and various stakeholders the ability to predict the likely "footprint" of future development under a wide range of assumptions (e.g., low density development, high density development, trend population growth, etc.). The matrix also lets various stakeholders assess the impact of growth and the loss of open space within a regional context. For example, communities interested in protecting open space now have a spatial inventory that can be used to prioritize land acquisitions (if so desired), or be used to guide policies that can channel growth to areas best suited for development. The proactive management of open space should allow communities to grow without compromising quality of life, and in the long-term protect private property rights by allowing for the strategic design of open space and voluntary means for protection.

Public Responses to Natural Resource Management Practices and Conditions

Description: This project uses social science methods to explore inter-relationships of ecological knowledge, environmental values, attitudes toward natural resource settings and management activities, and human behaviors. Current activities focus on three topics: (1) factors affecting rancher's use of new practices that can improve ranch sustainability; (2) public beliefs and attitudes with respect to wildland fuels management practices in the U.S.; and (3) public beliefs, attitudes, and prospective behaviors with respect to invasive weeds and their management in Southwest rangelands. Under topic (1), work was completed on a study of factors that enhance or impede adoption of management innovations by livestock produces in rural Utah. Interviews of ranch innovators in revealed that respondents adopt new practices to improve not only profitability, but also environmental quality and relationships with agencies and the public. Innovators displayed high commitment to, and expectation of, maintaining the ranch for future generations. Typically they gained confidence about changes in management via frequent interaction with Extension and ranchers' organizations. Barriers to innovation include access to time and capital, and real or perceived political impediments (e.g., a misperception that the rules for distributing NRCS funds made help with individual ranchers' projects difficult to obtain). I have begun a follow-up study of ranchers who change management strategies to apply livestock behavior principles, focusing in the processes by which management changes are undertaken and the factors that facilitate or impede successful adaptation of behavior-based management systems to individual operations. For topic (2), analysis was largely completed of public attitude/belief surveys were completed in rural and wildland-urban interface counties in Arizona, Colorado, Florida, Georgia, Oregon and Utah. Also completed were evaluations of outreach activities in Georgia and Arizona, and materials were prepared for evaluation in Utah. Workshops for wildfire/fuels managers will be

conducted in early 2003 to disseminate results of these analyses. For topic (3), a public attitude/belief survey was prepared to measure knowledge, attitudes, and behavioral intentions with respect to weeds in 11 counties in Arizona, Colorado, New Mexico and Utah. Data analysis is under way. Preliminary results have been used to help guide work on a statewide rangeland invasive weed management plan for Arizona.

Impact: Studies of ranch innovation, wildland fuels knowledge/attitudes, and weed knowledge/attitudes will assist Extension, federal agency personnel, and other educators in developing outreach strategies that respond to the motives, knowledge bases, value systems, and concerns of target audiences. We have identified factors that can improve both door-to-door and video-based approaches to education about fuels reduction. Information about ranch innovators has been shared with a wide range of private, agency, and university educators who work to promote use of economically and environmentally sustainable ranch practices.

Changing Values, Beliefs, and Behavior of Public Natural Resource Agency Cultures and Their Employees

Description: Although on sabbatical leave most of this year, several short-courses were developed and presented to the USDA-Forest-Service(USFS) and Bureau of Land Management(BLM). These courses translate and operationalize concepts developed in our research to help mid-career professionals in USFS and BLM be more effective in their jobs and careers. As a visiting research scientist in the Environmental Sciences Department, Wageningen University, the Netherlands (2002-2003), I am collaborating with colleagues (in mutual research, writing and on-and off-campus courses) to make these concepts more relevant to the European Community--with a special focus on the Danish Forest Service.

Impact: Our research continues to help natural resource management professionals in the USA and Europe better understand and effectively cope with the changes in their national cultures, organizations and professions, and better provide for the diversity of values and demands of their peoples.

Constraints for Adoption of Improved Management Systems for Range Livestock Production on Private Land

Description: In the past year we have entered a new phase of work. Doctoral candidate Steve Huckett was matriculated and is supported by this project. He has spent the past year conducting literature reviews and developing a research proposal that focuses on the process of how to sustain stakeholder involvement in watershed management programs. The case study site in Utah will be the watershed of the Little Bear River in southern Cache County. The Little Bear Watershed Restoration Project is the oldest such effort in Utah, initiated in 1992. We are interested in tracking the history of this project and documenting whether project investments, technology adoption, and community participation devoted to improvement in water quality and quantity in this agro-urban setting have been sustained over the past 10 years.

Impact: Water quality and quantity is perhaps the most vital output of our land management systems today. This project will determine the factors that are most important in delivering sustainable, cost-

effective community-based watershed management programs in the Intermountain West. Results will be made available to land management agencies, city governments, and policy makers to help improve sustainability and impact of such efforts.

Use of Over-Head Wires and Diversionary Food to Reduce Wildlife Damage

Description: Wildlife damage costs the U.S. economy billions of dollars annually with much of this loss occurring in the agricultural sector. Yet, wildlife also provide so many economic and intangible benefits for society that lethal methods of control are usually not an option for farmers confronted with wildlife damage. During 2001, I examined the use of overhead wires and diversionary food as a means of reducing problems caused by birds. In the preliminary tests, sandhill cranes stopped pulling up newly-planted seeds in corn fields which had adjacent bait stations but continued their damage in untreated corn fields. I also examined whether gulls could be kept away from food plots by erecting wires above them. I found that inconspicuous wires (e.g., monofilament line, spider wire) were more effective than conspicuous wires(e.g., hemp rope, baling twine).

Impact: If successful, the use of overhead wires and diversionary food could help reduce wildlife losses to agricultural production.

Livestock/Wildlife -

Feeding Strategies to Optimize Dairy Cow Performance With Minimum Environmental Impact; Metabolic Relationships in Supply of Nutrients for Lactating Cows

Description: This research project revealed the following feeding strategies to optimize dairy cow performance and to improve farm profitability with minimum impact on the environmental. (1) Inclusion of full fat extruded soybeans and full fat extruded cottonseeds in the diets of dairy cows enhances nutritive and therapeutic value of milk by doubling the conjugated linoleic acid (CLA) content. (2) Increased supply of calcium through oral supplements of calcium chloride improves farm. profitability by preventing milk fever in marginally hypocalcemic cows (3) Modifying corn grain particle size from coarse-ground to fine-ground or steam flaked does not improve milk yield of dairy cows but enhances milk protein yield by 6.3%, reduces nitrogen excretion into the environment and improves efficiency of protein utilization in dairy cows. (4) Treating forage portion of cow's diet with currently available xylanase enzyme or using a fat-coated protein compared with fat alone as a source of feed for cows does not improve the dairy farm profitability. (5) Dairy cows grazing on high quality grass emits similar amount of methane into the environment as cows fed conserved forage and grain diets inside the barn. (6) Conjugated linoleic acid content of milk fat varies with the breed of a cow when fed similar diets. (7) The price of protein supplement for dairy cows should be based not only on protein quality but also on fat content to improve farm profitability.

Impact: Manipulating dairy cow diet can result in improved farm profitability and reduced environmental pollution.

Application of Behavioral Principles to Management

Description: We determined (1) if terpenes limit intake of nutritious foods, (2) if supplemental macronutrients increase intake of sagebrush, and (3) how herbivore experience interacts with plant toxins to influence diet mixing. We found that (1) terpenes in sagebrush limit intake of sagebrush by sheep, and (2) supplemental macronutrients nearly double intake by sheep in pens and in the field. We also found that (3) experience and the availability of nutritious alternatives - alfalfa and a 50:50 alfalfa:barley mix - both influenced food choice. Naive lambs ate much less of the three foods with toxins - tannins, terpenes, oxalates - if they had ad libitum access, as opposed to restricted access, to the nutritious alternatives (66 vs 549 g/d). Experienced lambs also ate less of the foods with toxins if they had ad libitum access, as opposed to restricted access, to the nutritious alternatives (809 vs 1497 g/d). In both cases, lambs with experience ate more of the foods containing the toxins than naive lambs, whether access to alternatives was ad libitum (811 vs 71 g/d) or restricted (1509 vs 607 g/d). When access to familiar foods was restricted to 10%, 30%, 50%, or 70% of ad libitum, animals ate more of the foods with toxins and gained more weight as follows 10% = 30% > 50% =70%.

Impact: These findings suggest that (1) managed grazing by livestock can convert sagebrush into a source of forage, thereby enhancing the biodiversity of sagebrush-steppe ecosystems, with substantial long-term benefits economically (Atwood, unpublished economic analysis), and (2) different systems of management alter how animals forage. Continuous grazing at low stock densities is likely to encourage selective foraging, whereas short-duration grazing at high stock densities is likely to encourage diet mixing. Thus, what was traditionally considered proper grazing management - rotational grazing at low stock densities - may have trained generations of livestock parents and their offspring to "eat the best and leave the rest" thus inadvertently accelerating a decline in biodiversity and an increase in the abundance of less desirable plant species.

Plants -

Evaluation of Water, Radiation and Energy Balance Components in Semi-Arid and Arid Environments

Description: We set up an automatic weather station over a playa (the flat floor of an undrained desert basin that becomes at times a shallow lake), approximately 65 km east-west by 130 km north-south, located at the U.S. Army Dugway Proving Ground (40 degrees 08 minutes N, 113 degrees 27 minutes W, 1124 m above mean sea level) in northwestern Utah, USA, in 1999. This station measured the incoming (Rsi) and outgoing (Rso) solar or shortwave radiation using two CM21 Kipp & Zonen pyranometers (one inverted), the incoming (Rli or atmospheric) and outgoing (Rlo or terrestrial) longwave radiation, using two CG1 Kipp & Zonen pyrgeometers (one inverted), and the net (Rn) radiation using a Q*7 net radiometer (Radiation Energy Balance System, REBS). We also measured the 10-m wind speed (U10) and direction (R.M. Young wind monitor) and precipitation (Campbell Sci., Inc.). The measurements were taken every two seconds, averaged into 20-min, continuously, throughout the year. The annual (August 1999 - August 2000) comparisons of global or solar radiation and windiness with two other stations in central (Hunter) and northern (Logan) Utah, indicate higher solar radiation (Rsi at Dugway = 7797 MJ / (m^2 - period) vs. Rsi at Hunter = 7021 MJ / (m^2 - period) and Rsi at Logan = 6865 MJ / (m^2 - period) and much higher annual mean windiness (U at Dugway = 387 km / d vs. U at Hunter = 275 km / d and U at Logan = 174 km / d) throughout the period over the playa. These data reveal the possibility of simultaneously harvesting these two sources

of clean energies at this vast and uniform playa. Keywords: Annual radiation balance, playa, solar and wind energies, windiness.

Impact: Analysis of the incoming solar radiation at the playa (Rsi, at Dugway) shows, on the average, about 19.6 MJ / (meter ^ 2 - d) solar energy throughout the 397 days of the experiment. Using photovoltaic solar cells (33% efficiency), we have about 6.5 MJ / (m ^ 2 - d) = 1.5 * 10 ^ 2 J /(m ^ 2 - s) = 1.5 * 10 ^ 2 Watt / (m ^ 2) = 5.4*102 kWh / (m ^ 2) from each solar collector (for day length = 12 h). Our study of wind data over playa showed that the calm conditions occurred only about 3 % of the time throughout the experimental period (August 1999 - August 2000). The average wind speed at 10 m amounted to 4.3 m / s during this period. The theoretical power (P) available from wind can be formulated as: P = (3.14 / 2) * airdens* E * R^2 * U20^3 where P is power in W, airdens = 1 kg / m^3 is the air density, E = 30 % - 40 % is the turbine efficiency, R is the turbine-blade radius in m. U20 = U10 [Ln(20 / zo) / Ln(10 / zo)] where U20 is wind speed at 20 m in m /s, and zo = 0.0002 m is the aerodynamic roughness length over playa. A single wind turbine with an efficiency of 40 % and R = 10 m (installed at 20 m), and U20 = 4.6 m / s (average wind speed in playa at 20 m) would yield about 6.1 * 10^3 W = 2.2 * 10^4 kWh. The maximum (gust) wind speed of 25.5 m / s occurred around 1900 local time on 19 March 2000. To prevent destruction of the turbine in winds greater than 10 m /s, the blade can be designed to gradually feather (reduce their angle of attack) as wind speed increases. Our study showed that the Great Basin playa could be a suitable area to harvest renewable energies.

Sustainable Cropping Systems Utilizing Low-Cost Precision Agriculture Techniques

Description: We continue to evaluate remote-sensing methods and precision agriculture techniques to enhance sustainable cropping systems for the Intermountain region. Replicated plots were established at USU's Greenville Farm in collaboration with the USU Crop Physiology Laboratory. A 'laboratory-standard' grade spectrophotometer ($50K) was purchased, which can quantify the spectral reflectance of wheat (visible to the far infra-red bands). Additionally, we developed techniques to separate these measurements into very narrow-band spectral fingerprints. Hard-red spring wheat was established and treated with various rates of nitrogen and phosphorus fertilizer with an additional irrigation variable (line-source sprinkler design). This has allowed us to separate the spectral fingerprints for nitrogen, phosphorus, and water stress. A less expensive sensor system was developed for on-farm use. This new low-cost on-farm sensor was tested and shows significant promise as a farm/ranch tool.

Impact: This is the third year of this revised project. Mr. Kurt Harman (a cooperator) estimates that space-based sensors saved him over $35,000 on the one center pivot that we had instrumented. $35,000 per pivot of wheat would equate to over $1,000,000.00 in the Intermountain area.

Dynamics of Rhizosphere Chemistry: Influence on Sustainable Agriculture

Description: Recently, the environmental fate of iodine (I) as a biocide in soil and hydroponic biologic systems has been of interest where its impact is not well understood. The active killing agent in biocide formulations is elemental iodine (I2). We determined that the lifetime of the iodine (I2) active in soils is less than or equal to 6 hours and iodide (I-) is the end-point metabolite of the reaction of I2 active with soil constituents. Thus, since I2 has an extremely limited lifetime, the important species to study from an environmental fate standpoint is the end-point metabolite iodide (I-). We conducted an exploratory study to determine the volatility rate of iodide (I-) in soils under controlled

laboratory conditions. The primary volatile species of iodine in soils is hydrogen iodide (HI), which under normal aqueous conditions exists in equilibrium with iodide (I-). Our studies indicate that iodide (I-) appears to have a significant natural volatility pathway and the percent iodide (I-) volatility (PIV) half-life in soil, interpolated from a nonlinear exponential fit to our PIV experimental data, was determined to be about 10 days. The PIV averaged over all soils tested, was significant at the individual tested time intervals; the percent iodide volatilization (PIV) being 67.5 percent at twenty days and 80.4 percent at fifty days. Upon analysis of our own and previously reported data, we concluded that iodide volatility in soils is influenced more by the capacity of a specific soil to retain iodide than by its ability to generate potentially volatile forms of iodine. We have demonstrated, via correlation matrices and modeling, that the volatility of iodide from a specific soil can be anticipated and/or predicted to a large degree based on its indigenous iodine (iodide) content (ISI), organic matter content (OM), and its pH. We have determined that the indigenous level of iodine found in soils (ISI) is a strong indicator of a soils capacity to pick up and hold iodine - soils that have higher levels of indigenous iodine will tend to have lower percent iodide volatility (PIV) values relative to soils that have a low or non-existent indigenous iodine level. Our research supports previous postulations that iodine, as iodide, volatility from soils accounts for one of the primary natural pathways in use for cycling atmospheric deposited indigenous iodine (iodide) from land back to the oceans (iodine sink). From the perspective of externally introducing manufactured/ mined iodine into the global iodine cycle, if twenty-five percent (4,000 Metric Tons) of all the iodine produced by mining in the world per year was used in pesticide soil applications it would represent only 0.00095 percent of the iodine (iodide) that is already in natural flux on land surface soil alone.

Impact: Iodine based pesticides are being considered as possible alternatives to methyl bromide. We are evaluating the chemistry of iodine in soil so that we can understand its fate when it is added to the environment as a methyl bromide alternative.

Western Regional Sustainable Research and Education (SARE) Program

Description: The Western SARE program has continued to implement programs, as directed and authorized in Subtitle B of Public Law 101-624. The program funded approximately $3.1 million in (through authorization from USDA-CSREES) research and education projects across the Western Region in 2002. This funding has grown from roughly $1.1 million in 1994 to $2.8 million in 2001. IT WILL TOTAL OVER $3.1 million in 2003. The total number of grants administered by the WSARE program has grown from 3 projects transferred from California at the end of 1993 to 27 in 1994, 74 in 1995, 136 in 1996, to over 454 in 2002. Region-wide, $1.4 million was awarded in 2003 to sustainable agriculture and pollution prevention research projects; over $571,000 was allocated to professional education efforts for extension and other agricultural personnel; and about $240,000 was split among 27 farmer/rancher-initiated projects in the Western U.S. In addition, another $170,000 will be split among state and territory Cooperative Extension programs in the West to further state-level Extension activities for sustainable agriculture professional development. Further results are available on the Web at: http://wsare.usu.edu.

Impact: The impact of the program is best measured on the farms and ranches. A national survey and evaluation of SARE stakeholders was conducted in 2002 by Michael Grogh and Associates

(Minneapolis, MN). Western SARE ranked highest compared to all other regions. An estimated impact ($ saved by farmers/ranchers) of over $2 million has been published.

The Utilization of Municipal Sewage Sludge (Biosolids) for Irrigated Crop Production

Description: The goal of this project was to evaluate the long term effects of repeated (annual) biosolids applications on irrigated grass forage yield, mineral composition, soil test nutrient levels, and nitrogen mineralization rates. Over a six year period, biosolids applied at the agronomic rate for nitrogen using U.S. EPA guidelines produced 68% as much dry matter as a comparable inorganic nitrogen fertilizer treatment (168 kg N/ha). A treatment composed of 50% of the agronomic rate of nitrogen from biosolids plus 50% of the nitrogen from inorganic fertilizer produced an average of 86% as much dry matter as a 100% inorganic nitrogen fertilizer treatment. Measured organic nitrogen mineralization rates estimated using two methods (buried bag and nitrogen balance) were variable, but generally indicated that early-season nitrogen mineralization from biosolids was slow and may produce smaller early-season forage yields than inorganic fertilizer. Secondly, a significant amount (28%) of the nitrogen applied in biosolids was not recovered in plant tissue or soil sampling, and is thought to have been lost as volatile ammonia from surface application of biosolids. Repeated applications of biosolids increased soil test phosphorus, DTPA-extractable zinc, iron, copper, and manganese, and total kjeldahl nitrogen. Soil pH, salinity, soil test potassium, ammonium, nitrate, and DTPA-extractable levels of lead, cadmium, chromium, and nickel did not increase with repeated biosolids application. These results suggest that repeated application of biosolids with low heavy metal levels does not lead to an increase in heavy metal contaminants in soil or plant tissue. Insufficient nitrogen availability from biosolids due to slow organic nitrogen mineralization rates and/or high ammonia volatilization rates resulted in yields lower than comparable inorganic nitrogen fertilizer treatments. U.S. EPA formulae for calculating biosolids application rates may require adjustment in the ammonia volatilization factor to produce yields comparable to inorganic fertilizers.

Impact: This project has resulted in increased beneficial use of biosolids via land application and reduced land filling in Utah. Ultimately this translates into lower sewage disposal fees for residents since treatment plants do not have to pay large sums of money to dispose of sludge.

The National Atmospheric Deposition Program

Description: Our participation in the National Atmospheric Deposition Program consists of collecting weekly precipitation samples, conducting laboratory tests to determine the pH and conductance of the samples, and mailing the sample and our test results to the Central Analytical Laboratory (CAL). We also perform regular site maintenance, including the periodic changing of the control bucket, winterizing and summarizing the rain gage, servicing the station to correct problems with equipment, and maintaining the area surrounding the precipitation collector and the rain gage.

Impact: Collection of acid rain data will assist the nation in evaluating the location and quantities of acidic rainfall and the effect on the environment.

Water Use and Growth of Selected Vegetables With Emphasis on Onion

Description: Irrigation timing significantly impacts onion growth and yield. Our objectives were to evaluate the delivery and timing of water applications to onions and find ways to improve water use efficiency. The specific objectives are 1. To evaluate the water requirements for drip irrigated intensively managed onions; 2. To identify water efficient cultivars of onions; 3. To determine the mechanism of improved water use efficiency; 4. and, To develop sound water management practices for Utah's onion growers. Three plant populations (175,000; 200,000; and 225,000 plants per acre) and two irrigation frequencies (daily or every seven days) were used to assess plant growth and productivity. These frequencies would mimic the differences between a drip irrigation system and currently used furrow systems. Irrigation amounts were based on available soil water, soil water depletion, estimated evapotranspiration, published crop coefficients (Kc), and precipitation. Information collected was used to estimate seasonal water use for the crop. An additional study using early and late and high and low yielding onion cultivars irrigated every 2nd or 5th day was also established. Onions were seeded in late-March 2002 and stand counts were assessed 30 days later. Irrigation treatments were initiated in late May 2002. Establishment was good in 2002 and plant stand achieved were approximately 10% of expected. A strong localized hailstorm in early June severely damaged the test site resulting in 50% leaf loss and compromised the collection of growth data and yields. This is the second year were weather interfered with our study. The test site was used to work out our root growth protocols. Aluminum pipe, 20-cm long and 7.6-cm diameter, was pressed into the soil over plants and the core removed. Onion roots, attached to each plant, were washed from the soil, counted and weighed. This technique allowed us to keep the primary root system intact and is being used to generate estimates of root distribution, biomass and dry weights to go with leaf area and weight measurements. Additional refinement of the technique was conducted in commercial onion fields in 2002. Using this system we were able to better quantify root number and mass around individual onion plants.

Impact: Information on irrigation needs and timings continue to be of interest to onion growers throughout Utah and the region. Onion productivity is tied to sound irrigation management practices, detailed information on cultivar adaptability to a production area, irrigation frequency and yield responses to these parameters. Our information will provide onion growers in the Western USA with information that saves water while maintaining farm profitability.

Reduction of Water Use in Turfgrass by Plant Improvement and Improved Management Strategies

Description: Water conservation in turf: We continued investigations centered on the goal of reducing turfgrass water use in urban landscapes of the arid West. Research of irrigation intervals (2, 4, and 6 day intervals applying approximately 70% of ET) was concluded in 2002. Moderate quality differences were observed with 2 day intervals best. This is compared to large differences in 2000 and minimal differences in 2001. Although data analysis is not yet complete, frequent intervals resulted in a cooler turfgrass canopy temperature, which likely favors the cool season grasses. Preliminary analysis of soil moisture data showed consistent levels of moisture in the 2 day interval treatment compared to the 4 and 6 day. Further analysis will compare these results among two cool-season species and a warm-season species. Superior selections of buffalograss were again evaluated through 2002 and increased into larger plots for turfgrass evaluation and material increase. Selections have high turfgrass quality, rapid growth, dark color, and significantly longer season of growth than average. The goal for these selections is for a vegetative and seeded variety adapted to the northern Utah environment. We

concluded a study of morphological differences between ploidy levels in buffalograss in order to better evaluate plants in the field. None of the morphological measurements indicated significant differences between the ploidy levels. In conjunction with the National Turfgrass Evaluation Program, we evaluated varieties of Kentucky bluegrass and tall fescue for low-water use in the cool-arid West. Although it is too early for even preliminary conclusions, a wide range of differences were observed and many promising cultivars did well under significantly less irrigation than normally applied. Kentucky bluegrass was irrigated at 60% of ET, 25% irrigation than normally recommended. Two preliminary studies were begun in 2002. The first is a survey of organic products applied to turf for evaluation of drought tolerance effects. If promising results are obtained, further research will be conducted. The second new study is on surfactants for putting green use. Although this is a two or three year study, first year results show the ability for significant water savings with some products. Irrigation frequency may be lengthened without hydrophobic sands developing. We continued cooperation with USDA scientists on evaluation and genetic improvement of wheatgrass and other potential low maintenance turf species continued. Work in 2001 involved initial evaluation of an Agrostis collection. In cooperation with Dr. Kelly Kopp and others in our department, we initiated a study to better characterize turfgrass water use (Kc values) using eddy covariance methods. We concluded our first evaluations of grass/wildflower mixtures. While none of the mixtures in our study were satisfactory for a lawn, we obtained very useful information on competitiveness of different species. This information will enable us to compile and evaluate another set of mixtures that will likely have commercial application in the arid West.

Impact: Turfgrass is the largest component of most urban landscapes by acreage. Our efforts are designed to (1) provide management practices to reduce water use and (2) provide alternative grasses that managers can use in the cool-arid West. Irrigation needs may be decreased 50% in many situations by using new grasses and/or new management practices.

Turfgrass Management in the Intermountain West: Conservation of Water and Nutrients

Description: Preliminary experimental treatments (fertilization and clipping management) and data collection were begun during the 2002 growing season at the Greenville Research Farm. Anion exchange membranes were inserted and removed from each plot on a weekly basis to relate desorbed nitrate to turfgrass quality and yield. Soil moisture data was also collected throughout the 2002 growing season. Analysis of the data is currently being performed with preliminary results expected in early 2003. The experiment will begin again in the spring of 2003 and will continue through the growing season of 2004.

Impact: Specific information about turfgrass cultural practices that will optimize turfgrass water use efficiency will result from this work. Irrigation water use by landscape managers, grounds keepers and home owners will be optimized and water conservation will be achieved.

Water Management in Woody Landscape Plants

Description: Tree Water Use: water use of one broadleaf shade tree species was quantified in three climates. Three sweetgum (Liquidambar styraciflua `Moraine') in 100 l containers were obtained from a nursery and placed on load cells in a trench 0.75 meter deep to moderate root zone temperatures at the Utah State University Greenville research farm. Gravimetrically measured water loss from the load

cells was recorded with a datalogger in hourly increments. Daily water loss was replaced with a drip irrigation system nightly. This experiment was duplicated in Lubbock, Texas, in a semi-arid climate, and in Orlando, Florida, in a humid climate. Tree water loss was monitored continuously from June in Lubbock and Orlando, and from late July in Logan concurrent with reference evapotranspiration (ETo) measurement. A partial dry-down was conducted at all the locations in late season where trees were irrigated at 50% of full water replacement for one week. At all three locations 1-2 dawn-to-dusk stomatal conductance studies were conducted once under well watered conditions and once during the partial dry down. Preliminary analysis of the data form Logan showed the trees used 1-2 mm of water daily during the study period, approximately 20-30% of ETo. Dawn-to-dusk stomatal conductance results showed progressive closure from early morning, when the vapor pressure deficit reached 2 kPa, through the day in Logan. In Orlando conductance values peaked at noon at 2 kPa, and were twice as high as in Logan. The data from Lubbock has not yet been analyzed. Intermountain Native Plant Production: This field study compared production time for 15 perennial and 10 shrub species under two irrigation regimes, drip and overhead sprinkler, with two different growing media, an expensive ($50/m3) commercial organic mix and a cheaper bark-fired clay mixture ($20/m3) using the pot-in-pot system. There were no apparent differences in shrub and perennial growth between the two irrigation treatments. Growth media had a large effect on plant growth. All species performed well in the commercial mix, and three crops of wildflowers were produced over the season. However, the low-cost mix had higher salt levels from the fired clay component (approximately 3 dS) that impaired growth in some species. Native species from lower, drier habitats with greater probability of exposure to salt were generally unaffected in the bark-fired clay media, but species from wetter, higher elevation habitats were severely affected, and species from intermediate habitats were mildly affected. A cost analysis of production with this method is currently being conducted. A second, related, project screened different low-cost growing media mixes using bark and local inert products, as the fired-clay/bark mixture was clearly unacceptable for plant production due to high salt levels. Working with a local supplier of landscape products, a number of mixtures were tested on approximately 20 native species. A 60% bark: 40% fine pumice mixture was found to be the most suitable at the lowest cost and will be used in all future studies.

Impact: The results from the tree water use will be very useful at a basic level in helping tree managers understand how broadleaf deciduous transpiration varies in different climates, and the fractional water loss coefficients relative to evapotranspiration can be directly applied by tree managers in more accurately irrigating urban trees. The native plant production information will make production of native, drought adapted plants more attractive in terms of production costs and low-cost media to nurseries in Utah and the Mountain West.

Factors Controlling Vegetation Structure in the Great Basin

Description: Processing of soil samples collected during the previous field season was continued and data analysis was completed on most of these samples. These soil samples were collected at two-week intervals throughout 1999 and 2000 from replicated sagebrush, crested wheatgrass, and cheatgrass communities. Samples were analyzed for microbial biomass carbon (C), soil respiration, soil labile C, inorganic nitrogen (N) concentrations, and net N mineralization and nitrification to see if temporal patterns in C and N cycling rates differed among plant community types, and to determine the mechanisms for these differences. While nearly all previous models of soil trace gas flux have assumed that NO fluxes are directly related to gross rates of nitrification, we showed that this is not true across a wide range of forest and rangeland ecosystems.

Impact: In cheatgrass soils, rapid shifts in the C:N ratio of the labile soil organic matter pool during summer appear to regulate soil inorganic N concentrations and create high nitrate concentrations in time for the fall rains. This coincidental timing of high nitrate concentrations and germination of cheatgrass seeds may serve to promote cheatgrass re-establishment and perpetuation. Management techniques that serve to limit this accumulation of nitrate may break the feedback cycle that promotes cheatgrass dominance at the expense of more desirable perennials. Models of NO flux from soils will have greater predictive capacity if net –cycling rates, rather than gross –cycling rates, are used as driving variables. This should make modeling easier for a range of ecosystems, because net rates are more
easily measured than gross rates.

Interactions Among Bark Beetles, Pathogens, and Conifers in North American Forests

Description: A harvest planned in old growth spruce stands with spruce beetles and root diseases is on hold due to an environmentalist lawsuit. Stump removal trials and using competitive saprophytes to reduce inoculum of root disease are planned. Scanning electron microscopy reveled the presence of fungal mycelium in the roots with stain columns that yield no cultures of fungi. These stain columns are a symptom of fungal infection. We will not use molecular techniques to confirm the identify and extent of these fungi in roots. We will also seek to characterize host response and disease effects on the host in this early stage of the infection process.

Impact: Culturing fungi from roots may not be an adequate indication of the presence of pathogens. This research will help scientists understand fungal distribution in forests.

Nutrient Dynamics in Forests and Woodlands

Description: The objective of this research in forest soils and nutrient cycling is to investigate factors that determine productive capacity and sustainability of wildland soils, to investigate the role of wildland soils in a changing environment, and explore the relationship between carbon (C) and nitrogen (N) dynamics in wildland ecosystems.

Impact: Findings from this research emphasize the critical relationship between C dynamics and cycling of other nutrients. Outcomes of this research are relevant to the productive capacity of soils (nutrient availability and release); the sustainability of certain land use practice; the ability of wildland ecosystems to retain exogenous elements (e.g., atmospheric N pollutants) the ability of soils to store C; and the functioning of wildland soils under changing global climate (e.g., rate change of processes). Research is not yet completed on this project.

Silviculture of Intermountain Subalpine Forests

Description: Harvesting to implement the alternative silvicultural system for lodgepole pine on the T.W. Daniel Experimental Forest was completed. This silvicultural system is based on previously developed reference conditions and prescriptions patterned after the natural disturbance regime in the lodgepole pine type. A study has been completed on young lodgepole pine stands to assess possible relationships between snowshoe hare utilization and various combinations of young stand relative

density and juxtaposition of young and mature stands. Results suggest that there is a fairly short time window in which lodgepole pine stands have the potential to provide quality snowshoe hare habitat. Quality snowshoe hare habitat requires a mosaic of high density and moderate density patches.

Impact: Results from this project are contributing to the way that Intermountain subalpine forests are managed for a variety of objectives. The federal listing of Canadian lynx and endangered means that the snowshoe hare/stand density work has taken on even greater importance.

Assessing the Impact of Forest Diseases

Description: Efforts are underway to develop and improve survey techniques using global positioning systems (GPS). Techniques developed by this project for sampling dwarf mistletoe infestations were modified for assessing the extent of Armillaria root disease in Jack pine stands. A GIS based impact simulation tool has been developed for ARCView GIS. This tool uses files collected from GPS-based surveys to project the timber volume lost to dwarf mistletoe–caused mortality, the area out of production, and the treatment area.

Impact: This project has greatly decreased the cost of obtaining pest survey information while increasing the accuracy of those data. The system being implemented allows projection of pest impacts for an individual stand and throughout a region, that will greatly aid forest managers in setting appropriate harvest levels.

The Ecology and Management of Disturbance in Intermountain Subalpine Spruce-Fir Forests

Description: Data were analyzed showing that an extensive avalanche cycle produced sufficient downed Englemann spruce to contribute to a spruce beetle outbreak. A new project was initiated to determine the influence of spruce beetle outbreaks and silvicultural treatment alternatives on fuels accumulation and potential fire potential.

Impact: These studies will aid understanding of how select agents of disturbance interact and affect vegetation over large spatial and long temporal scales in Intermountain subalpine spruce-fir forests.

Landscape Resource Modeling

Description: We destructively sampled a large number of trees of six species to obtain sapwood area/leaf area data and completed regression analysis of the data, with very good results. We also sampled a large number of forest stands for total sapwood by size class by species to reconstruct the canopy leaf area distribution by size class and species. Samples locations were entered into a GIS for climate modeling of site water balance and soil moisture availability.

Impact: Work this year obtained data for development of the simulation model, and is preliminary to final results.

Nitrogen Immobilization for Restoration of Cheatgrass-Infested Range

Description: We completed analysis of field competition experiments. In addition, seeds have been collected and field plots set up to address the role of nitrogen (N) availability in seedling emergence (weeds versus desirable native) and early community development.

Impact: Preliminary field results are similar to those from the greenhouse. N-immobilization reduced growth of both the weed cheatgrass and native perennial bottlebrush squirreltail, but suppresses the weed more than the native. Competition analysis further suggest that –immobilization increased the competitive ability of squirreltail relative to cheatgrass, but only at low to moderate densities of cheatgrass.

Effects of Woody Vegetation on Plant Recruitment in Utah Rangelands

Description: We continued to monitor seedling emergence from our experiments at the Tintic site that was burned in a crown fire in the summer of 1999. Despite many live seeds remaining buried in experimental cages at the time of the fire, no seedlings emerged in 2001.

Impact: Preliminary results suggest that juniper seeds in the soil do not survive intense woodland fires and that the seedbank is not likely to contribute to juniper establishment following fire.

Development of New Approaches to Rangeland Monitoring and the Assessment of Condition and Trend

Description: A 20-year set of plant and soil cover data were obtained from sagebrush semi-desert plant communities in eastern Juab County, Utah, that were first inventoried before a wildfire in 1981 and then either protected from grazing or grazed subsequently. These data were organized by plant species, growth forms, and other ground cover classes. Graphical analyses, ordination, regression, and ANOVA were done. Each data format-analysis combination yielded somewhat differing monitoring perspectives. The vegetation didn't recover toward pre-burn conditions. Few tight linkages between species were observed. Also there was no evidence that thresholds were crossed into new states. Impacts: Our case study shows that the new state and transition models don't apply everywhere. This has cooled some over-extrapolation of this concept and given others pause for more careful interpretation of time series data from rangelands.

Cool Desert Range Ecology

Description: Responses of cool desert vegetation and ecosystems to temporal pulses of soil moisture from precipitation and associated nitrogen changes in the soil is the overall theme of our current work. Four major plant communities are being investigated: The exotic annual grass, cheatgrass (Bromus tectorum) that has invaded extensive areas of the Great Basin, the widely planted exotic perennial range grass, crested wheatgrass (Agropyron desertorum), the native shrub, sagebrush (Artemisia tridentata) and juniper trees occurring in open woodlands (Juipersum osteospermum). This past year has included continued extensive field studies of photosynthesis, respiration and water loss from stands of vegetation at different scales from single leaves to whole stands, remote sensing, extensive soils analyses, correlative glasshouse experiments and considerable simulation modeling. There is clear evidence that root systems of all these vegetation life forms transfer appreciable amounts of soil moisture from one region of the soil to another in response to soil moisture potential gradients. This

includes large quantities of water moving downward when soils are being recharged by precipitation. For example, over the primary fall/winter/early spring period of major soil moisture recharge, most of the water flows through the root systems rather than through the soil itself in an Artemisia tridentate community. This redistribution of soil water by root systems has many important implications for both rangelands and agricultural systems and is not widely appreciated. The juniper woodland persists with surprisingly little water uptake from deeper soils, and has very low leaf-level photosynthesis, transpiration and growth rates. However, the extensive foliage area per ground area results in an appreciable daily water loss from this woodland (0.85 mm per day). This species is surprisingly responsive to summer rain events. Field studies of crested wheatgrass and sagebrush to simulated small rainfall events was conducted to see how rapidly and effectively, both species acquired water and nitrogen from 5-mm and 15-mm rain events. Even the very small 5-mm events caused both species to respond, change root physiological properties and take up nitrogen as well as water. The crested wheatgrass was particularly responsive. Glasshouse studies were undertaken to determine how vertical water distribution in the soil affected the growth, gas exchange and nitrogen uptake of two shrub species, sagebrush and rabbitbrush (Chyrsothamnus nauseosus).

Impact: This comprehensive study of different cool desert vegetation types will contribute to an understanding, and basis for management, of rangelands. In particular, addressing the large question of how an invasive species such as cheatgrass (very widespread throughout the Intermountain West) can control areas once it is established is highly important for management. Competition for water and nitrogen are thought to be particularly important and this research should help to clarify how timing of these resources influences this competition. These studies should also contribute to understanding how these extensive vegetation areas are and will respond to changes in the regional climate as global climate change proceeds. Also, a strong emphasis on water dynamics in these communities will aid our understanding of how these vegetation types utilize and redistribute soil moisture. Thus, these studies are relevant for both rangeland and watershed management.

Electromagnetic Characterization of Soil Electrochemical and Geometrical Properties

Description: The principal advantage of expectation-maximization over previous methods of analysis is that an a priori assumption of relaxation time distribution is not required. A reference for the paper is included in this report. Models of dielectric relaxation mechanisms in montmorillonite clay suspensions were compared to data in an attempt to validate a model and better understand the relaxation mechanisms. The models provided differing mechanistic interpretations of the data, but one model was determined to be the most consistent with all of the experimental data. The montmorillonite clay suspensions used in preliminary experiments produced spectra with features dominated by bulk electrolyte and electrolyte-electrode dielectric relaxations. Use of impendance spectroscopy as a means of characterizing electrochemical and geometrical properties of soil materials is predicated on being able to detect soil surface processes. Much of the past year was developing an experimental system for making measurements with packed soil columns where the ratio of solid to solution is much greater than the liquid systems used previously. Our objective was to devise a cell that could be used to make measurement with variable column length and under conditions of variable saturation. We built and tested a two-electrode cell with features that would permit such variations. The cell was evaluated in the electrical engineering laboratories at Utah State University and in the laboratories of HP and found to be electrically sound. However, it proved to be nearly impossible to obtain the necessary reproducibility in spectra in the cell. We attributed the difficulties to problem in obtaining a consistent

and absolutely parallel alignment of the electrodes. We have selected a commercially available cell that is appropriate for measurements of fixed column length under water saturated conditions. The cell sacrifices some experimental objectives but eliminates electrode-solution relaxation process permitting analysis of the very low frequency portions of spectra where signatures of surface processes may be found.

Impact: An experimental system of determining impedance spectra of packed columns of soil materials has been developed. The system eliminates a major source of interference in the low frequency domain. Elimination of low frequency interference is a critical step in developing a technology appropriate for soil characterization.

Linking Ammonia Oxidizer Communities to Nitrification Kinetics in Soils Treated with Dairy Wastes; Microbial/Plant Nitrogen Interaction sin Animal Waste Management

Description: We have used both laboratory and field experiments to investigate the N transformations in dairy waste amended soils. The genes for the ammonia monooxygenase enzyme were used as functional markers for the ammonia oxidizing bacteria (AOB). Using these molecular tools, we observed shifts in the types of AOB in soils treated with different wastes that coincided with changes in process rates. Certain AOB are tolerant of high ammonia concentrations and high salinities found in animal wastes. These functional types of AOB may be distinguished by sequence motifs in their amoA genes. We have already observed shifts in the AOB populations due to waste treatment at our field site and will continue to monitor the population and community composition of the AOB using molecular tools based on the AMO encoding genes. In 1999 through 2002, changes in the kinetics of nitrification were observed for three waste treatments, high rate compost treatment had the highest V max and Km. Laboratory kinetic analysis of the ammonia oxidizer communities in the treated soils indicates that soil AOB are inhibited by high free ammonium levels, with the highest nitrification rates at approximately 1mM ammonium. We are continuing to analyze the data on N process rates from isotope dilution experiments performed in 1998-2002. Post-harvest in 1999-2002, we sampled soils down to 1.8 m depths to check for nitrate leaching below the root zone. Movement of nitrate was observed for the compost treatment. Highest values for nitrate accumulation were observed for the high rate compost at the 1.2 to 1.5 m depth. Nitrate levels reflected decreased rates of compost application in 2000-2001. The downward movement of nitrate indicates that N in excess of plant demand is being produced in surface soils that have been repeatedly amended with dairy-waste compost applied at rates sufficient to maximize yields. Soils receiving compost continue to mineralize N after plant demand has decreased in the fall. No leaching was observed for the other treatments. Several, but not all AOB, are known to have the ability to grow on urea as well as ammonium salts. We surveyed a collection of pure cultures of the AOB for their ability to grow using urea as a source of ammonia. The ability to use urea was found in the AOB from diverse taxonomic groups. In Nitrosospira sp. NpAV we have extended the sequence available for the urease operon, the first sequenced for an ammonia oxidizing bacteria. We have completed the sequencing of the structural subunit encoded by ureC from several Nitrosospira, Nitrosolobus and Nitrosococcus. This study on the diversity of the urease genes in AOB will be the basis for the molecular examination of the importance of urea as the substrate for nitrification. Molecular tools based on the sequences of ureC will be used to examine the functional diversity of soil AOB in subsequent years.

Impact: Our evidence of linkage between nitrifier genetics and kinetics of nitrification in soils may lead to management strategies for nitrification. Urea transformations should be considered as targets for management of nitrate production in waste systems. Knowledge on the diversity of urease in ammonia oxidizing bacteria may be important in waste treatment systems.

Effects of Temporal Changes in Soil Physical Properties on Water and Solute Transport; Characterization of Flow and Transport Processes in Soils at Different Scales; Post-Tillage Soil Structure and Pore Space Dynamics

Description: The main accomplishments this year were (a) development of models for hydraulic conductivity functions in unsaturated soils based on flow in angular pore space; (b) expansion of soil rheological models to describe soil compaction under steady and transient loads; and (c) development of methods for using TDR for grain moisture measurements in drying bins.

Impact: The impact of this year's results should improve aspects of field soil structure management; thereby reducing impact of compaction and costs of tillage, enhancing crop yields due to improved soil tilth management, and improving conditions for compliance with EPA regulations for agrochemicals transport.

Chemical Application Strategies for Surface Irrigation Systems

Description: Data from a field study conducted in previous years have been evaluated to determine if an accurate mass balance of chemicals injected under furrow irrigation could be determined. Such data are needed to validate simulation models of surface irrigation chemical injection strategies. Results show that a reasonably accurate mass balance can be obtained on a gross field basis, but it is unlikely that such data can be used to describe the spatial distribution of applied chemicals. The variability in basic soil parameters like bulk density masks the variability of the applied chemicals.

Impact: Chemigation is the process of applying water-soluble fertilizers, pesticides, herbicides, and soil amendments to the field through the irrigation system. For the last forty years, chemigation has been used successfully in conjunction with center pivot and drip irrigation systems, but not much with surface irrigation systems. With the development SIRMOD III software and advances in surface irrigation technology (e.g., surge flow), it is possible to simulate and manage entire irrigation events to achieve application efficiencies and uniformities comparable to sprinkle and drip irrigation. Since more than 50% of all irrigation in the US is by surface irrigation methods, the results of this research should provide a significant benefit to all water users.

Waste Management for On-Farm Sustainability

Description: This project continues to support the beneficial use of animal waste materials in agricultural production settings. A field-scale experiment was conducted using zeolite as a manure amendment in the chicken coop. Manure samples were collected and are currently being analyzed for N content. Atmospheric measurements were recorded. The non-treated and treated manure has been transferred to the composting pad and will be analyzed throughout the composting process.

Impact: Preliminary results indicate that zeolite was not effective at reducing in-house ammonia concentrations.

A Model for Landscape-Level, Cost-Effectiveness of Invasive Plant Management

Description: A GIS-based model for weed spread has been designed.

Impact: This project is expected to have significant impacts on the future of weed management. By using a GIS-based system, weed managers will eventually be able to apply the model to their specific area of concern and to a specific species or group of weed species. This will enable the managers to evaluate the costs and benefits of alternative weed control strategies before applying them on the ground.

Water Quantity/Quality -

Land Use Strategies to Address Nitrate Contamination of Groundwater in the Sevier River Watershed

Description: The purpose of this project is to identify land use strategies to address nitrate contamination of groundwater in the Sevier River watershed of Utah. Best management practices were implemented or continued for the seven original production sites.

Impact: Water sources vary considerably from one location to another in Sanpete Valley of Utah in regard to mineral content, as well as other characteristics. Results from these tests demonstrated nitrate reductions in four of five wells. The success of these low-cost practices supports the belief that altering common operating practices can reduce nitrate contamination of groundwater. A clearer understanding of turkey drinking water quality and its association with production performance could lead to improved recommendations to turkey growers regarding use of specific water sources for turkey drinking water.

Development of Economical Rangeland Monitoring Systems
Description: The protocol was developed to be used in a tiered format based on the level of information needed to make decisions. WEPP was found to be of limited value because of the high cost of data collection needed to calibrate the model at the intermediate watershed scale. In addition, sediment production found on most sites was primarily attributed to roads and trails found in the watersheds.

Impact: Once finalized this protocol will help land owners and managers understand the consequences of their management actions. They will be able to look at the economic impact of gathering data for the appropriate seeds to meet their needs.

Integrated Facultative Ponds (IFP) for Agricultural Wastewater Treatment

Description: The Integrated Facultative Pond has been determined to be a stable process (in statistical control) since September, 2001. Being a stable process, researchers have been able to predict the expected range of pollution potential, manure nutrient content, and gaseous emissions from the

process. Additionally, researchers have be able to analyze patterns of process variation and determine whether these variations occur due to special causes (non-routine events) or from common causes (those built into the process). The data collected is being recorded in a database and indicates that the pollution potential, manure nutrient content, and gaseous emissions of the wastewater are being reduced significantly.

Impact: The information collected from the system continues to assist owner/operator, private consultants and agency personnel in making informed decisions regarding integrated solutions to the manure treatment and management problems associated with animal feeding operations. Based on the findings of this study, two similar full scale ponds have been constructed in Utah. Both full scale ponds were designed by NRCS engineers and planners in consultation with USU AES researchers. Both ponds should be full operational in the spring/summer of 2003. Comparisons will be made between the current AES model system and the two full scale systems once the full scale process are determined to be stable.

Hobby or Hazard? Assessing the Environmental Impacts of Small Farms

Description: Nearly 60 percent of Utah's farms have gross sales of less than $10,000. This indicates that many of these farms are also small or part-time farms. A survey is currently underway to examine the management practices on small and part-time farms.

Impact: This survey will identify the use of management practices on small farms. Educational programs can then be developed to enhance the awareness and understanding of appropriate management practices and techniques.

Water Quality Issues in Poultry Production and Processing

Description: Approximately 5 years ago a comprehensive water sampling took place in the Sanpete Valley. At that time the data could not be analyzed. This year the data was analyzed by type of water (city, well, spring and irrigation). It was found that well and spring water were higher in mineral contents than city and irrigation water. Turkeys are grown throughout the Sanpete Valley. Location of water was examined as well. Wherever city water was used the mineral content and hardness was reduced. Well water in the middle part of the valley has higher mineral content and harder water. Performance data from 5 years ago was collected. The top 25% of the growers were removed from the database and their water data was analyzed and compared to the rest of the database. It was observed that the top 25% of the grower had all water sources and came throughout the valley. However the mineral content and hardness in the top 25% of the growers was generally lower compared to the rest of the growers.

Impact: Water quality has been shown to affect the performance of turkeys. Understanding the positive and or negative effects of water will be important. Sanpete Valley produces approximately 4 million turkeys a year. These birds are exposed to water from wells, springs, irrigation and the city. There is a location by source effect. As this interaction is understood it can be used to grow turkeys more efficiently in the Valley.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

007	345	627
010	347	701
015	348	703
018	351	705
052	356	706
173	359	707
278	360	709
322	390	710
323	431	712
324	434	713
329	442	726
330	446	727
335	449	730
338	463	746
344	471	810
861	917	924
862	919	941
905	921	942
910	922	943
911	923	960

Funding Level: 10,658,840.88 **SY FTE: 13.64**

Scope of Impact: Intermountain West, National, and International

Goal 5. ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

Utah State University Extension
Progress Report on Plan of Work Goals: 2002

Overview

Utah State University Extension provides a wide range of programs to assist Utah citizens in enhancing their economic opportunities and quality of life.

The family financial management programs and housing programs assist families in budgeting, debt reduction, housing, and planning for retirement. Specialists and County Agents help people to be wise consumers and to stretch the family income to meet increasing demands. Housing costs are increasing nationwide and in Utah. The housing programs that Extension is involved in help people qualify for financing, reducing down payments, and managing the demands of home ownership.

The Extension Community Resource Development programs assisted individuals, businesses, and economic development professionals to make choices and decisions regarding growth, employment, and development alternatives. Extension Specialists and Agents helped communities and businesses evaluate the advantages and disadvantages of development strategies such as corporate recruitment, tourism, business expansion, and entrepreneurship and new business start-ups. USU assisted people interested in starting or expanding a business to do strategic planning, market research, feasibility studies, and provided training in business and economic development strategies and skills. Specific program areas include: business retention and expansion, entrepreneurship training, small business management assistance, business incubators, rural tourism, and economic development planning.

County Agents are involved with community resource development at a local level. Many provide leadership training to community councils and advisory boards that are addressing economic development, health, and quality of life issues in Utah. These councils, in turn, go forward in their communities providing educational programs, services, and youth programs to residents. Many agents are members of local economic development committees and are actively involved in recruiting business to rural Utah, and in strengthening the agricultural sector of Utah's economy.

Public and elected officials throughout Utah work with USU Extension in developing their cities. USU Extension assists them with community needs' assessments by polling local residents on local development issues. Extension works with tomorrow's leaders by engaging teens on Youth City Councils. These councils help elected officials to understand youth problems and how youth can be of service to a city or town.

Rural communities in Utah are looking at ways to log onto the information highway. Smart Sites is one program that is bringing technology jobs to rural Utah. Many Extension agents provide information on useful websites to their clientele, including sites on up-to-date agricultural market prices, Master Gardening and horticulture, food safety, and business information. Extension agents are using electronic newsletters, e-mail, and county websites to deliver their programs to their audiences more effectively and efficiently.

State Assessment: The Goal 5 program areas are very effective in helping Utahans improve their quality of life. The demand for financial services, family and life programs, 4-H, and Community Development Programs remains strong in Utah. The slowing economy in Utah, along with the changing demographics, places increasing demands on quality of life programs. With the increasing Hispanic and other minority populations in Utah, USU Extension has placed, and will continue to target services for minority populations.

Total expenditures and FTE:
Smith-Lever $702,724
State Match $641,853
FTE: 24.2

Program Title: Economic Development

Key Theme: Jobs/Employment

Description: Utah State University Extension participates with the Utah Department of Economic Development and the Governor's Rural Partnership Office in establishing Smart Sites. These joint private, community, and education centers help develop and create family-sustaining, technology-based jobs for rural Utahans. This initiative identifies communities that are ready to partner with firms using computers and the Internet to perform computer-related functions. As Smart Sites are created they deliver technology-based training to rural workers, provide high-speed bandwidth to rural communities, encourage technology-based firms to locate in a Utah Smart Site or to contract with firms already located in Utah Smart Sites. Smart site partners provide incentives to firms that locate in a Utah Smart Site. The partners also help companies in Utah Smart Sites who are interested to obtain state and federal contracts to support their efforts.

Impact: The Smart Site team in Sanpete County obtained a $35,000.00 USDA grant to pay for the legal work to apply for and gain 8-A status resulting in Skyline Drive, LLC receiving 8-A status and conducting business. Sanpete County and several of the towns in the county own 51% of the business and local entrepreneurs own 49% of the company. The entrepreneurs contributed $20,000 in start up capital and the knowledge and skills that qualify the company for 8-A status. Technology companies have moved into the building and classes on word processing, spreadsheets, and the Internet are being taught.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Tourism

Description: Utah State University Extension specialists and agents are involved in a many tourism-based projects. Travelers accounted for $4.15 billion in traveler spending for the Utah economy with nearly one out of every nine jobs in Utah directly or indirectly related to tourism. Traveler spending generated $332 million in state and local tax revenues. Communities are exploring tourism as one tool for economic development. Specifically, efforts are underway to receive Heritage Area Designations from Congress. These efforts, in conjunction with the National Park Service, are guided by partnerships with local governments, county tourism bureaus and travel councils, the Utah Department of Community and Economic Development, Utah Division of History, Utah State University Mountain West Center, and, when Heritage Areas cross state boundaries, work is also being done with like partners in Idaho and Nevada.
USU Extension agents and specialists are engaged in education efforts and follow-up to the 2002 Winter Olympics opportunities. One Extension Agent presented information on the National Mormon Pioneer Colonization Heritage Area at Governor Leavitt's sponsored conference showing what state agencies and organizations are doing to capitalize on the 1,000-day window after the 2002 Winter Olympics. He showcased marketing and promotion products for the Heritage Area, including as articles, cd-roms, radio spots, product brochures, and local projects such as the Gallery at Apple Hollow.

Impact: Impacts from Extension tourism efforts include a $15,000 remodeling grant for the Long Valley Co-op in Glendale. The money was used to remodel a building that houses an apple juice business. Working with the owner of the building, the front two thirds of the building will be used by

local artists to showcase and sell their products. Remodeling and renovation for the "Gallery at Apple Hollow" has included a new roof, new facade, hookup to a sewer service, and refurbishing and painting the interior.
In addition, public service radio spots telling people about the places and attractions to visit in the National Mormon Pioneer Colonization Heritage Area were produced. Three thousand brochures on the area's local heritage businesses, tourism, and recreation opportunities were published and distributed. A study for the development and coordination of the craft industry in the area was completed and used to help meet the requirements for a heritage area feasibility study. The study was completed and distributed to strategic members of Congress.

One Extension agent's involvement in Ephraim City's Scandinavian Heritage Festival received a $1,000 grant to augment the $3,000 advertising budget. Even with increased number of food vendors at the festival, due to larger crowds than in previous years, all of the food product vendors sold all of their food.

Extension specialists helped organize a Bear River Heritage Conference. Forty-six percent of the participants completing the conference evaluation form indicated that they plan to adopt one or more recommended practices taught at the conference. One participant adopted historic preservation, down town Main Street program, economic development, and financing practices. Other participants indicated they would utilize folklorists and begin mapping the heritage resources in their areas. Other participants said they will explore using the Internet to market their products and some said they will use the information learned about business plans compositions and provisions.

Source of Funds: Smith-Lever, State

Scope of Impact: UT, ID

Key Theme: Community Development

Description: An Extension agent is a member of a workgroup pursuing the BLM/State land exchange, identifying lands on BLM that could be used for farming and also a site for a proposed dam. The selected acreage was reported to county commissioners and maps made of the proposed locations. The workgroup members also met with a state geologist from Water Resources for help in identifying locations with ample underground water where communities could be established.

Impact: With information about underground water, the agent and county highway superintendent identified, on the ground, locations that had lands that could be marketed for home sites if the land could be traded to the state of Utah and then to private individuals or families. Lands above the domestic quality water supplies were added to the list of exchange acres. Agents and Specialists also conduct tax studies to help county and city officials understand tax benefits and ratios.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Jobs/Employment

Description: The Escalante Mill has been reopened after a lot of community and partnership work with the former Southern Utah Forest Products sawmill, which was closed in early 2002. Extension has been participating with a number of entities to help reopen the mill. The effort included several partners from government, education and private sector who worked as a partnership to assist with acquiring financing, log supply and publicity to reopen, restore jobs and the tax base from the mill.

Impact: Many of the 60 former employees are rehired and the mill is the primary employer for Escalante. The new name is Skyline Forest Products.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Financial Assistance

Description: A regional agent in Utah has implemented a program called "Bring the Cow's to the Feed" which has increased local markets for forage and expanded the tax base by promoting dairy relocation. Since the program was initiated in 1989, ten dairymen with 14,300 cows have relocated to Millard and Iron Counties.

Impact: Attracted investment and economic activity for 1998-2002 is estimated at $51.4 million. Site work has been completed for a 3,500 head cow dairy in Iron County with estimated value of $4.9 million. One 1200 cow dairy that previously relocated to Millard County completed a second dairy of 2500 cows valued at $3.5 million.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Financial Management

Description: An Extension faculty is a member of a "Pumpers Committee" that monitors the electric rates paid by irrigators.

Impact: Testimony and analysis provided by an Extension Economist and others resulted in a yearly decrease of about $ 1.6 million from the rates to be paid by irrigators that were proposed by PacifiCorp.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Financial Management

Description: A futures workshop was held by the local extension agent to teach growers about futures contracts and options. Other principles about buying and selling were discussed and attendees were excited to try these new methods.

Impact: Three grain operators told the local agent that they had made in excess of $20,000 each for a total of $60,000 using the principles taught in the class. A dairyman indicated that the only money he made in 2000 was from the purchase/sale of futures contracts and options he had learned about and that was the only reason he was still in business. Another dairy manager explained that he had save thousands of dollars by using the concepts taught in class.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Agricultural Financial Management

Description: An economic feasibility analysis was conducted with Moroni Feed Company evaluating the change to year-round rather than seasonal production and processing of turkeys.

Impact: There has been an increased production from 78 million pounds in 1998 to about 90 million pounds in 2002. This increase represents about $ 7.2 million of additional revenue. Several producers have used their savings to build new facilities that allow them to produce throughout the year.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Home-based Business Education

Description: Extension agents help local communities plan and operate local bazaars and business fairs. Thirty home based businesses signed up and sold items at a one day Harvest Holiday Bazaar that had over 600 customers attend. Twelve home based business booths were set up at another Extension Christmas Open House that provided audiences of 337 people.

Impact: Surveys collected show that most businesses at the Harvest Holiday Bazaar made over $300 in one day. At the Extension Christmas Open House owners determined product marketability and the feasibility of their venture. From written evaluations, vendors reported this was an effective way to advertise and market their products. Net profits from booths sales varied from $117 to $410 as reported by eight vendors.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Program Title: Youth and 4-H

Key Theme: Children, Youth, and Families at Risk

Description: The Youth and Families with Promise program address youth problems through early intervention with at-risk youth, ages 8-14 and their families. The program is based on a two-level volunteer mentoring approach utilizing college-age and grandparent-age couples (grand-mentors) who serve as mentors to youth and their families. The mentors work directly with the identified youth focusing on motivation and tutoring relating to reading and academic skills: wholesome, structured, community, recreation; community service; involvement in 4-H and other community youth groups, as well as fostering the development of social and emotional developmental assets.

Impact: Evaluations indicate that the majority of youth participating in the Youth and Families with Promise Program statewide are maintaining or improving levels of the 19 thriving behaviors measured. Measures where two thirds or more of the youth improved included doing well in school, not giving up when things become difficult, and feeling confident about their selves. Participating youth, their parents, teachers and mentors indicate that the majority of youth participating in the Youth and Families with Promise Program statewide are maintaining or reducing the number of problem behaviors measured. Measures where two thirds or more of the youth reported less frequently included stealing and using cigarettes or tobacco.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Key Theme: Youth Development/4-H

Description: Extension agents and specialists are involved in providing a variety of traditional contests, camps, service opportunities, and clubs including Family and Consumer Science, Environmental Science, Livestock, Horse, Sport Shooting, and other clubs.

4-H is a "learn by doing," youth education program for boys and girls in the 3rd through 12th grades. Adult leaders bring together youth that have common interests and the youth choose a project. Projects are chosen among 100 project areas or created by the leader. The clubs meet together and learn. Clubs are able to explore 4-H activities, events, and trips throughout the year.

Impact: Evaluations of 4-H over the past year have shown that the majority of participants agree that 4-H helps them solve problems, follow instructions, accept responsibility, understand what is required to succeed, set goals, and strengthen decision making skills. One asset development survey showed that a majority of 4-H members are actively engaged in learning, talk about the value of hard work, have high levels of love and support from families, gain confidence in their personal abilities, and expressed feelings of self-esteem derived from their4-H accomplishments. Sport shooting training resulted in no deaths, no injuries, and a reduction in the number of accidents, and improved firearm safety for youth participating. In one county 118 4-H participants planted 430 trees and shrubs.

Source of Funds: Smith-Lever, State

Scope of Impact: UT

Description: Extension agents are involved in Farm Field days in counties throughout Utah.

Through various learning stations youth gain an understanding of agriculture and the role it plays in Utah. The material was sent to the schools so teachers could prepare the students for the hands on learning experience. Students took pre and post tests to determine if the field day helped to increase their knowledge. More than 9738 youth participated in Farm Days.

Impact: In Salt Lake County students' post test scores improved by over 11.5%. In Iron County, on a 1 to 10 scale, with 10 being the most positive, the average rating of 9.1 was given in how the program helped students understand that agriculture is part of their everyday lives. In Millard County the rating was 4.9 on a 5-point scale. The agriculture curriculum that was sent out and used by teachers was also highly rated.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: Extension agents and specialist are involved with farm safety. Seven youth completed a tractor and farm safety program and received certificates of training that enable them to get a job operating a tractor. Topics covered in the course included: maintenance, safety equipment, highway travel, tractor operation, fire safety, and roll over protection. The course included a tractor driving practical exam and written exam.
A pesticide and farm safety program was held in cooperation with Farm Bureau. Topics covered were: pesticide laws, pesticide safety, and farm safety plans. Completing a farm safety plan enables a farmer to get lower insurance premiums. A total of 12 people attended.

Impact: The average score on the pre-test was 88% and the average score on the post-test was 93%. This represents a knowledge gain of 5% for the youth completing the tractor and farm safety program. The participants in the pesticide and farm safety program held in conjunction with the Farm Bureau rated the overall workshop very high at an average score of 4.6 on a scale of 1=low to 5=high.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: USU Extension provides training in safe practices related to agriculture.
More than 1000 youth and adults were trained. Approximately 50% of the youth completed written exams and practical tests and more that 95% passed the tests on the first attempt. About 30% of the adults were required to complete written examinations (they test every three years) and 90% of those taking exams passed on the first attempt.

Impacts: This training resulted in no deaths, no injuries, a reduction in the number of accidents, and a reduction in expenses associated with unsafe practices.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: Extension agents assist with planning, organizing, and conducting county fair junior livestock auctions.

Impact: In one county 73 animals were sold generating $49,500.00 in gross sales for the market livestock members in the county. Of this total, $23,300.00 was booster money donated to the members from generous donors in the area. Another county had 249 market animals exhibited at the fair involving 170 youth. Of the 249 animals exhibited, 141 were sold, generating $169,416.25 in gross sales for the youth of Summit County. In Salt Lake County financial support at the auction resulted in raising $82,583. Youth learned important life skills and increased their knowledge by participating in the junior livestock auctions. In one county, 85% of the surveyed parents of youth in junior livestock program felt "strongly" that the livestock program helped build a work ethic and responsibility in their children. Sixty-five percent felt that the youth learned about money management.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Program Title: Community Organization and Leadership Development

Key Theme: Youth Development/4-H

Description: Extension agents are involved with after school and summer programs for youth. These after school programs included 2 series of Summer Day Camps for kids 4-5 and 6-8. Topics included: Bugs, Ecosystems, Dinosaurs, and Farm Animals. In addition a weeklong Camp Invention, a program developed by the National Inventor's Hall of Fame, was held for kids entering the 2nd through 6th grade. Hands on physics principles were applied through a series of activities involving marbles. Total enrollment for these camps exceeded 500 participants (some youth participated in more than 1 program). One hundred and fourteen youth, 5-6 adults per event and 3 youth volunteers participated in after school programs. They learned participating as a team member, working with diversity, cooperating and accepting differences, interpersonal and cultural competence, and volunteer skills in service learning responsible citizenship.

Impact: In a recent evaluation (mail survey) parents expressed that through participating in summer programs their child learned something new and the ability to socialize with other children. These experiences also allowed children to become more aware of their environment and agriculture. Camp Invention not only increased social skills, but increased youth's analytical and critical thinking skills through taking apart household items and building new inventions.

One hundred and eighty five parents of youth in Extension after school programs responded to a survey. They felt that the summer after school and weekend programs helped their children gain comfort with animals and bugs, gained confidence, self-esteem, and the ability to listen and followed directions.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Key Theme: Leadership Training and Development

Description: Extension supports Teen Leadership Councils throughout Utah. Teens have been trained to take leadership responsibility through the monthly teen council meetings and by being encouraged to participate in such activities as day camps, 4-H Kick-Off, county contests, and state sponsored events such as Jr. Youth Conference, Adventure Camp, and State 4-H Contests. All of these events provide learning experiences where youth are involved as presenters or learners as others exhibit their leadership abilities.

Impact: Thirty-two (32) youth presented workshops at county and state level leadership trainings, giving a cumulative total in excess of one hundred thirty-two hours of youth-directed leadership. Fifteen youth cleaned, painted, and fixed up the Manti animal shelter.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Key Theme: Leadership Training and Development

Description: The largest attended Teen Leadership Training was conducted with over 144 participants from 4-H, Youth of Families and Promise, and Youth City Councils.

Impact: A comprehensive evaluation by youth participants was conducted. Eighty-five percent of participants gained skills improvement with leadership skills, 91% gained skill improvement with public speaking, 72% skill improvement with service importance and 79% showed skill improvement with patriotism.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: The 4-H Leadermete was held in February in Cedar City with 236 leaders from across the state of Utah attending the 3-day meeting.

Impact: Evaluations returned by participants showed 90% of participants increased ideas for club activities, 90% reported increased knowledge of activities. Ninety percent said participation in Leadermete helped them with other community activities.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Key Theme: Youth Development/4-H

Description: USU Extension is involved with The Discovery Alliance, a close knit collaborative network of informal science education programs working together with the common goal of providing high quality learning experiences for students of all ages. The Discovery Alliance is headquartered at USU, providing services to Utah, Southern Idaho and beyond. Programs include the Discovery on Wheels, Discovery Space Simulator, Discovery Summer Science Camps, and the Discovery Center. During the fall of 2002, Discovery on Wheels visited 24 schools during which more than 10,000 students, and 500 teachers participated. Discovery on Wheels reached out to approximately 118,000 individuals while attending fairs and festivals in Wyoming, Idaho, and Utah. Discovery on Wheels also attended three Utah Starzz games in July (and five games in June). Over 800 students in grades 1st-8th participated in the Discovery Summer Science Camps and affiliated REACH science programs from July through August. Camps were held at four different locations. Students from as far away as central Utah and Rexburg, ID attended. Several successful Discovery Space Simulator missions were held throughout the summer in conjunction with 4-H.

Impact: There is an increased awareness of Utah State University, USU Extension and 4-H among students and parents throughout Utah. Students developed positive attitudes and a greater appreciation for science. Teachers are more motivated and excited to incorporate hands-on science into their curriculums. Students and parents alike were very pleased with all aspects of programming. Youth increased their teamwork and socialization skills, greater self-image and self-confidence.

Source of Funds: Smith-Lever Act

Scope of Impact: UT, ID

Key Theme: Youth Development/4-H

Description: A USU Community Development Educator works with the Youth City Council program that assists Utah communities in establishing and operating Youth City Councils. These councils are patterned after the municipal form of government where the youth live. High school age youth are elected by their peers or interviewed by elected officials and appointed as Youth Mayors, Youth Council Members, Youth Committee Members, and Youth City Department Heads. Through monthly meetings and activities the youth develop mature citizenship, leadership, a sense of personal achievement and an understanding of government. Utah State University Extension cosponsored the 19th Annual Youth City Council Leadership Institute. Workshops and activities on leadership, collaboration, teamwork, community tourism, vitalizing communities, and other topics were given for Youth City Council members and advisors.

Impact: Councils reported doing some of the practices they learned in past institutes. Some began switching the Mayor/Co-Mayor mid year so more youth could be in the Mayor's position. Others cut back on the numbers of meeting they held and improved the meetings they were having. Councils began calling trees/calling lists and many implemented service in their community based on ideas and projects learned at the Leadership Institute. One council has used a unity activity (land-mine game) learned years ago over and over in different activities. Some of the outcomes of the AYC program include: at age 19, a former YCC mayor ran for and was elected to the Riverton City Council;

sponsored meet the candidates nights; raised money to save an historic home; created Youth Courts; helped to create city ordinances on youth tobacco and alcohol. Youth are gaining an appreciation for and understanding of local government. The YCC program is having a positive impact in the lives of youth.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: An Extension agent held Voter Awareness in cooperation with the Garfield County Clerk. Forty-six high school seniors from the three high schools in Garfield County participated. Topics covered included State and Federal Government, County Government, Voter Registration, Police and Courts, Political Parties, and City Government. The Teenage Republicans gave a short nonpartisan presentation on "Get Out the Vote."

Impact: Over 96% of the attendants registered to vote and through this program they will be informed responsible voters.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Key Theme: Literacy

Description: USU Extension, in cooperation with the Logan City School District offered computer training for Hispanic youth with limited English speaking abilities.

Impact: During a ten-week period, six students completed the computer-training program. Four of those students upon entering the program were not attending any classes regularly at Logan High School. Now these students are attending 75% of the time. They have all developed proficiencies, which allow them to access the Internet to assist them with their homework. Their skills in keyboarding have improved. They have improved their ability to read, write and converse in English from a grade level of 4 to that of a 5th grade level.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Description: USU Extension agents and Specialists are involved in teaching Water Quality concepts to youth. One agent trained students to test water for nitrates and phosphorus along with temperature and pH. They also learned about ground water and the importance of keeping it free of contaminates. They gain a better understanding of the water cycle in that water takes many different routes as it progresses through the water cycle. Student also learned the importance of keeping our water clean and drinkable along with water conservation. More than 300 people celebrated the Bear River and the diverse water related activates in its watershed. Presentation of posters about their monitoring and

service activities, and a series of speakers on history, folklore, current issues, etc. in the watershed. Three hundred and twenty five students monitored seven sites on the Bear River and its tributaries.

Impact: Five hundred and twenty-nine kids learned about the relationship between healthy aquatic insects and clean water. Six hundred and fifty students learned about soils, plants, wildlife, water and the water cycle at the Cache County Natural Resource Field Days.

Source of Funds: Smith-Lever Act

Scope of Impact: UT

Utah Agriculture Experiment Station
Progress Report on Plan of Work Goals: 2002

Program Title: Family Training, Development, Assistance, and Sociology

Key Theme: Other - Health

The following projects summarize work that is being done in the area of human health.

Calcium and Phosphate Homeostasis: Factors Regulating Intestinal Transport; Factors Influencing the Intake of Calcium Rich Foods Among Adolescents

Description: This research involves an examination of factors which regulate intestinal transport of calcium and phosphate, using chickens as the test animal. Results from our study strongly suggest that a rapid, membrane-initiated pathway to stimulation of intestinal calcium transport is important in young, growing animals that are actively forming new bone.

Impact: Young animals (and humans) that are actively forming bone respond robustly to exogenous 1,25(OH)2D3 (a diet strong in vitamin D) with enhanced intestinal calcium transport. This response, which declines with maturation, is most likely mediated by a specific binding protein that is distinct from the nuclear receptor. Therefore, the membrane "receptor" represents a new therapeutic target for analogs of vitamin D that can stimulate intestinal calcium transport.

Utah Health, Nutrition, and Lifestyle Survey of Adults 50 Years of Age and Older

Description: The increased collective risk of heart disease (HD), type II diabetes, hypertension, stroke and obesity that is found in many populations has been termed, Syndrome X. The rates of most chronic diseases in Utah are lower that the national average with the exception of type II diabetes, which is higher. We investigated the occurrence of Syndrome X in a population sample of 290 men and 262 women living in Utah in 2002. The sample was divided into six groups by gender and three age groups. Measures of obesity were determined using the Body Mass Index. The associations among the five variables were calculated using contingency correlations. RESULTS: The group of men ages 50-64 showed a statistically significant relationship between diabetes and obesity, (rc = .40). A weaker relationship was noted between HD and hypertension (rc= .29). In the male 65-79 age group, the number and strength of inter-correlates increased: diabetes and stroke, rc = .72; diabetes and obesity, rc

= .50; diabetes and hypertension, rc = .27 and hypertension and HD, rc = .21. The 80+ male age group had no significant relationships. For women, significant relationships were noted between obesity and diabetes in the 50-64 age group, rc = .43 and the 65-79 group, rc = .35. In the younger group a weak relationship was found between hypertension and HD, rc = .12. The only association in the 80+ group was between obesity and stroke, rc =.37. It appears that the Utah population doesn't fit the Syndrome X model. We also analyzed the diet of the Utah population 50 + years for the nutrients of greatest concern in old age: energy; folate; Vitamins B6, B12, A, E and D; calcium; magnesium; zinc; phosphorous; and protein. The median energy intake is 2456 Kcal for men and 2195 Kcal for women exceeding the expected intakes by about 20 %. The median nutrient intakes for both men and women were adequate for all nutrients examined except folate, vitamin E, calcium and magnesium. Vitamin E was the limiting nutrient with Recommended Dietary Allowances (RDAs) of 48% for men and 45% for women. Median intakes greater than 150% of the RDA were phosphorus and Vitamins B12 and D for both genders and Vitamin A for women, reflecting the high intakes of meat (mainly beef) and dairy products. Dietary supplements contribute the total nutrient intake. In Utah, 81% of the women and 67% of the men take at least one supplement compared to 53% and 41% of women and men respectively take supplements according to a national survey. The Utah average is 3.0+/-3.0 per person. Fifty-nine percent of the people were taking multi-vitamin and mineral supplements, 36% vitamin E, 35% vitamin C and 41% calcium. Those who have nutrient intakes of 100% of the RDA or higher are also the most likely to take dietary supplements, causing some concerns about nutrient toxicities from total intakes of vitamins A and D, calcium, magnesium, phosphorous, and zinc, in the highest percentiles of consumers.

Impact: Prevalence data on diabetes and heart disease have been diverging in the Utah population for over 20 years and the cancer rates in Utah are now the lowest in the nation. However, no one has looked at the association of these diseases as a group. In the literature, the clinical conditions of syndrome X are closely associated in occurrence and by common physiological pathways. Therefore, the Utah population, which doesn't follow the usual disease patterns, raises some interesting research issues as to what factors are present or absent that explain the variation. The dietary information shows that older people in general have adequate diets but many consume excess energy resulting in overweight or obesity among 80% of people over 50 years of age. More people than in any other state use dietary supplements. Some supplements may fill deficits in nutrient intakes below actual need but some people are likely to be taking supplements over time that could result in toxicities. These data have been shared with the Utah Division of Aging and Adult Services and they are using them to assist senior centers and Meals on Wheels to design better menus specifically for Utah clients.

Physiological Roles of GTPase-Activating Proteins (GAPS)

Description: Considerable progress was made during the third year of the project. We were successful in reconstituting slow, muscarinic inhibition of neuronal L-type calcium channels in a mammalian cell line, and in characterizing the effects of two GAPs (RGS2 and RGS4) on this signaling pathway. Furthermore, we were able to obtain significant new insights into the physiological role of a recently identified signaling protein (AGS-1).

Impact: Our experimental results provide new insights into the properties of RGS proteins and AGS proteins. These insights will be useful in completely understanding cell signaling pathways in mammals. A complete understanding of cell signaling pathways is essential for the rational design of

drugs and other therapies used to treat various animal diseases. Furthermore, our findings provide enhanced understanding of neuronal L-type calcium channels, which perform essential roles in hearing, secretion of insulin, and cardiac function.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

209	227	638
220	237	841

Funding Level: $204,386.88 **SY FTE: 1.21**

Scope of Impact: National and International

Key Theme: Other - Family-Community Relationships

These projects describe the impacts associated with the interaction of family and communities.

Impacts of Structural Change in the Dairy Industry

Description: The trend in the dairy industry for many years has been the loss of small family operations. The replacement of small family enterprises with a few large dairies employing transient labor can disturb social structure and negatively impact the environment of the rural communities these livestock surround. This project is part of a national study on the impact on communities of change in the dairy industry.

Impact: Preliminary data indicate that both small- and large-scale dairies operating in the Intermountain West are family enterprises. However, the strategies for continuing success differ depending upon the size of the operation and the available land base.

Social Change and Adaptation Response to Shifting Sustenance Structures in Western Communities

Description: During the past year efforts on this project have been concentrated on analysis of the data collected during the summer of 2001 in three rural Utah community areas, one study area in eastern Nevada, and one in southwestern Wyoming. Project publications, focusing on the linkage between rapid population growth and fear of crime and on social and economic consequences of amenity-based growth document important social costs of uncontrolled and unplanned growth in rural communities. In addition, five presentations of the data were made at conferences in 2002. These presentations focused on, attachment to community and how this was being impacted by rapid population growth and economic transformations, federal designation of the Grand Staircase Escalante National Monument and how this impacted Escalante residents' perceptions of community, acceptance of tourism as an alternative form of economic development and local residents' attachments to special

places involving both natural landscapes and the built environment. These papers are currently being revised for submission to journals.

Impact: Data analysis findings will assist policy makers and community officials better understand the social impacts of rapid population growth and economic transformations affecting many areas of rural America. The findings will help to identify conditions that require increased planning efforts in order to enhance the well-being of rural people and the capacity of rural communities to pursue development initiatives.

Population Dynamics, Social Change and Outcomes: Spatial, Temporal, and Life Cycle Variations

Description: The purpose of this project was to analyze the relationships between demographics and other social, economic and health factors in Utah compared to other regions of the nation. An extensive amount of data was gathered from censuses, health reports and other pubic agencies for each decade between 1950 and 1990. Research revealed that Utah became more distinct with respect to it sociodemographic profile in 1990 than in 1990. Between 1950 and 1990, differences between Utah and the nation emerged on percent urban, per capita income, fertility, white male life expectancy, per pupil educational expenditures and auto theft rates. Utah became more similar to the nation as a whole on one of our 24 indicators, percent employed in manufacturing. Research on other areas, particularly the South, indicated a strong trend toward an obliteration of regional differences by way of increased communication, transportation and commerce. To the contrary, our results indicate that forces such as original identities, existing ecological basis for unique cultural traits, selective migration and assimilation act to enable the endurance of culture regions. A recent key focus of the research is on changes in minority populations. Analysis indicates that Utah's Hispanic population is growing more rapidly than it is for the nation as a whole, an increase of 139% between 1990 and 2000 for Utah's Hispanic population compared to an increase of 102% for the West as a whole.

Impact: Quality data analysis is imperative for policy makers as well as for businesses, schools, health providers and other social institutions in order to plan for and provide appropriate services. This is particularly true for rural communities where services are often more difficult to obtain. Detailed analysis of health problems of Utah's diverse socioeconomic groups, including the extent to which they are covered by insurance, is needed to maintain and improve the health of the state's population. Information on changes in Utah's population are important to many of the state's efforts to promote community and economic development.

Factors Influencing Willingness to Continue Family Farm Operations in Utah

Description: During the initial 6 months of this new AES project, the researchers have focused mainly on the cleaning and analysis of previously collected survey data collected from Utah/Texas ranchers and farmers as part of the 2002 Farmer and Rancher Survey (conducted in partnership with Texas A&M). Initial results suggest that there are strong differences between owners of rangeland in Utah and Texas - both in terms of their rangeland management strategies, and in the ways they have been impacted by structural changes in the livestock sector. These include changes in the macroeconomic conditions in the agricultural sector, increasing environmental regulation, decreased access to public lands for grazing, and growing competition for rural land from non-farm/ranch

development activities. Interestingly, we were able to develop a typology of property rights orientations (PROs) that reflect four distinct dimensions: (i) a strong pro-individual private property rights orientation; (ii) a belief that individuals' rights are conditioned by society and community values; (iii) a belief in an ethic of land stewardship; and (iv) a perception that individual private property rights are increasingly being threatened. These PROs appear to be systematically related to respondent socioeconomic characteristics, as well as their self-reported land management behavior, willingness to invest in land improvements to promote public goods, attitudes towards public lands policies, and future plans. These results were used to help draft a grant proposal that would allow us to extend this work to a larger sample of rural landowners in Utah, Colorado, and Texas. Activities of the project investigators in 2002 included completion of work associated with a prior experiment station project titled the 'Factors Influencing Willingness to Continue Family Farming Operations in Utah' that was the predecessor for UTA00844. This involved: (a) distribution of results of the 2001 Western Dairy Farm Poll to county extension agents in Utah, Idaho, and New Mexico; and (b) publication of results from a survey of Utah farmers regarding land conversion decisions. In addition, an article was published summarizing the economic ties between different sized dairy farms and local communities.

Impact: While still in its early stages, our initial work suggests that there is considerable diversity in local patterns and impacts of structural change in the Western livestock industry. We are optimistic that further data collection and analysis will help provide useful information to local, state, and national decision-makers to help them provide assistance to families and communities struggling to adapt to these changes.

Rural Economic Development and the Opportunity-Threat of High-Level Nuclear Waste

Description: During the past year project data collection activities were completed and data analysis activities were initiated. Building on semi-structured interviews conducted in prior project years, the investigators conducted more than two dozen additional in-depth interviews with individuals representing local, state, and regional groups and organizations that have become engaged in the controversy over potential siting of a high-level nuclear waste storage facility on the Skull Valley Goshute Indian Reservation in Tooele County, Utah. We also completed the collection of an extensive set of textual materials pertaining to this issue from newspaper archives and web sites, as well as transcripts from a series of public hearings conducted by the Nuclear Regulatory Commission. Interview transcripts and notes, newspaper and other text files, and public hearing files have been entered into an electronic data base, and a categorical coding scheme has been developed to facilitate use of the N6 software package for analysis of qualitative data. While data analysis efforts were still at a preliminary stage at the end of 2002, initial analyses reveal that community stigmatization has been one outcome of the discourse concerning this controversial project.

Impact: This project will provide policy makers with an improved understanding of how efforts to site controversial facilities such as those involving nuclear waste disposal affect the capacities of affected communities to pursue collective social and economic development objectives.

Family and Work Identities During Times of Transition

Description: Progress Report:

We completed development of the survey, "Family, Work and Community in Utah", in the spring and pilot tested it in the summer. Following the pilot test we made final revisions to the research instrument and developed a codebook to reflect those revisions. We obtained an electronic utility billing address list from Logan City. From this list we used a systematic random sample to select households to which we distributed questionnaires to couples qualifying for inclusion (married or cohabiting with children under 18 at home and one partner in paid labor force) and agreeing to participate. This survey was a self-administered questionnaire and picked up by a graduate research assistant within 48 hours of drop off. Two-hundred and four surveys (102 couples) were completed, with a 75% response rate. We will begin reporting findings in 2003.

Impact: Transitions in identities in work, community, and family environments may be difficult, particularly for nonnative populations. This research explores issues relevant to well being of residents of Cache Valley. Findings will aid practitioners in facilitating adaptation to contemporary challenges in negotiating work and family issues.

Family Business Viability in Economically Vulnerable Communities

Description: The Influence of Business, Family, and Resource Intermingling Characteristics in Predicting Cash Flow Problems in Family-Owned Businesses: This study investigates cash flow problems of 673 family businesses from a nationally representative sample. The final model of the three-step hierarchical binary logistic regression was used to predict the probability of the occurrence of cash flow problems in the business, household, and in both the business and household. Businesses and households with cash flow problems were more likely than those without cash flow problems to report intermingling of finances from business to family and vice versa. Business system variables, family system variables, and resource intermingling variables contributed to the explanation of cash flow problems in the business, household, or in both entities. Functional Integrity and Family Goal Success of Farm and Non-farm Business Owning Families: Different or Not?: This study investigates the difference in family functioning between farm (n=101) and non-farm (n=572) business-owning families. A path analysis was performed. No difference was found in the use of the negotiating style of interaction. Farm families report more tensions generated by business issues. The two types of family businesses do not differ in family goals. Profit is the most important business goal for farm businesses whereas reputation with customers is most important for non-farm businesses. The level of transfer of business income to the family positively affects functional integrity of the family within farm business-owning families.

Impact: Intermingling of finances between the family and business systems occurred more often in businesses with cash flow problems than those without cash flow problems. Businesses with cash flow problems had higher liabilities, were more likely to be located in rural counties, and were more likely to use business real estate to secure family loans. The finding of the succession planning behavior among family business owners suggested that many family business owners were not aware of the significance of successful transfers of their business. In 2000, female business managers had higher level for the business success and goal achievement than did male business managers. Using panel data from the 1997- 2000 National Study of Family Businesses (NSFB), the results of the study will provide valuable information about how family businesses have been sustainable over time.

Health-Wealth Connection and Institutionalization of the Very Old

Description: The objective of this research is to explore the interrelationships of health, wealth, family assistance, and the use of institutional care by the very old. The Wave I and II of the Asset and Health Dynamics of the Oldest of the Old (AHEAD) were successfully downloaded and a data set for the project were created. The accuracy of the data was checked by cleaning the data and running descriptive analyses. A set of variables were drawn to examine the relationship between financial asset holding patterns and physical and mental health among the individuals aged 70 and older. Guided by previous research and economic theories, various conceptual and empirical models were developed and tested. Based on the results, three papers were submitted for presentations at national meetings including the Gerontological Society of America (GSA) and Association for Financial Counseling and Planning Educators (AFCPE). Two papers were accepted and presented at the GSA meeting and one paper was accepted and presented at the AFCPE meeting. The three papers are currently in revision for journal submissions.

Impact: The results of analyses provide detailed information about the asset holding patterns in relation to physical and mental health of the individuals aged 70 and older. The information shared with researchers/educators in the field of consumer economics and gerontology will impact the development of educational programs for the very old.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

074	843	972
353	844	974
421	846	985
839	869	990

Funding Level: $510,761.58 **SY FTE: 2.5**

Scope of Impact: Intermountain West, National

Cross-Cutting Management Initiative or Goal:

No accomplishments or results

Focus Areas Identified in FY 2002 CSREES Budget:

Biobased Products:

No projects, accomplishments or results

Advances in Biotechnology to Develop New Agricultural Products:

UTA 099, 164, 460: Many researchers are establishing projects to identify economic trait loci (ETL) in livestock. The development of a genome map for sheep will greatly enhance the identification of

genetic regions influencing economically important traits in sheep. The role of NAGRP and the U.S. Sheep Genome Coordinator is to facilitate the development of the ovine genome map, leading to the identification of ETL in sheep. Callipyge is a major gene responsible for a pronounced muscle hypertrophy in sheep. We have initiated a multi-faceted approach for the identification of the causative gene in callipyge. The isolation and characterization of the callipyge gene will lead to many exciting areas of study. Elucidation of the gene may allow better understanding of the relationship between muscle development, fat accumulation and tenderness. Possible manipulations of the gene may lead to improvement of carcass composition in other livestock species.

UTA 223: Fat removal has an adverse effect on cheese flavor and texture properties. The identification and characterization of microbial enzymes that are chiefly responsible for the production of cheese flavor defects will allow industry to develop starter systems that improve lower-fat cheese quality. This will increase consumer confidence in lower fat cheeses and expand the demand for these goods to individuals that avoid cheese because of diet and the absence of high quality low fat alternatives.

UTA 390: This research should result in a very economical hazardous waste or environmental cleanup technology. This can result in far less risk to environmental pollutants. Therefore, the economic, environmental and social impacts could be very significant.

Improved Pest Control and Food Quality and Protection Act Implementation

UTA 524: The research seeks to determine and enhance the impact of biological control insects (predators and parasitoids of insect pests, and weed-feeding insects) on target pests in Utah alfalfa and rangelands. More effective biological control of pest insects and weeds can enhance agricultural productivity while reducing the need (and associated economic and environmental costs) of pesticide application.

UTA 527: Methods for control of plant disease that are compatible with the environment are desired and biological control of pests is one strategy. We have identified several genes in a beneficial bacterium that are essential for survival on root surfaces under competitive conditions in the soil. Exploiting these traits may enable more effective use of the beneficial strains under field conditions.

UTA 551: The project will give Utah and other growers ways to test for resistance problems before they spray.

UTA 618: Testing and demonstration of new, lower toxicity chemicals for control of disease and arthropod pests of tree fruits is important to the viability of the state's fruit industry. EPA is eliminating many traditional, broad-spectrum pesticides, and research and extension efforts are needed to assist growers with implementing new, more selective controls. The determination of alternative bactericides for fire blight control is critical now because streptomycin resistance was detected in Utah strains of the pathogen, Erwinia amylovora. Our studies on the role of injury and leaf age in fire blight infections will be used to develop methods to aid fruit growers to use the correct strategy to control fire blight following a rain or hailstorm. Evaluation of lethal and sublethal effects of fungicides allows our recommendations for control of powdery mildew and other fungal diseases to include information on possible effects to phytophagous and predaceous mites.

UTA 626: The plum curculio (PC), Conotrachelus nenuphar, is a quarantine insect in the western U.S., and negatively impacts the export of fruit to outside markets. Delimitation of the insect's distribution to one county in Utah and identification of the primary habitat and hosts will assist Utah's agricultural regulatory agency in suppressing and eliminating this pest in northern Utah. This information will also assist commercial fruit growers in other counties of Utah in keeping their export markets open.

Invasive Species Program

UTA 743: Weed management strategies developed by this project are in extreme demand by producers and land managers faced with the nearly impossible task of controlling these troublesome plants. Some represent first ever control options.

Modifying Food Intake Behavior

UTA 209: It is well known that age-diminished intestinal calcium transport can contribute to poor bone health. The molecular/cellular basis for decreased vitamin D-stimulated transport appears to be through the membrane-initiated, rather than the nuclear-initiated pathway. This may suggest new approaches for treatment of the elderly.

UTA 214: Our results to date provide support for a protective effect of dietary protein intake against the risk of osteoporotic hip fracture in women 50-72 years of age. Dietary vitamin K intake also appears to be associated with a reduced risk of hip fracture in both men and women. These findings, if confirmed by randomized trials, may provide new methods for the nutritional prevention of osteoporotic hip fracture.

UTA 220: Intake of calcium is declining among youth in the U.S. Adequate calcium intake is essential for protection against osteoporosis, and perhaps colon cancer and hypertension. To reduce disease risk, rigorous research needs to be accomplished on the types and quantities of calcium-rich foods that youth are consuming, as well as motivators and barriers to intake. This knowledge will aid in the design of intervention strategies to reduce disease risk later in life.

UTA 227: This research further supports the concept that 24,25(OH)2D3 is a 'new' hormone with inhibitory effects. Calcium and phosphate balance might be improved in some disease states by finding ways to reduce the levels of the 'new' hormone. Conversely, 24,25(OH)2D3 might be used to protect against hypercalcemia.

Organic Agriculture Production and Processing Methods

No projects, accomplishments or results

Scientific Basis for Optimal Health

UTA 214 : Our results to date provide support for a protective effect of dietary protein intake against the risk of osteoporotic hip fracture in women 50-72 years of age. Dietary vitamin K intake also

appears to be associated with a reduced risk of hip fracture in both men and women. These findings, if confirmed by randomized trials, may provide new methods for the nutritional prevention of osteoporotic hip fracture.

Small Farms and Their Contributions to Local Economies

UTA 012: This research has significant implications for Utah farmers and nonagricultural enterprises. The measurement of profit and the organizational structure of the business can be significantly impacted by both state and federal income taxes. Careful tax planning and identification of the appropriate corporate structure can result in significant tax saving and enhanced valuation of Utah farms and nonfarm property.

UTA 074: The rural health care study suggests several concrete steps which local communities can take in order to further efficient health care. Local subsidies and restrictive legislative policies have resulted in high costs and inefficient health care providers. The banking study should suggest whether or not concentration in banking (that is, the proportion of local deposits held by large banks) impacts rural economic development and the availability of credit. The snowmobiling study will provide information to decision-makers on the potential impacts of altering policy with respect to access to recreation areas.

Sustainability of Agriculture and Forestry

UTA 701: These findings will help foresters recognize two important agents which stress forest vegetation and increase its susceptibility to bark beetles and diseases.

UTA 703: Findings from this research emphasize the critical relationship between C dynamics and belowground nutrient cycling processes. Outcome of this research is relevant to the productive capacity of soils (nutrient availability and release); the sustainability of certain landuse practices; the ability of wildland ecosystems to retain exogenous elements (e.g., atmospheric N pollutants); and the functioning of wildland soils under changing global climate (e.g., rate change of processes).

UTA 705: Extension forestry education programs will reach more landowners. Urban forestry professionals will better-understand the professions demographics and the experiences of women and minorities in the profession. The urban forest resource at Camp Williams National Guard facility will be safer, more abundant, healthier, and more valuable.

UTA 709: The regional growth projections allow stakeholders in the Mojave Desert to predict the likely "footprint" of future development under a wide range of assumptions (e.g., low density development, high density development, trend population growth, etc.). These forecasts are of great interest to the Department of Defense, which is seeing its military installations encroached upon by residential development. Land management agencies like the National Park Service and BLM are also interested in assessing how future development will affect the habitat of species of key concern like the desert tortoise.

UTA 713: Results from this project are contributing to the way that Intermountain subalpine forests are managed for variety of objectives. In addition the development of appropriate silvicultural systems,

experimental units contribute to demonstration objectives. The recent lynx listing, the snowshoe hare/stand density work has taken on even greater importance.

UTA 726: These studies all present social science data collected at the regional level, rather than for one site or administrative unit. This increases the value of the results for: 1) setting management objectives, 2) providing a spectrum of recreation opportunities, and 3) meeting both ecosystem management and social equity goals in natural resource planning. The results also indicate that there are problems with certain standard recreation management practices, policies, and planning approaches used by federal and state agencies, such as the standard application of recreation carrying capacity (RCC). RCC often results in visitor use limitations in heavily used areas, and this approach may actually exacerbate rather than reduce both ecological and social impacts of recreation use on public lands.

UTA 737: This project has had several positive impacts for various natural resource users in Utah. Understanding consumption patterns of people dependent upon water from the Wasatch-Cache National Forest has identified water conservation approaches that could potentially serve more users with existing supplies, lowered the costs of expanding water delivery systems, and reduced environmental impacts on streams. Finding ways to administer fish health programs in Utah so as to reduce the risks of spreading pathogens and of introducing exotic species has economically and environmentally benefited a range of stakeholders, particularly private aquaculturalists, sport fishermen, and resource managers working for federal, state, and local governmental entities.

Water Quality

UTA 324: The Impact this year's results should improve aspects of field soil structure management for better hydraulic and structural properties towards reducing impact of compaction and costs of tillage, enhancing crop yields due to improved soil tilth management, and improving conditions for compliance with EPA regulations for agrochemicals transport.

UTA 338: This research and the educational materials resulting from the project have facilitated land application of biosolids as an option to landfill disposal in Utah. Currently, approximately 50% of the municipal biosolids produced in Utah are recycled through land application, thereby reducing the need for and cost of landfill disposal.

UTA 332: This study is a cooperative study that will examine the fate of nutrients in a grass-legume grazing system. In areas with high ground water tables, leachable nutrients are of great concern.

UTA 942: Information developing from this project continues to assist owner/operator, private consultants and agency personnel in making informed decisions regarding integrated solutions to the manure treatment and management problems associated with Animal Feeding Operations.

B. Stakeholder Input Process - 2002

The Utah Accountability In Action Program was established in 2000 with the express purpose of providing opportunity for urban and rural residents to provide open to the public stakeholder input to

Extension and the Agricultural Experiment Station. This is the second year this stakeholder reporting process has been used in Utah. In 2002 a cross section of ten (1/3 of the state) urban and rural counties were randomly selected to participate in this assessment-based program. The counties of Cache, Davis, Duchesne, Emery, Juab, Millard, Sanpete, Summit, Uintah and Wasatch were selected in 2002. Elements of the program included a customer needs survey; stakeholder reporting and listening session; under-served/civil rights training session; overall operations review session; and a concluding session on revising plans of work and writing better outcome and impact statements.

Each of the ten participating counties conducted a random sample survey of customers to determine customer satisfaction and their future needs based on relevant program issues. Respondents were asked to rate how important these identified issues were to them and their families in the next five years. Highest priority issues in rank order as identified by stakeholders include: strong families, sound parenting; safe foods, healthy diets, sound health practices; water resources and water resource management; adult's ability and willingness to nurture and guide youth; youth ability to reason, make responsible choices, seek and apply knowledge in new situations; youth character building and life skills; preparation for family; student, work, and civic roles/responsibilities; informed consumers, family financial management; affordability of higher education programs; working with other citizens to address mutual concerns; retaining and expanding business in my community; securing and maintaining an adequate job and income; workforce preparation; participating in public-private activities in which cooperation is high; population pressure on agricultural lands, natural resources and communities; land use planning/management; quality of high tech (web-based, satellite) delivery of courses, degree programs, and training updates and; safe/affordable options for child and elder care.

Stakeholder input in each of the ten counties was then solicited in a stakeholder reporting and listening session. County Extension staff shared with stakeholders' program output success markers and outcome achievements from their plans of work. The results of the county customer needs survey was shared with stakeholders. The culminating activity involved a listening session where stakeholders shared research agendas for the Experiment Station and gave input to Extension program areas and issues they would like considered. A cross section of program related issues identified by stakeholders and subsequently considered in the revisions of individual plans of work by staff in the ten counties included:

- Need proactive help with West Nile Virus & mosquitoes control
- Education on conservation, water/air quality, and educate and promote Ag land and protection
- Money management & basic cooking skills taught at early age
- Urban rural relationships and Extensions role
- Research the potential for county wind power—windmills
- Technology training for youth, adults, and low income families
- Young family finances—debt/ education and ongoing financial planning
- Grasshoppers/ crickets infestation control and successful IPM measures
- Business retention, expansion, introduction to marketing
- Market Extension to younger generation to involve youth in all aspects of Extension programs and activities
- Predator control—livestock people caught in the middle—compromises—urban creep.
- Knowledge of rules/regulations with respect to water issues
- How to develop alternative outlets for agriculture production

Special efforts were made by each county to insure that underserved populations were invited and made aware of the public stakeholder session. Newspaper advertisements and articles were written, flyers produced and distributed, personal letters sent, posters developed and posted to make the public aware of these stakeholder meetings. 185 participants attended the ten meetings held across the state in January, February, and March 2002. Attendance records from these stakeholder input sessions indicate that the majority of Utah's ethnic groups were represented in the discussions although not in every county stakeholder session.

Based on stakeholder input Extension staff reviewed and revised individual plans of work in a new reporting system called FOCIS (Friendly On line Compact Information System) designed to capture measured program outcomes. Stakeholder ideas were integrated into these plans of work with clearly defined strategies for achieving outcomes in the future.

In addition to the Accountability in Action Program Utah has developed an integrated process for securing regular stakeholder input into perceived needs, program implementation and assessment. Extension Advisory Councils function in most all of the 28 counties of Utah. Many counties have specialty councils involving commodities, issues, and other special interest groups. Now in its second year of operation, the statewide Extension Executive Council also meets quarterly to provide input into Utah programs and activities. Each of these councils has been formed to represent underserved populations, ethnic, cultural, and economic diversity within the geographic areas served. A concerted effort is made by Extension administration to consider the views from these councils in designing, developing and orchestrating programs for the citizens of Utah.
These councils provide representative views of the constituent groups they represent.

Stakeholder input into the programs of Utah Extension and the Agricultural Experiment Station is broad and varied. The elements of the Accountability in Action Program, Compact Planning, environmental scanning efforts, and advisory councils have all contributed to an open and fair process for stakeholder input in Utah.

C. PROGRAM REVIEW PROCESS

Merit Review Process - Extension Plan

There have been no significant changes in the Cooperative Extension Service merit review process for the five-year plan of work.

Scientific Peer Review Process - Agricultural Experiment Station

The scientific peer-review process within the agricultural experiment station involves two steps. The first step includes a review by two scientists requested by the principal investigator (PI). These two scientists provide written comments regarding the proposal and return them to the PI for evaluation and use as appropriate. Prior to submission, the PI's Department Head also reviews the proposal. Once the proposal reaches the station, two additional scientific peer reviews are obtained, from either other on-campus faculty (if the expertise exists) or an off-campus faculty (if on-campus expertise does not exist). The review returned to the Experiment Station is forwarded to the PI with comments from the associate director as to any recommended changes that need to be made.

There have been no significant changes since the submission in the last 5-year Plan of Work.

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

1) Did the planned programs address the critical issues of strategic importance, including those identified by the stakeholder?

The planned program areas for the Utah Agricultural Experiment Station are: *(1) Plant and Animal Health and Safety, (2) Agricultural Product Enhancement, (3) Pasture Reclamation, Development, and Quality, (4) Human, Wildlife, and Domestic Livestock Interactions and Compatibility, and (5) Family Training, Development, Assistance, and Sociology.*

The planned program areas for the Utah State University Extension Service were *(6) Agronomy/Crop Production, (7) Horticulture, (8) Livestock, (9) Safe and Secure Food and Fiber System, (10) Nutrition and Health, (11) Rural and Community Forest Extension, (12) Sustainable Livestock Production, (13) Rangeland Resources Extension, (14) Noxious Weed Control, (15) Families and Youth at Risk, (16) Business Retention and Expansion, (17) Economic Development Planning, and (18) Youth and 4-H, (19) Sustainable Agriculture, (20) Integrated Pest Management, (21) Utah Pesticide Impact Assessment Program., (22) Expanded Food and Nutrition Education Program, (23) Statewide Water Quality Education and Technical Support, (24) Non-point Source Pollution, (25) Renewable Resources Extension Act, (26) Native American Programs.*

The relationship between the program areas identified above and the stakeholder issues identified below are indicated by various superscripts, where the superscript value corresponds to the number associated with the planned program area. These stakeholder issues were identified in the process described in this document, as well as the initial Plan of Work for Utah State University's Extension Service and Agricultural Experiment Station.

Improving production efficiency [1, 2, 6, 7, 8, 12, 13, 20]
Preserving farmland and open spaces [4]
Determining ways of enhancing quality of life and improving family life [5, 15, 16, 17, 18, 22, 26]
Identifying the important relationships between work and family [5, 15, 16, 17, 22, 26]
Developing socially acceptable methods of water conservation, recycling, and use [4, 23, 24, 25]
Developing alternative crops and enhance existing crops [1, 2, 6, 7, 19, 20]
Expanding study of intensively managed pastures [3, 6, 8, 12, 20, 23, 24]
Investigating best methods of waste control and disposal [4, 9, 12, 21, 22, 24, 25]
Expanding marketing options for farmers [2, 6, 7, 8, 9, 11, 12, 16, 17]
Developing better methods of weed control/management [1, 2, 3, 14]
Developing methods of identifying and controlling animal and plant diseases [1, 2, 6, 7, 8, 9, 12]

2) Did the planned programs address the needs of under-served and under-represented populations of the state(s)?

Under-served Minority Output Indicators and Outcomes

Ethnic Group	% Utah Total	UT Ethnic Population	% And Number Population Reached in USU Cooperative Extension Program - 2002			
			% Served	No. Served	Goal	Gender
White	89.0%	1,992,975	35%	693,440	------	Males
Black	.8%	17,657	32%	5,654	5,826	356,573 (47%)
Hispanic	9.0%	201,559	20%	41,166	66,514	Females
Am Indian	1.3%	29,684	20%	6,036	9,795	394,958 (53%)
Asian	1.7%	37,108	16%	5,938	12,245	

In 2002 ten counties received Civil Rights update training and review. County training included establishing criteria for meeting all reasonable actions for serving the underserved in communities. Demographic profiles detailing ethnic and minority parity goals were reviewed with counties and techniques for reaching minorities was discussed with action plans developed.

Output and Outcome Indicators

Contact summary of traditionally underserved population show a marked increase from 2001. This is due in fact to better reporting methods and increased activity in serving the under served.

Highlighted below is a sample of the type of work Utah Extension is doing to serve the underserved and minority populations.

Home Ownership and Personal Finance

"Opening the Door to Home Ownership" classes people preparing for home ownership are being offered to singles, young and older married, low income households, people with disabilities, older and even retired people purchasing a home for the first time. Students included people from Europe, Hispanics, Asian and Pacific Islanders, American Indians, Blacks and White.

The PowerSave computer program is 80 or 90% translated and programmed into Spanish. We have been told that we will receive the additional money to complete the translation. Since PowerSave can switch between English and Spanish it might finally be useful in ESL training. USDA has expressed interest in using PowerSave in the new national initiative on preparing for a secure financial future. Financial counselors in branches of the military are also interested in using PowerSave.

Horticulture and Master Gardening

Master Gardeners helped with a container gardening class at Tana Acres, a low-income housing development. Half of the apartments are Hispanic. Youth and adults participated ion the design, development and care of the gardens.

A special program helped greenhouse growers find training in pesticide safety for Spanish-speaking employees with the USU Pesticide Specialist & Utah Department of Agriculture.

Four Hispanic families utilized garden plots at the community garden in the summer of 2002. The families are part of the Multicultural Parent Association and found out about the gardens through organization meetings, which includes representatives from Extension. Two Asian families used garden plots as well.

4-H and Minority Involvement

The 4H aid taught after school 4H to parents and youngsters at elementary schools each week during October. Emphasis was placed on getting minority youth and their parents to participate. One English-Spanish speaking mother was recruited to interpret for the non English-speaking mothers.

West Jr. High 9th grade science student enhanced their understanding of water quality. Student learned the importance of clean water and how polluted water could affect their lives. They learned the importance of conservation and protection of both ground and surface water. There were 50 students of which 36 were American Indian.

With the schools supporting the PAWS-ON program minority youth and parent contacts have been 81 American Indians and 16 Hispanic. Through this program, minorities have and opportunity to see what USU Extension can offer.

Have been working with S. Zamora to being a group to teach and present traditional Mexican folk dances. We worked with some of the girls from community interested in the group and applied for a grant from the National 4-H Council. We were funded and the money will be used to provide the group with dresses to use in presenting their dances at various community events.

In promotion of 4-H Conversations bulletins were written in Spanish and posted next to those in English in public places. Hispanic organizations were invited to attend, many with a personal invitation. A Hispanic facilitator was provided, as were instructions and forms in Spanish. Three Hispanic youth attended. The Richfield Residence hall was personally invited to attend and as a result 13 Native American youth and their counselor attended. As a result of this contact, Native American youth have participated 4-H programs.

Two Latino youth and two adults were asked to present a workshop at the National 4-H Technology Conference about the Computer Assisted Literacy Program for Non-English Speakers. On July 27 they traveled to Minnesota and gave the presentation at the National 4-H Technology Conference. Their principals and the 4-H Office for outstanding representation recognized them. This experience has helped to gain the trust of the Latino population in Cache Valley with 4-H and USU Extension

This last year the 4-H staff has been active in providing classroom enrichment at two juvenile lockdown facilities for over 700 different youth. Our programming involves over 120 hours of teaching time (over 50,000 of man hours of education). We have presented a variety of subjects including: “Cookie Mining,” water rockets, kites, soils, water models, sewing, gardening, pruning,

team work, computes, and much more. There is a growing interest form other facilities for our programming

During the past ten weeks Latino six students completed the computer-training program. Four of those students upon entering the program were not attending any classes regularly at the High School. Now these students are attending 75% of the time. They have all developed proficiencies, which allow them to access the Internet to assist them with their homework. Their skills in keyboarding have improved. They have improved their ability to read, write and converse in English from a grade level of 4 to that of a 5th grade level.

We held our Expansion and Review meeting for the 4-H program. Attendees consisted of: 1 Native American man, 1 Native American woman, 1 Hispanic woman, 1 Hispanic female youth, 1 Asian woman, 2 Caucasian male youth, 4 Caucasian female youth, and 5 Caucasian women. Group suggested getting minority youth involved by contacting church groups where minorities attend, recruiting at schools and continuing with community clubs that involve all youth. One suggested that a local cable TV network coming to the area might be a possibility. Consensus was to market 4-H as offering more than livestock, horses and cooking.

Home Based Businesses

A workshop in Piute County was developed and taught with special attention to attract Latino's to learn more about home-based business. As a result of the workshop six new families established home based businesses and are now affecting their lives of thirty people in the community. They have developed a tax base.

Senior Programs

A unique program for seniors was developed. They were fun, exciting, youthful and even challenging at times. But, I truly felt I made a difference in their lives and I know they did in mine. They told me that it is hard to teach an old person something new. But, sometimes I think we just need to give them an opportunity to learn. I taught them nutrition principles with a senior focus, new food safety concepts, menu planning and shopping skills as well as the importance of healthy snacking. Their exit diet recalls and behavioral checklists showed they had made positive changes in both their eating habits and behaviors.

3) Did the planned programs describe the expected outcomes and impacts?

The planned programs, as developed in the 1999 Plan of Work submission, with the Extension portion modified in 2000, does describe expected outcomes and impacts in sufficient detail to provide a means of evaluating their effectiveness. See original Plan of Work submitted by Utah, with the 2000 amendment provided by Utah State University Extension and the Utah Agricultural Experiment Station.

4) Did the planned programs result in improved effectiveness and/or efficiency?

There are many planned programs at USU that are resulting in improved effectiveness and efficiencies. For example, Under Goal 1 the livestock pooling programs, feed rationing, soil sampling, and agricultural research programs are all leading to more efficient and effective agricultural practices in Utah. Within Goal 2, the USU Food Safety Managers Certification Course has increased the effectiveness of mandated food safety manager training in Utah. The pest suppression efforts of USU and Utah's regulatory agency helped quarantine the Plum circulio (PC), insect pest in northern Utah, from other Utah counties in keeping their export markets open and is valued at $2.4 million/annually. The Expanded Food and Nutrition Education Program is helping people to improve their food resource management practices, nutrition practices, and food safety practices. Examples of a few of the Natural Resource/Environmental programs under Goal 4 that are making a difference are the biosolids disposal (municipal waste) program; the water quality, conservation, and education program; and the managing wildlife program, the latter having saved an estimated $200,00 for farmers and ranchers in wildlife damage. Examples of Goal 5 programs improving the effectiveness of constituents include the financial management programs that are helping individuals and families to get out of unnecessary debt, the business programs that help new businesses get started and established business to expand. Overall, USU Extension and Experiment Station's planned programs have resulted in improved effectiveness and efficiency for government, the private sector, and in some cases, the nonprofit sectors of Utah's economy.

E. MULTISTATE EXTENSION ACTIVITIES

Brief Outcome Summaries Multistate Extension Activities

AGRONOMY AND CROPS

- Joint pesticide recertification programs were developed with Arizona Extension and the BLM to promote chemical safety and to train new applicators. 47 completed certification, which will help insure the health and safety of both home and commercial applications of pesticides in Southern Utah and Northern Arizona.
- NACAA/NASA fellows and volunteer agents from Idaho, Utah, Arizona, and Colorado developed application skills in the "On Target" training to assist producers in the use of GPS systems to facilitate fertilizer, irrigation, and pesticide/herbicide applications in their states. The effects of learning these new technologies provide producers with increased efficiencies and reduced production costs.
- Seven western states collaborated to consider plans of work to control Lolium species and feral rye in wheat. The resulting work resulted in a Jointed Goatgrass plan and initiative for eradication of these weeds in wheat. A proposal for funding this plan was developed as a component of collaboration.
- The Utah State and Idaho State Extension Service developed a plan to aggressively attack Dyers Woad infesting areas of Northern Utah and Southern Idaho. A "Bag a Woad" program was developed and youth in 4-H clubs, Junior Master Gardeners and other were funded to help collect Woad for which a bounty of $10 per 40-pound sack was paid. Over 17 tons of bagged Woad was collected in an effort to eliminate this weed.
- Master gardeners in Southern Idaho were instructed on composting techniques and then admonished to develop a composting program within the Franklin County areas. Master Gardeners have been successful to this end.
- Alaska, Idaho, Oregon, Washington, and Utah are exploring the formation of an Agroecological Pest Management Area. Three meetings have been held to date with plans of formation now coming to fruition.
- Utah pasture production research plots have yielded published data with producer applications, which have been adopted and utilized by Idaho NRCS. The resultant reports have assisted farmers and ranchers in Idaho in dealing with nutrient management plans and irrigated pasture alternatives. Information on production and livestock preference information was provided in an easy to understand format for local producers.

LIVESTOCK

- Utah and Arizona range livestock producers learned the benefits of aboriginal burning on the development of range plant communities. Techniques associated with water collection in extremely dry conditions were taught and ranchers learned about the "guzzler" water catchment system. This system demonstrated to ranchers that water availability might be maximized in extreme drought conditions.
- Ranchers from the Navajo Nation learned techniques on vaccinating animals properly and how to properly handle animals in an enclosed situation utilizing a squeeze chute in an effort to improve beef quality through the BQA program.

- Utah, Idaho, California, and Arizona are currently developing an agricultural economics risk assessment model to assist dairy operators in eleven western states. The impact of this program has assisted the nation with increased dairy production and growing numbers of dairy production animals.
- Beef producers from Utah and Colorado collaborated on discussions of improved beef production while touring the Kiowa Creek Angus Ranch and Tom Lasater Ranch. Shared management ideas helped Utah and Colorado producers understand beef production practices and techniques from this regional producer market.
- Producers from throughout the United States and Canada were exposed to the latest research on utilizing various residue feeds, cheese, whey, straw and wheat middlings to produce cheese whey silage. Implications for providing high quality whey silage for Utah and Idaho cattlemen as a producer cost reduction technique is being explored with potential cooperators.
- Utah Extension assisted Idaho livestock producers, agricultural professionals, engineers and technology providers with techniques to measure odors using a variety of field means and tools. Participants learned how odors are generated, what BMPs are appropriate, how to conduct on-site odor assessments and how to write odor management plans. Plans to improved odor management practices as a future adopted practice demonstrates an intermediate planned outcome for these producers and designers.
- Improved dairy management practices were taught to producers in Montana, Nevada and Wyoming, including Hutterite colonies, by the Utah state Extension Veterinarian and Dairy Specialists who estimate an increase in net farm income of $10,000 per year for each of nearly thirty farms receiving instruction and consultation during the year.

YOUTH AND 4-H

- Arizona and Utah Extension have collaborated on a ranching computer-training program to assist farmers and ranchers, including youth, to better understand spreadsheet applications, balance rations and money management techniques. A web site has been developed to promote training of youth who have been asked to help in the design and development of various 4-H web sites through the 4-H technology team.
- Utah, Idaho and Wyoming youth have learned general principles of engineering, physics, biology and chemistry through a traveling interactive hands on program called Discovery on Wheels. Youth have learned more about their aptitude for sciences, the support of Utah State and Extension in future career and educational planning and established self confidence in problem solving.
- Utah and Nevada youth have developed intercultural working groups to develop a skate park, Ballet Folklorico, Cinco de Mayo, and High School Leadership training of student leaders are products of the 4-H experience. Youth have learned self-reliance; trust building and self-esteem as both Latino and Anglo 4-Her's work together. An appreciation for their differences and the fostering of foreign language understanding has resulted.
- Youth leadership training has been conducted with Utah, Idaho and Montana 4-H Ambassadors. Outcomes include increased youth self-confidence, ability to conduct meetings, presentation skill improvement, and effective techniques for working with groups.

- Collaboration with Mississippi has resulted in the formation of over 55 Utah 4-H clubs in the Health Rocks Training Program. Utah has provided a virtual faculty member to the Health Rocks Training and Development team, which serves Health Rocks programs nation wide.
- Utah 4-H leaders on the 4-H sport-fishing program trained a corps of volunteers from Wyoming. Interest an involvement in the sport-fishing program has resulted in Wyoming.

ECONOMIC DEVELOPMENT AND PLANNING

- Alaska, California, Colorado, Hawaii, Montana, Nevada, North Dakota and Texas have collaborated with Utah on a Nature-Based Tourism Project designed to assist communities interested in developing a nature-based tourism resources. Programs are in the process of being formed in these states with added support coming from the Western Rural Development Center.
- Three counties in Utah and four counties in Idaho have formed a council designed to help producers, providers, and communities preserve their historic and cultural heritages. The Bear River Heritage Area Council brings together those interested in promoting heritage as an economic development tool.
- Utah Extension specialists have assisted Washington and Montana with business retention projects. These targeted economic development activities have resulted in new structures to encourage cooperation and linkages among businesses and local government, new learning and development concepts, the application of knowledge and techniques to local problems and the development of a forum for discussion of problems and opportunities.

BUSINESS RETENTION AND EXPANSION

- Collaboration with Idaho and the Bear River Heritage Council is bringing together partners to work together in identifying, preserving, and enhancing natural, cultural, and economic heritage and stabilizing and expanding economic opportunities associated with our heritage. A conference in November brought together interested parties to explore opportunities for expanding and retaining businesses in the Northern Utah and Southern Idaho region.

Brief Summaries

Integrated Pest Management and Demo Fruit
(Alston, D.)

FIRE BLIGHT CONTROL: Bactericides were compared for control of blossom blight of pear and apple. Gentamycin at 500 ppm, streptomycin and Mycoshield provided significantly better control of fire blight on Bartlett pear than the check. Vacciplant at low and high rates and Gentamycin at 250 ppm were not effective. On Jonathan apple, the Gentamycin at 500 ppm and streptomycin provided significant control, whereas Mycoshield and Vacciplant did not. The elicitor, Vacciplant, was not effective at stimulating resistance adequate for control of blossom blight. POWDERY MILDEW CONTROL: Fungicides were compared for control of powdery mildew in Montmorency tart cherry. Rally is a standard, but is reported to be less effective in commercial orchards because of resistance. Sulfur is an old and effective fungicide, but often incites mite problems. Cabrio and Pristine are new strobilurin fungicides with a new mode of action. Oil may control mildew when applied early. Pristine

provided the best control (p=0.001). Sulfur, Cabrio, Rally and oil were in a second group, but still provided better control than the check. Procure was better than the control, but not as good as other fungicides. There was no mite buildup in the trees. TOXICITY OF FUNGICIDES AND CHLORONICOTINYL INSECTICIDES TO MITES: Munger cell bioassays found the demethylation-inhibiting fungicides, Rally and Procure, were nontoxic to Tetranychus urticae and Galendromus occidentalis and didn't affect mite reproduction or consumption of prey by the predatory mite. Benlate, a benzimidazole fungicide, was acaricidal to both species of mites, but surprisingly didn't reduce consumption of T. urticae by G. occidentalis. Benlate is likely to disrupt mite biological control in the field. Residues of two chloronicotinyl insecticides, Provado and Calypso, didn't affect reproduction of T. urticae, but Provado at 8-oz/100 gal was toxic to females. The relatively short evaluation period (5 d) and exposure of mites to residues versus direct contact may have reduced effects observed in this study. EFFICACY OF PROVADO FOR WESTERN CHERRY FRUIT FLY CONTROL: Three tart cherry orchards (1-2 acres each) were treated with either three applications of the chloronicotinyl insecticide, Provado, a standard Guthion program, or left untreated. Fruit infestation at harvest was 0.001%, 0%, and 94.1% fruit infestation with Rhagoletis indifferens larvae, respectively. Provado shows excellent promise as an alternative to the organophosphate insecticide, Guthion. REPLACEMENT OF OP INSECTICIDES WITH SPINOSAD IN PEACH TWIG BORER MANAGEMENT: 2001 and 2002 studies demonstrated that season-long peach twig borer control could be achieved with three applications of Success (spinosad). One application of Success applied at bloom to control over wintering larvae replaced Lorsban applied with a delayed dormant oil. Two applications of Success were timed with the degree-day model, same as two applications of Guthion in the standard program. No fruit injury resulted in either treatment.

Impact: Testing and demonstration of alternative chemicals for control of disease and arthropod pests of tree fruits is important to the viability of the state's fruit industry. EPA is eliminating many traditional, broad-spectrum pesticides, and research and extension efforts are needed to assist growers with implementing new, more selective controls. In addition, development of pest resistance (fire blight to streptomycin; codling moth to organophosphates) and toxicity of beneficial arthropods (fungicides and pyrethroids to predatory mites) to older, broad-spectrum pesticides necessitates the need for commercial agriculture to transition to more selective, softer materials.

Management of Intensive Grazing on Irrigated Pastures for Dairy Cattle
(Bowman)

24 mid to late first lactation cows averaging 190 days in milk, based on milk production and days since freshening, were randomly allotted to 3 comparable treatment groups of 8 cows each. Treatment 1 (TRT 1) cows were housed in confinement dry lot corrals and fed a balanced total mixed ration (TMR). Cows on the other two treatments were gradually adjusted to over a 2-week period to an intensively managed perennial ryegrass/white clover pasture by increasing the time that they were allowed to graze each day and decreasing the amount of TMR that was fed. After this adjustment period, TRT 2 cows received 40 lbs of TMR daily plus free access to pasture and TRT 3, cows also on pasture, were fed corn silage and a concentrate mix (equivalent dry matter to the 40 lbs of TMR). The cows on pasture were fed 1/2 of their respective supplemental feed 1 hour before each milking (2X/day). Pastures were sprinkle irrigated (2" water/10d) and nitrogen fertilizer was applied with each sprinkling (190kg/ha/season). Electric fences permitted small paddocks for 12 hours of grazing

vegetative growth (15 to 20 cm tall). Milk production average 33.5 kg/day during the 2-week period prior to the start of the trial. Average milk production for the 15-wk treatment period declined 16, 22 and 28% for the respective treatments. The milk decline of those cows on pasture was most evident during the first 6 weeks (2-wk adjustment and 4-wk treatment) when average daily milk declined 6.6, 14.8 and 17.8% for the respective treatments. This decline was not as abrupt as in a similar experiment last year because more care was taken to adjust cows to the pasture regime. Returns above feed cost favored the 2 groups on pasture. In another experiment, 24 Holstein heifers averaging 352 kg body weight grazed either irrigated orchard grass/white clover (OG) or perennial ryegrass/white clover (PRG) pastures for 149 days. Drinking water and a mineral package w/Bovatec were always available in each grazing paddock. Heifers were moved to a fresh paddock every 24 to 36 hours. Pasture was maintained in a vegetative stage of growth (15 to 20 cm tall). Average daily weight gains were 909 and 993g for heifers grazing OG and PRG, respectively. Monthly body weight gains were more consistent for those heifers grazing (PRG) because of more constant forage quality compared to (OG). The OG was ready to graze 14 days before the (PRG) in the Spring. PRG has consistently been ready to be grazed 60 days after planting in the spring while OG essentially requires a full growing season to become established.

Impact: Intensively managed irrigated perennial ryegrass pastures w/white clover offer an alternative to total confinement dairy production. More research is needed on amounts and types of supplement for lactating cows on these pastures and how to adjust them to the initial diet changes and to grazing itself when going from dry lot feeding. Dairy heifer body weight gains and health are very acceptable when both the heifers and the pastures are managed intensively; however, PRG resulted in higher body weight gains again this year compared to OG.

Biological Control in Pest Management

Systems of Plants
(Evans)

Studies were continued of biological control of insect pests in alfalfa, and of weeds in Utah rangelands. Long-term sampling of alfalfa fields was continued in 2002 to determine population sizes of the introduced predators Coccinella septempunctata and Harmonia axyridis, as well as of native lady beetles and pea aphids. Results revealed continuing low density populations of native lady beetles and pea aphids following the successful establishment of C. septempunctata in northern Utah over the past decade. H. axyridis again occurred in low numbers in alfalfa fields in 2002. Field experiments were conducted to study aggregation of adult lady beetles to local outbreaks of aphids, and the ability of these predators to suppress such outbreaks. Laboratory studies were pursued to measure the strength of predation on native lady beetles by both H. axyridis and C. septempunctata. Laboratory studies were also conducted to measure the consumption rate of conspecific eggs versus aphids by C. septempunctata adults. Long-term field experiments and establishment studies were continued for insect biological control agents for a number of Utah weeds, including squarrose knapweed, Canada thistle, leafy spurge, and purple loosestrife. Dissections of squarrose knapweed seedheads collected throughout central Utah in 2001 (a dry year with little flowering activity) revealed infestation rates by insects (especially the seed-head fly Urophora quadrifasciata and the weevil Larinus minutus) to average 68% at individual sites (versus 1% in 1993 when insects were first introduced). Intensive field

sampling at individual sites documented the seasonal patterns of attack of these biocontrol agents, and associated seasonal patterns of successful seed production by the host plant.

Impact: The research seeks to determine and enhance the impact of biological control insects (predators and parasitoids of insect pests, and weed-feeding insects) on target pests in Utah alfalfa and rangelands. More effective biological control of pest insects and weeds can enhance agricultural productivity while reducing the need (and associated economic and environmental costs) of pesticide application.

Management Style & Competence of Dairy Farmers as an Indicator of Profitability And Productivity
(Young)

The correlation of MBTI preferences with production values to see what definable skills determine productivity on a dairy was completed this past year and resulted in a publication in the Journal of Dairy Science. In general, few preferences were correlated with production values; however, the "E-I" dimension seemed to be the most relevant and further work into the financial correlations would be interesting. Further work at this time probably will be postponed. The use of control charts for summarizing information on a dairy to enhance the ability of a dairy farmer to make appropriate decisions has increased during the past year. I currently have created various control charts for 39 dairy farms in Utah, Idaho, Wyoming, Montana and Nevada. At present I have two herds that I have sufficient information to compare daily bulk tank milk, milk fat percent, milk protein percent and somatic cell count with changes in rations or management decisions to determine the effects on income as measured by the Federal Milk Marketing Order (FMMO) and Chicago Mercantile Exchange (CME) cheese price. It was interesting that most ration changes did not result in changes in bulk tank milk levels or milk components. It was also interesting than many production changes in either milk yield and/or components did not necessarily translate into increased income. Further, there was a difference in income depending on whether one used the FMMO or the CME cheese price. I was able to document a two-week increase in somatic cell count that decreased bulk tank milk yield. This resulted in lost income in just milk sales of over $30,000 and the dairy farmer was not aware that it had happened. Control charts are becoming valuable on these farms when used at team meetings with the consultants, nutritionists, and dairy farmer in making management decisions. The bankers of one dairy have required the use of control charts to document day-to-day changes in income for this dairy. The association of the Milk Urea Nitrogen test (MUN) with production variables was written and submitted to the Journal of Dairy Science. This has delayed the next objective of this project in determining the profitability associated with changes in MUN as measured using control charts and DHIA records.

Impact: Control charts can aide the dairy farmer in making management decisions by separating the day-to-day variability from real changes that can have production, health and economic consequences. The MUN test can help improve income by making sure that protein in the ration is being correctly used. This will reduce environmental impact from nitrogen.

The Utilization of Technologies to Improve Economic Returns Through Retained Ownership of Calves

(Zobell, D)

Studies over the past two years have focused on the production and utilization of cheese whey silage for growing and finishing cattle. During the past year cheese whey silage (WS) was produced at two separate locations to determine the effect of feeding WS on production characteristics of growing holstein heifers (HH) and finishing beef steers (BS). For the HH study, WS was produced by combining liquid cheese whey (W), wheatgrass straw (WGS) and wheat middlings (WM) at proportions of 51.5, 38.3 and 10.2% (DMB) respectively and ensiling for 30 days prior to feeding. The WS had a DM nutrient analysis of 46.4% DM, 13.8% CP, 17.3% ADF, 27.4% NDF, .59% Ca, .56% P, and pH of 3.9. Forty-eight HH (258 kg) were assigned to treatments of Control (C) or Treated (T) with eight head per pen and three pens per treatment for this 56 d study. The C heifers received a growing ration with DM proportions of 16.6% alfalfa hay (AH), 40.4% corn silage (CS), 41.0% WM and 2.0% supplement (S). Treated HH received the WS and supplement. Control and T rations were isocaloric and isonitrogenous. For the BS study, WS was produced by combining and ensiling W, wheat straw and WM at DM proportions of 63.1, 28.9 and 8.0% respectively. The WS had a DM nutrient analysis of 43.5% DM, 13.3% CP, 19.9% ADF, 28.4% NDF, .64% Ca, .67% P, and pH of 4.3. Forty steers (438 kg) were assigned to treatments of C or T with five head per pen and four pens per treatment in this 84 d study. Control steers received a diet consisting of 85.6% dry-rolled barley (B), 8.1% CS, 1.5% SBM and 4.8% S (DMB). Treated steers received 84.1% B, 12.2% WS and 3.8% S (DMB). The C and T rations were isocaloric and isonitrogenous. All steers were slaughtered together, with marketing time determined by ultrasound scan and carcass data recorded. Both studies were a completely randomized design where pen was the experimental unit and calves were stratified by weight and age and assigned to treatment. Statistical analyses of data for both studies were performed using the MIXED procedure of SAS. Results from the HH study indicated ADG (kgxd-1), DMI (kgxd-1) and FE values for C and T of 1.09 and 1.06 (P=.79); 8.0 and 6.55 (P=.11); and 7.38 and 6.52 (P=.32) respectively. Finishing steer results for C and T respectively were 1.11 and 1.20 (P=.15) for ADG (kgxd-1); 9.05 and 9.73 (P=.006) for DMI (kgxd-1); and 8.26 and 8.22 (P=.93) for FE. There were no differences between treatments for any of the carcass traits measured (P>.05). Although production variables were not different, cost of gain was decreased by 35.3% and 5.7% respectively for the HH and BS studies, due to the lower cost of the T rations. These studies suggest there may be an economic basis for including whey silage in growing and finishing diets.

Impact: Cheese whey silage is produced from residue feeds such as straw, wheat middlings and liquid cheese whey. Our studies have shown that nutritious and cost effective roughage is produced and is an alternative feedstuff for growing cattle in the Intermountain West. Finishing cattle do not benefit as well as roughage is a smaller component of their diet. Further studies will investigate its impact on beef cow production under maintenance.

F. BRIEF SUMMARIES INTEGRATED UTAH AGRICULTURE EXPERIMENT STATION

Each of the following Utah (UTA) Agricultural Experiment Station Projects (arranged by CSREES Goal) includes an Extension Service component, even though not all are identified by Extension for expenditure percentage purposes, nor are all projects identified under this specific goal area as far as the Utah Agriculture Experiment Station is concerned.

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

103 - A National Agricultural Program to Clear Pest Control Agents for Minor Uses
179 - Grazing Livestock Nutrition and Management to Improve Production Efficiency
418 - Management of Intensive Grazing on Irrigated Pastures for Dairy Cattle
449 - Feeding Strategies to Optimize Dairy Cow Performance with Minimum Environmental Impact
461 - Improvement and Impact of Production and Management Practices in Utah Turkeys
478 - Variation in Body Condition Score of Beef Cows as an Effector of Low-Quality Forage Utilization
332 - Environment and Economic Impacts of Nutrient Management on Dairy Forage Systems
524 - Biological Control in Pest Management Systems of Plants
624 - Puccinia Thlaspeos as a Biocontrol Agent for Dyer's Woad
628 - Stomatal Responses to Humidity in Wheat
797 -Water Use, Growth, and Irrigation Management of Grass and Grass/Legume Pastures at High Elevations
279 - Freeze Damage and Protection of Horticultural Species
292 - Rootstock and Interstem Effects on Pome and Stone Fruit Trees
328 - Improvement of Winter Wheat Through Breeding
331 - Management and Ecology of Irrigated Pastures in the Intermountain West
344 - Water Use and Growth of Selected Vegetables with Emphasis on Onions
345 - Reduction of Water Use in Turfgrass by Plant Improvement and Improved Management Strategies
352 - Pasture and Forage Research
353 - Impacts of Structural Change in the Dairy Industry
351 - Multidsciplinary Evaluation of New Apple Cultivars
735 - Breeding and Testing Improved Varieties of Barley, Spring Wheat, and Oats
743 - Cultural, Biological, and Chemical Control of Weeds in Field Crops
013 - Environmental and Economic Impacts of Nutrient Management on Dairy Forage Systems

Goal 2: To Provide a Safe and Secure Food and Fiber System

230 - Food Storage: Preserving Quality and Safety

Goal 3: To Achieve a Healthier, More Well-Nourished Population

214 - Nutrition and Risk of Osteoporotic Hip Fracture in Elderly Utah Residents
220 - Factors Influencing the Intake of Calcium Rich Foods Among Adolescents

Goal 4: To Achieve Greater Harmony Between Agriculture and the Environment

173 - Development of Co-Existing Livestock and Wildlife Enterprises in Aspen Landscapes
471 - Water Quality Issues in Poultry Production and Processing
861 - Waste Management for On-Farm Sustainability
941 - Land Use Strategies to Address Nitrate Contamination of Groundwater in the Sevier River Watershed
942 - Integrated Facultative Ponds (IFP) for Agricultural Waste Water Treatment
324 - Water and Solute Flow and Management as Related to Changes in Soil Physical Properties

338 - The Utilization of Municipal Sewage Sludge (Biosolids) for Irrigated Crop Production
431 - Sustainable Cropping Systems Utilizing Low-Cost Precision Agriculture Technology
442 - Water Management in Woody Landscape Plants
446 - Farm and Landscape Water Allocation and Conservation at the Rural:Urban Interface
335 - Western Regional Sustainable Agricultural Research and Education (SARE) Program
052 - Benefits and Costs of Resource Policies Affecting Public and Private Land
705 - Social and Biological Aspects of Community Forests
709 - The Economic Value of Open Space in the Intermountain West
726 - Social Equity and Ecosystem Management: Integrating Social Science in Resource Planning and Policy
737 - Integrating Human Dimensions into the Science and Management of Utah's Forest Ecosystems
229 - Developing Methods to Add Value to Agricultural By-Products
905 - Development of New Approaches to Rangeland Monitoring and Assessment of Condition and Trend
911 - Development of Economical Rangeland Monitoring Systems
919 - Constraints for Adoption of Improved Management Systems for Range Livestock Production on Private Land
923 - Applications of Behavioral Principles to Management

Goal 5: To Enhance Economic Opportunities and the Quality of Life Among Families and Communities

007 - Rural Communities and Public Lands in the West: Impacts and Alternatives
074 - Rural Economic Development: Alternatives in the New Competitive Environment
885 - Components of School Readiness and School Success for Children in Low-Income Mexican American Families in Rural Northern Utah
972 - Promoting Life Management Skills to Enhance Employment Among Family Support Service Recipients
973 - Rural Low-Income Families: Tracking their Well-Being and Functioning in the Context of Welfare Reform
985 - Family Business Viability in Economically Vulnerable Communities
839 - Social Change and Adaption Response to Shifting Sustenance Structures in Western Communities
841 - Interdependencies Among Community, Agriculture, and Social Change in Nonmetropolitan Utah
844 - Factors Influencing Willingness to Continue Family Farm Operations in Utah
869 - Family and Work Linkages

Multi Activities - Utah Agricultural Experiment Station

Goal 1:
No specific objective under Goal 1.

Goal 2:

NC-140, 2002
NC-185, 2007

NCR-31, 2004
NCR-101, 2006
NCR-190, 2006
NE-183, 2004
NRSP-03, 2002 (Granted 1 year extension)
NRSP-8, 2003
W-006, 2002
W-045, 2005
W-102, 2004
W-130, 2003
W-171, 2004
W-1177, 2002
WCC-039, 2005
WCC-058, 2004
WCC-077, 2004
WCC-081, 2006
WCC-091, 2004
WCC-097, 2005
WCC-201, 2004

Goal 3:

NC-131, 2005
NCR-140
W-1122, 2007
W-130, 2003
W-181, 2004

Goal 4:

NCR-170, 2006
NE-132, 2004
NE-162
NRSP-3, 2007
NRSP-8 (Up for Renewal)
W 045, 2005
W-133, 2002
W-184, 2002
W-1185, 2002
W-187, 2004
W-188, 2004
W-190, 2006
W-192, 2006
W-195, 2005
W_Temp061
W_Temp161, 2007

WCC-103, 2006
WCC-011, 2004
WCC-021, 2004
WCC-040, 2006
WCC-055, 2006
WCC-066, 2006
WCC-067, 2005
WCC-069, 2005
WCC-093, 2004
WCC-095, 2004
WCC-102, 2006
WCC-103, 2006
WCC-110, 2004
WCC-202, 2005

Goal 5

NCA-013, 2002
NE-162, 2002
NE-167, 2004
NE-177, 2002
NE-1011, 2007
W-167, 2005
W-1001, 2007
WCC-084, 2002

NCA-013, 2002 **Rural Sociology**
Krannich, R. Cooperators: not available
SSWA

NC-131, 2005 **Molecular Mechanisms Regulating Skeletal Muscle Growth**
Carpenter, C. **and Differentiation (UTA00236)**
NFS Cooperators: AZ, CA-D, IA, IN, KS, MI, MN, NE, OH, PA, SD, TN, UT, WA, WVA, WI

NC-140, 2002 **Rootstock and Interstem Effects on Pome and Stone Fruit**
Seeley, S.D. **Trees (UTA00292)**
Lindstrom, T. Cooperators: AR, CA, CO, GA, IL, IN, IA, KS, KY, MA, MD,
PSB ME, MI, MN, NO, ND, NJ, NY, OH, OR, PA, SC, SD, TN, UT, VA, VT, WA, WI, WV

NC-1009, 2007 **Metabolic Relations in Supply of Nutrients for Lactating Cows**
Dhiman, T. **(UTA00417)**
ADVS Cooperators: AL, AZ, CA, FL, IL, IN, IA, KS, KY, MD, MI, MO, NH, ND, NMA, OH, PA, SD, UT, WA, WI

NCR-31, 2004 **Physiological Aspects of Forage Management**

MacAdam, J. PSB	Cooperators: not available
NCR-190, 2006 Bunch, T. ADVS	**An Accelerated Breeding Program Using the St. Croix and Barbados Blackbelly Hair Sheep to Increase Meat Production and Profitability** Cooperators: not available
NE-132, 2004 Miller, R. Snyder, D. ASTE	**Environmental and Economic Impacts of Nutrient Management Dairy Forage Systems (UTA332)** Cooperators: IL, IN, MD, MI, MS, IL, IN, NJ, NY, OR, PA, Univ. of PA, WA, WI, WV, UT
NE-162, 2002 Fawson, C. ECON	**Rural Economic Development: Alternatives in New Competitive Environment (UTA 074)** Cooperators: AZ, CA, CO, DE, GA, IA, IL, IN, KY, MI, MN, MO, NV, NY, NH, NC, ND, OH, OR, PA, RI, SC, TX, UT, VA, WA, WI
NE-167, 2004 Lee, Y. Human Environ.	**Family Business Viability in Economically Vulnerable Communities (UTA00985)** Cooperators: HI, IA, IL, MN, MT, NJ, NY, OH, PA, RD, UT, WI
NE-177, 2002 Jackson-Smith, D. SSWA	**Impacts of Structural Change in the Dairy Industry (UTA00353)** Cooperators: CTS, KY, ME, MI, MN, NY, OH, PA, TX, UT
NE-183, 2004 Seeley, S.D. Lindstrom T. PSB	**Multidisciplinary Evaluation of New Apple Cultivars (UTA00351)** Cooperators: (being developed)
NE-1011, 2007 Fawson, C. ECON	**Rural Communities, Rural Labor Markets and Public Policy (Formerly NE-162)** Cooperators: (being developed)
NRSP-3, 2007 Jensen, D. PSB	**National Atmospheric Deposition Program (NADP) - A Long-Term Monitoring Program in Support of Research on the Effects of Atmospheric Chemical Deposition (UTA00322)** Cooperators: CA-D, CA-R, GA, IA, IL, IN, MI, MN, NE, NH, OH, PA, UT, VA, VT, WI
NRSP-8, 2003 Cockett, N. ADVS	**National Animal Genome Research Program** Cooperators: AL, AZ, CA-D, GA, IL, IN, IA, KS, KY, LA, MA, MD, MI, MN, MO, MS, NE, NY, OK, OH, TX, UT, VA, WI: NON-AES: USDA/ARS, NCA, NAAB, TUFTS U, CHNMC, UBC, NIL, AB, DPR, NTDF, ASI, BYU

W-006, 2002 Jensen, K. ARS	**Plant Genetic Resource Conservation and Utilization (UTA00762)** Cooperators: AK, AZ, CA-D, CO, HI, ID, MT, UT, WA, WY
W-045, 2005 Aust, S. CHEM	**Environmental Transformation, Exposure, and Effects of Pesticide Residues (UTA00390)** Cooperators: ARS, AZ, CA-B, CA-D, CA-R, FL, HI, IN, KS, NV, NM, NY, OR, UT, WA
W-102, 2004 Healey, M.C. ADVS	**Control of Animal Parasites in Sustainable Agriculture Systems (UTA00133)** Cooperators: AZ, CA, FL, IA, KS, LA, MN, MO, MT, UT, VA, WA
W-1122, 2007 Coulombe, R.A. ADVS	**Beneficial and Adverse Effects of Plant-Derived Chemicals on Human Health and Food Safety (UTA 476)** Cooperators: AZ, CA-B, CA-D, CO, HI, ID, MI, OR, UT, WA, WY
W-130, 2003 Seeley, S.D. PSB	**Freeze Damage and Protection of Horticultural Species (UTA 279)** Cooperators: CA-B, CA-D, CO, FL, GA, IN, MD, MN, NV, PA, OR, SD, UT, WA, WV, WI
W-133, 2002 Jakus, P. ECON	**Benefits and Costs of Resource Policies Affecting Public and** Private Land (UTA00052) Cooperators: CA-B, CA-D, CO, CT, GA, IA, MA, ME, MI, MN, MT, NV, NH, NM, NY, OH, OR, TN, UT, WA, WV, WY
W-167, 2005 Riley, P. Kiger, G. SSWA	**Family and Work Linkages (UTA00869)** Cooperators: CA-D, CO, ID, NM, NV, OR, PA, SD, UT, WA, WY
W-171, 2004 Bunch, T.D. White, K. ADVS	**Germ Cell and Embryo Development and Manipulation for Improvement of Livestock (UTA00123)** Cooperators: AR, CA-D, CO, CT, IA, IL, LA, OK, OR, UT, WA, WI
W-1177, 2002 Bailey, D. Econ	**Enhancing Global Competitiveness of U.S. Red Meats (UTA00085)** Cooperators: AZ, CA-D, CO, ID, IA, KS, NE, NV, NM, OK, SD, TX, UT, VA, WA, WY
W-181, 2004 Dhiman, T. ADVS	**Modifying Milk Fat Composition for Improved Manufacturing Qualities and Consumer Acceptability (UTA00423)** Cooperators: CA-D, IA, ID, IL, KY, MN, NY, OH, SC, SD, UT, VA, WA, WI

W-1185, 2002	**Biological Control in Pest Management System of Plants (UTA 524)**
Evans, T.	
Biology	Cooperators: AZ, CA-B, CA-D, CA-R, GU, HI, ID, KS, MT, NM, NY, OR, UT, WA
W-187, 2004	**Interactions Among Bark Beetles, Pathogens, and Conifers in NorthAmerican Forests (UTA00701)**
Baker, F.	
Forest	Cooperators: AR, CA-B, CA-D, CA-R, CO, FL, GA, IA, LA, MN, MS, MT, OH, OR, UT, WI
W-188, 2004	**Characterization of Flow and Transport Processes in Soils at Different Scales (UTA 329)**
Or, D.	
Jones, S.	Cooperators: AZ, CA-B, CO, DE, IN, IL, IA, KS, MT, NV, ND, UT, WA, WY
PSB	
W-190, 2006	**Agr. Water Management Technologies, Institutions, and Policies Affecting Economic Viability and Environmental Quality (UTA 020)**
Jakus, P.M.	
ECON	Cooperators: AZ, CA-B, CA-D, CO, GA, HI, ID, IN, KS, NC, NE, NM, NV, OK, OR, UT, WA, WY
W-192, 2006	**Rural Communities and Public Lands in the West: Impacts and Alternatives (UTA0007)**
Godfrey, E.	
ECON	Cooperators: AK, CO, ID, NM, NV, OR, UT
W-195, 2005	**Water Quality Issues in Poultry Production and Processing (UTA00471)**
Bagley, L.	
Frame, D.D.	Cooperators: AL, AR, CA-D, DE, GA, IN, KS, LA, MD, MI, MN, ADVS MS, NC, OH, OK, OR, PA, TN, TX, UT, VA, WVA
W-1001	**Population Change in Rural Communities**
Berry, E.	Cooperators: (being developed)
Toney, M.	
SSWA	
W_Temp161, 2007	**Managed Grazing Systems for the Intermountain West**
Hill, R.	Cooperators: (being developed)
MacAdam, J.	
Snyder, D.L.	
Wiedmeirer, R.	
WCC-011, 2004	**Turfgrass Research**
Johnson, P.	Cooperators: AR, AZ, CA-D, CO, GU, MT, NE, NM, NV, OR, TX, UT, WA
PSB	
WCC-021, 2004	**Revegetation and Stabilization of Deteriorated and Altered**

Schupp, G. Forest	**Lands** Cooperators: AK, AZ, CA-D, CA-R, CO, MT, NM, NV, UT, WA, WY
WCC-039, 2005 Cockett, N. ADVS	**Coordination of Sheep and Goat Research and Educational Programs For Western States** Cooperators: AZ, CA-D, CO, MT, ND, NM, NV, OK, OR, TX, UT, WY
WCC-040, 2006 West, N. Range	**Rangeland Ecological Research and Assessment** Cooperators: CA-B, CO, ID, ND, NM, NV, MT, OR, SD, TX, UT, WA, WY
WCC-055, 2006 Godfrey, E. ECON	**Rangeland Resource Economics and Policy (UTA00072)** Cooperators: CA-D, CO, ID, MO, NM, NV, OR, SD, TX, UT, WA
WCC-058, 2004 Kjelgren, R. PSB	**Production, Transition Handling and Reestablishment of Perennial Nursery Stock** Cooperators: AZ, CA-R, CO, HI, IA, ID, IN, MI, MO, NJ, NM, OH, OK, OR, PA, RI, TX, UT, WA, WI
WCC-066, 2006 Messina, F. Biology	**Integrated Management of Russian Wheat Aphid and Other Cereal Aphids** Cooperators: CO, KS, MN, NE, TX, UT, WA, WY
WCC-067, 2005 Rasmussen, V.P. Newhall, R. PSB	**WCC for Sustainable Agr.** Cooperators: AS, CO, GU, ID, MT, NM, NV, OR, WA, WY, UT
WCC-069, 2005 Alston, D. Biology	**Coordination of Integrated Pest Management Res. and** Extension/Education Programs for the Western States and the Pacific Basin Territories Cooperators: AK, AZ, CA, CA-D, CA-R, CO, GU, HI, ID, MT, NM, NMA, NV, OR, UT, WA, WY
WCC-077, 2004 Dewey, S. PSB	**Biology and Control of Winter Annual Grass Weeds in Winter Wheat** Cooperators: CO, ID, KS, MT, NE, NM, OK, OR, UT, WA, WY
WCC-081, 2006 Hole, D. PSB	**Systems to Improve End-Use of Small Grains** Cooperators: ID, MT, OR, UT, WA
WCC-091, 2004 Griggs, T. PSB	**Improving Stress Resistance of Forages in the Western United States** Cooperators: AZ, CA-D, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY

WCC-093, 2004	**Western Regional Soil Science and Inventory**
Boettinger, J.	Cooperators: AK, AZ, CA-B, CA-D, CA-R, CO, HI, ID, MT, NM,
PSB	OR, UT, WA, WY
WCC-095, 2004	**Vertebrate Pests of Agriculture, Forestry, and Public Lands**
Schmidt, R.	Cooperators: AZ, CA-D, IL, LA, MO, NE, NY, TX, VA, UT, WA
Forest/Fisheries	
WCC-097, 2005	**Research on Diseases of Cereals**
Kropp, B.	Cooperators: CA-D, CO, ID, IN, KS, MN, MT, ND, NE, OR, SC,
Biology	UT, WA, WY
WCC-102, 2006	**Climatic Data and Analyses for Applications in Agriculture**
Jensen, D.	**and Natural Resources**
PSB	Cooperators: AZ, CA-D, CO, ID, NM, NV, OR, TX, UT, WA
WCC-103, 2006	**Nutrient Management and Water Quality**
Koenig, R.	Cooperators: AK, AZ, CA-D, CO, HI, ID, MT, NM, NV, OR, UT, PSB
	WA, WY
WCC-110, 2004	**Improving Ruminant Use of Forages in Sustainable Production**
Olson, K.	**Systems for the Western U.S.**
Zobell, D.	Cooperators: AZ, CO, HI, MT, ND, OR, SD, TX, UT, WA, WY
ADVS	
WCC-202, 2005	**Climatic Data Applications in Irrigation Scheduling and Water**
Kopp, K.	**Conservation**
PSB	Cooperators: AZ, CO, KS, MO, ND, TX
WCC-208, 2006	**Western Region Impact Statement Development**
Harris, L.	Cooperators: AK, AR, AZ, CO, HI, MT, NM, NV, OR, SAM, UT,
Hinkamp, D.	WA
AES	

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

Institution **Utah State University**
State **Utah**

Multistate Extension Activities	**FY 2002**
Planned Program/Activity	
Agronomy/Crops	**$5,199**
Livestock	**85,404**
Youth and 4-H	**34,777**
Economic Development Planning	**9,694**
Business Retention and Expansion	**9,695**
Total	**$144,769**

Fund Audit Salary Tracking:
Alan Young
Ron Bowman
Jim Keyes
Curtis Crittenden
John Murphy

Cooperative State Research, Education and Extension Service

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

Institution **Utah State University**
State **Utah**

Integrated Activities (Smith-Lever Act Funds)	**FY 2002**
Title of Planned Program/Activity	
Integrated Pest Management and Demo Fruit (Alston, D.) #618 06/03/05	**$42,338**
Management of Intensive Grazing on Irrigated Pastures for Dairy Cattle (Bowman) #418 06/30/04	**15,567**
Biological Control in Pest Management	**28,162**
Systems of Plants (Evans) #524 09/30/07	
Management Style & Competence of Dairy Farmers as an Indicator of Profitability And Productivity (Young) #421 06/30/03	**14,239**
The Utilization of Technologies to Improve Economic Returns Through Retained Ownership of Calves (Zobell, D) #451 06/30/03	**65,269**
Total	**$165,575**
(28.8% Smith-Lever Funds)	

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Establishment of Target Percentages
for Multi-state Extension Activities and Integrated Activities

Institution: Utah State University, Agricultural Experiment Station

State: Utah

Check one: ___ **Multi-state Extension Activities**
_x_ Integrated Activities (Hatch Act Funds)
___ Integrated Activities (Smith-Lever Act Funds)

Options for Determining Target Percentages (Circle one)

A. 25 percent (submission of Form CSREES-Base is waived) **T**

B. **Target Percentage of _____ (two times the preliminary baseline percentage of _____).**

C. **(Option only available if higher than option B and less than 25 percent)**

Target Percentage of _____ for FY 2000 and thereafter.

D. **(Option only available if higher than option B and less than 25 percent.)**

Target Percentage for FY 2000 and thereafter phase-in:

FY 2000 _____
FY 2001 _____
FY 2002 _____

_____ _____
Director **Date**

Form CSREES-REPT (2/03)

Supplement to the Annual Report of Accomplishments and Results
Integrated Activities (Hatch Act Funds)
(Attach Brief Summaries)

Institution **Utah State University, Agricultural Experiment Station**
State **Utah**

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

Title of Planned Program/Activity FY 2001

Estimated Costs Title of Planned Program/Activity FY 2000	2001	2002	2003	2004
2a. Plant and Animal Health and Safety: Identification		$ 95,889		
2b. Plant and Animal Health and Safety: Control		$ 71,564		
2c. Plant and Animal Health and Safety: Safety Assurance		$ 34,634		
3. Agricultural Produce Enhancement		$ 848,118		
4a. Intensive Pasture Management and Use		$ 29,208		
4b. Natural Resource Management		$ 306,923		
5a. Human Health		$ 4,162		
5b. Family-Community Relationships		$ 62,334		
*Total		$1,423,916		

_____ _____
Director **Date**

Form CSREES-PLAN (2/03) Integrated Activities (Hatch Act Funds)

Continuation (Detail) of Form CSREES-REPT for 2002

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

Institution Utah State University, Agricultural Experiment Station
State Utah

Check one:
____ Multistate Extension Activities
__X__ Integrated Activities (Hatch Act Funds), projects identified
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity FY 2002

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

Project Number	Hatch Expenditures	Multi-State Expenditures	Total Hatch Expenditures	Nonfederal Expenditures	Other Federal Expenditures
012	0	0	0	38,565	0
091	0	0	0	37,048	0
123	0	83,666	83,666	36,172	0
214	0	0	0	46,009	208,136
244	0	167,331	167,331	431,330	416,271
286	0	0	0	292,365	324,724
326	0	0	0	669,215	670,475
334	0	0	0	22,773	37,119
342	0	0	0	0	0
343	26,650	0	26,650	44,990	55,516
355	0	0	0	0	56,389
451	0	0	0	48,827	0
551	35,654	0	35,654	213	0
737	0	0	0	5,172	0
737	0	0	0	0	6,438
737	0	0	0	5,172	6,438
787	0	0	0	40,729	121,522
811	0	0	0	47,372	6,144
885	0	0	0	573,605	79,669
912	0	0	0	0	0
Total	62,304	250,997	313,301	2,339,557	1,988,842

Goal 2. Plant and Animal Health and Safety.

Area	Project Number	Hatch Expenditures	Multi-State Expenditures	Total Hatch Expenditures	Nonfederal Expenditures	Other Federal Expenditures
Safety	153	0	0	0	0	21,237
	180	0	0	0	11,143	0
	468	0	0	0	12,205	0
	513	43,060	0	43,060	0	0
	537	0	0	0	56,451	11,937
	607	52,830	0	52,830	21,198	0
Control	103	0	31,222	31,222	0	0
	133	0	31,222	31,222	9,844	0
	400	0	0	0	293,084	1,089,838
	415	0	0	0	106,856	0
	462	0	0	0	7,432	7,625
	466	0	0	0	21,277	196,412
	618	0	0	0	25,702	0
	622	0	0	0	34,972	0
	624	40,342	0	40,342	8,232	0
	626	0	0	0	14,562	0
	636	0	0	0	0	72,351
	743	0	0	0	127,076	6,637
Safety Assurance	126	1,610	0	1,610	50,420	0
	445	0	0	0	0	0
	476	0	33,025	33,025	28,065	0
Total		137,842	95,469	233,310	828,517	1,406,035

Goal 3. Agricultural Product Enhancement.

Project Number	Hatch Expenditures	Multi-State Expenditures	Total Hatch Expenditures	Nonfederal Expenditures	Other Federal Expenditures
009	0	0	0	7,011	0
011	0	0	0	33,627	4,509
016	0	0	0	39,583	0
017	0	0	0	37,188	0
019	0	0	0	0	94,178
023	0	0	0	0	94,178
085	0	16,256	16,256	0	0
099	0	73,692	73,692	28,369	0
164	10,136	0	10,136	0	0
170	0	0	0	0	0
217	0	0	0	6,673	0
222	0	0	0	18,957	0
223	22,205	0	22,205	13,054	0
230	0	0	0	30,121	0
231	0	0	0	647,792	0
232	0	0	0	8,143	0

234	43,848	0	43,848	147,268	0
236	0	32,286	32,286	2,748	0
241	33,252	0	33,252	0	0
279	0	49,131	49,131	10,084	0
292	0	0	0	0	0
328	106,313	0	106,313	10,390	0
337	57,975	0	57,975	50,043	0
344	0	0	0	44,842	0
357	0	0	0	32,407	18,728
358	0	0	0	55,483	0
423	0	20,141	20,141	43,127	0
460	0	0	0	0	874
461	0	0	0	11,616	0
464	0	0	0	1,606	57,954
465	0	0	0	0	
470	0	0	0	0	0
472	0	0	0	11,177	0
473	0	0	0	46,563	0
479	60,537	0	60,537	4	0
483	40,262	0	40,262	42,828	0
524	0	9,476	9,476	14,662	18,123
527	72,282	0	72,282	55,733	0
533	43,849	0	43,849	67,890	17,873
583	0	0	0	2,541	0
628	49,105	0	49,105	42,498	123,224
630	0	0	0	18,823	0
632	0	0	0	0	3,293
637	0	0	0	0	36,989
735	61,389	0	61,389	63,261	0
760	0	0	0	1,137	0
762	0	837	837	0	2,796
Total	601,152	201,817	802,970	1,647,248	472,717

Goal 4: Agriculture and Natural Resources

Area	Project Number	Hatch Expenditures	Multi-State Expenditures	Total Hatch Expenditures	Nonfederal Expenditures	Other Federal Expenditures
Pasture	008	0	0	0	16,934	1,577
	013	0	11,439	11,439	15,266	0
	179	0	0	0	66,904	0
	331	13,308	0	13,308	30,554	0
	352	0	0	0	0	46,759
	362	0	0	0	35,257	51,461
	418	0	0	0	23,704	0
	797	0	0	0	39,957	0
Natural Resource Management	007	0	3,483	3,483	16,896	79,957
	010	0	0	0	23,522	0

	15	0	0	0	34,688	0
	018	0	0	0	50,232	0
	052	0	36,908	36,908	2,662	0
	173	0	0	0	283,507	505
	278	0	0	0	61,272	0
	323	22,729	0	22,729	33,679	40,448
	324	0	0	0	66,794	0
	329	0	35,000	35,000	34,467	0
	330	18,728	0	18,728	91,672	4,469
	335	0	0	0	0	682,369
	338	0	0	0	31,661	601
	340	0	0	0	54,348	29,516
	344	0	0	0	44,842	0
	345	0	0	0	89,284	0
	347	0	0	0	0	91,662
	348	0	0	0	0	85,183
	351	0	18,552	18,552	0	0
	356	0	0	0	8,000	1,181,797
	359	0	0	0	47,398	22,358
	360	0	0	0	0	215,138
	390	0	45,196	45,196	138,105	0
	431	0	0	0	27,886	0
	442	0	0	0	57,154	0
	446	0	0	0	0	0
	449	0	0	0	2,370	0
	463	0	0	0	0	9,471
	471	0	52,584	52,584	59,681	0
	627	0	0	0	17,338	0
	703	0	0	0	0	19,036
	705	0	0	0	57	938
	707	0	0	0	0	17,222
	709	0	0	0	13,511	0
	710	0	0	0	0	13,232
	712	0	0	0	0	11,116
	713	0	0	0	0	9,970
	726	0	0	0	0	13,402
	727	0	0	0	0	5,368
	729	0	0	0	0	8,479
	730	0	0	0	0	20,626
	746	0	0	0	36,148	30,884
	810	0	0	0	24,025	0
	861	20,590	0	20,590	6,944	0
	862	0	0	0	0	698,308
	905	0	0	0	28,277	8,012
	910	0	0	0	36,080	0
	911	0	0	0	19,078	72,843
	917	20,483	0	20,483	23,756	0
	919	32,671	0	32,671	662,099	0
	922	0	0	0	44,915	0
	923	0	0	0	191,348	23,316

	924	0	0	0	516	506,078
	941	0	0	0	8,945	0
	942	0	0	0	23,875	0
	943	0	0	0	15,778	0
	960	0	0	0	23,144	0
Total		128,509	203,162	331,671	2,664,528	4,002,104

Goal 5: Empower People and Communities.

Area	Project Number	Hatch Expenditures	Multi-State Expenditures	Total Hatch Expenditures	Nonfederal Expenditures	Other Federal Expenditures
Health	209	0	0	0	39,081	24,888
	220	0	4,162	4,162	33,573	11,728
	227	0	0	0	0	0
	237	0	0	0	42,548	0
	638	0	0	0	40,436	0
	847	0	0	0	11,281	0
Family	074	0	16,093	16,093	6,943	0
	353	0	14,562	14,562	5,401	0
	421	0	0	0	21,245	0
	839	9,090	0	9,090	30,319	0
	843	0	0	0	31,223	0
	844	0	0	0	28,239	0
	846	0	0	0	0	25,224
	869	0	20,865	20,865	27,856	0
	972	0	0	0	9,509	0
	974	0	0	0	4,472	216,056
	985	0	1,725	1,725	0	0
	990	0	0	0	41,942	0
Total		9,090	57,407	66,497	374,067	277,896