

Utah FY 2001 Report of Accomplishments and Results

March 2002



Utah State University Experiment Station
Utah State University Extension

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A. PROGRAMS

Goal 1. An Agricultural System That Is Highly Competitive in The Global Economy

Overview:

Some of the successes under Goal 1:

The report for Goal 1 addresses sharing gardening information to large groups of people in the state, helping homeowners solve horticulture problems, educating private and public land managers about controlling/stopping noxious weed growth, and assisting the turkey industry with information to help increase productivity. Extension agricultural programs continue to assist farmers and ranchers to increase production, decrease costs, and explore new or alternative markets.

The Ogden home and garden show is attended by thousands of people each spring. Most of these people are interested in gardening. It is a target audience of those who could benefit from our service and help. Getting information about Utah State University Extension and our programs to them is important. Inputs: Master Gardener Volunteers manned a booth that had information on our horticulture programs. Three to four Master Gardeners manned the booth at all times (over the three days) to answer questions and supply information. Outputs: We presented 10 one-hour workshops at the home and garden show using experts from Utah State University and from our community. More than 500 people attended the workshops. A total of 32 Master Gardeners donated more than 150 hours to man the booth, representing a \$1,500.00 dollar value. They reached approximately 5,000 people over the three days. Outcomes: Thirty-two Master Gardeners were trained in working with people. They feel more confident in working with the public and serving others.

Many homeowners have horticulture problems that they cannot solve. They seek correct diagnostics and sustainable control options to help them in their gardens and landscapes. Inputs: We offer a weekly diagnostic clinic, every Wednesday from 3:00 to 6:00. We use our office space and equipment, and have between two and 5 Master Gardener volunteers available to assist. Outputs: In 2001 we held 26 Diagnostic clinics and helped 410 people in diagnose their problems in our clinic. We had 15 different Master Gardeners volunteer a total of 250 hours, representing a value of \$2,500.00. Outcomes: 15 Master Gardeners improved their diagnostic skills and ability to help other people. Four hundred and ten homeowners were given a correct diagnosis of their problem and were thus better able to make a wise decision on control options.

Competitive, noxious, and/or invasive weeds reduce agricultural productivity and threaten natural ecosystems throughout Utah and the West. Weeds were identified as a key program issue in statewide stakeholders listening sessions. Better methods of weed control are needed, as well as expanded use of partnerships to accomplish mutual weed management objectives. The overall goal is to help private and public land managers stop the spread and reduce the existing acreage of noxious weeds at the state, county,

and local levels. The role of Extension is to provide education and technical support to those individuals and agencies managing noxious weeds. Extension educational programs are expected to elevate awareness, improve weed recognition skills, and to broaden support for weed management programs among traditional agricultural producers, state and federal land management agencies, and the general public. Decision-making abilities of weed managers will be improved in aspects of control method selection, timing, and execution.

Weed recognition and/or weed management skills were improved in the 2261 individuals attending Extension presentations. Weed identification and control publications increased the knowledge level in thousands of additional individuals. The U.S. Forest Service, Bureau of Land Management, and the National Park Service have developed national weed management strategies built upon fundamentals outlined in the USU wildfire/weed management model. Local state and federal land managers have expressed increased commitment to weed management as a result of our cooperative weed mapping projects. Through efforts of the Invasive Species Advisory Committee, a National Management Plan has been created to further help public land managers develop local weed management programs.

Because of the need to upgrade USU's Turkey Research Center (TRC) facilities to help turkey producers improve in and employ optimal production techniques, a modern \$160,000 growout facility has been constructed. This new grow out building is equipped with state-of-the-art environmental control for totally confined turkey production. USU now has a research grow out facility capable of evaluating turkey production practices under enclosed environmentally controlled conditions. This additional grow out building increases potential turkey production at the TRC by at least 40%, and creates the ability to raise turkeys year round.

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

Total Expenditures and FTE:

Smith-Lever \$477,546

State Match \$411,916

FTE: 16.45

Utah State University Extension Accomplishments

Title: Agronomy and Crop Production

Key Theme – Agricultural Profitability

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Description:

USU Extension Agents and Specialists are involved in agricultural research. Agents collect and summarize data on joint trials and research, many conducted on farms throughout Utah. Extension has been evaluating and updating fertilizer requirements in an ongoing program involving numerous field trials conducted on an annual basis. Dissemination of these results is done at field days, crop schools, and in research and Extension publications. In 2000-01, 11 field trials were established at various Utah locations during the 2001 field season to evaluate the response of alfalfa to P, K and S, the response of wheat and barley to N, and the response of corn to N, P and K. Three field days were held and results of the field trials were presented to 146 participants. Results were additionally presented to 223 producers at 14 winter crop schools, and two Extension bulletins and two research papers were published.

Examples of trials conducted in Utah include:

A corn silage variety trial of eight varieties.

A grain corn population trial at a farm in Hooper.

A four-year potassium fertility in a corn and alfalfa research demonstration project.

A two-year weed controls research demonstration with weed specialists in Utah and Wyoming.

An alfalfa variety trial in Uintah County.

In Millard County, 10 silage and 13 grain corn varieties in trial plots.

Some of the varieties are the old stand by that farmers use and others are new varieties that are still in need of performance data to be collect. The yield and nutrient data will be taken later this year and will then be available in all county Extension offices in the State. Seed dealers with varieties in the trials will also receive a copy of the results.

Impact:

The corn silage variety trial showed the highest yielding variety produced 2.6 tons/acre more than the lowest yielding variety. At \$30/ton this equates to a \$78/acre advantage. For Weber County, there is a possible benefit of \$254,982 on the 3,269 acres of corn silage. The grain corn population trial showed stand counts that had three replications at 32,300 plants/acre and three replications at 36,100 plants/acre. The 36,100 plant populations showed a \$38/acre (14 bushel/acre) advantage. On the 631 acres of grain corn grown in Weber County this could amount to an increased value of \$23,978.

At the present time, Millard County has about 5,000 acres of corn that is grown for silage. Silage corn in Millard County averages about 25 T/A (at 70 percent moisture) and some of the newer varieties will produce 4-5 tons more than average. If producers average even 2.5 tons more of silage per acre that would be 12,500 more tons of silage valued at \$20/T in the field would be an extra \$250,000 for the growers in Millard County if they grow the right varieties of silage corn. Grain corn averages 150 bushels throughout the county. Newer varieties have been averaging 25+ bushels more per acre. Even if you have \$4 dollars per hundredweight corn that would be \$60 more per acre for the farmer. With 2,000 acres of grain corn grown in Millard County and figured on a 25 -bushel increase at \$4.00 per hundredweight would mean an additional \$120,000 for area producers.

New varieties of alfalfa has the potential to lower feed costs and increase cash -crop income.

According to a survey of seed suppliers, greater than 99 percent of new fields were planted to improved alfalfa varieties. Comments were made that farmers are interested in the varieties that have done well in our trial and that most are willing to pay a premium price for improved varieties.

Corn, Wheat and alfalfa trials were exhibited at the Greenville Farm field day to approximately 67 field day participants. Alfalfa trials were exhibited to 32 participants at the Panguitch field day. Pasture trial results were exhibited to 47 participants at the Caine Dairy field day. Field day evaluations were conducted by County Agents.

Extension printed a new alfalfa fertilizer guide with 500 copies distributed to County Agents for dissemination to producers. A new electronic bulletin on soil pH management was also published, and an electronic bulletin on orchard soil, water and plant tissue testing returned from external review, in 2001.

Description:

Agriculture Extension Agents provide routine field surveys for Russian Wheat Aphids, Cereal Leaf Beetles, Codling Moths, armyworms and grasshoppers. Russian Wheat Aphid and Cereal Leaf Beetle have been important pests in small grains for several years and treatment costs average \$12 per acre. Western Yellow Striped Armyworm invaded Utah County in early July. Reports of extremely heavy infestations were made on 4000 acres of alfalfa from Goshen to Springville. Extension assists farmers in knowing when it is necessary to spray for these pests. Technical assistance is provided to agriculture producers through personal visits, phone calls and newspaper articles regarding pest surveys, population thresholds, spray schedules, soil problems, etc. One agent had 1708 personal contacts in response to visits, seminars, etc. to general agronomic, horticultural, and natural resource requests. The USU Extension office in one county produced six newsletters to better inform area producers about the following subjects: How to renew their pesticide license, safe storage moisture for grains, futures' workshops, scouting for cutworms, phosphate recommendations for alfalfa fields, controlling armyworms, upcoming agriculture field days, Mormon crickets, Russian wheat aphids, stem nematode, controlling white top in alfalfa, and putting up good silage. Extension handled many calls the past two years in regard to alfalfa stem nematodes so USU sponsored a producer meeting in which the USU Extension Plant pathologist, addressed the problem with stem nematodes. Agents participate with the Farm Bureau, NRCS, Soil conservation districts, etc. and many conduct noxious weed control programs and advise county weed supervisors. In one county the Winter crop school was attended by nine participants who received instruction from an agent and specialists in soil fertility, alfalfa and corn variety selection, insects, etc.

More than 35 pest advisories were issued by Extension to an e-mail list of 35 clientele and many more accessed the information on the IPM web site and via a recorded phone message in Utah County. More than 900 Utah citizens attended IPM training workshops and clinics. Fifteen extension county agents were trained at the week long Plant Pest Workshop. IPM and insect pest management information was delivered on the Utah public radio program, Access Utah, on four occasions. The Utah IPM web site was updated to

include a greater amount of relevant IPM information. Six IPM Mini -grants provided funding to county agents to develop and disseminate information on IPM. Eight counties were assisted with ordering of orchard insect trapping supplies. More than ten industry and government agency committees' meetings were attended to represent pest management perspectives.

More than thirteen hundred Utah clients were provided with knowledge on insect pest management in horticultural and ornamental plants that should increase their awareness and use of multiple insect management tools (biological, cultural, chemical, genetic) and decrease their use of pesticides.

Impact:

Field crops in one county were protected by timely insecticide applications for Russian Wheat Aphids, Cereal Leaf Beetles, armyworms, grasshoppers in numerous fields and Codling Moths in three apple orchards and numerous home orchards. In Utah County, approximately 2500 acres were not treated that otherwise would have been treated unnecessarily, saving growers \$30,000. Estimated savings of \$80,000 in potential yield loss as a result of protecting the barley against Russian Wheat Aphids and Cereal Leaf Beetles (CLB).

Based upon information from Extension entomologists one Ag Agent recommended no chemical controls but rather a timely cutting of the alfalfa to curtail damage. Every grower contacted reported success in avoiding costly damage without chemical control. Growers saved \$12 per acre treatment cost or roughly \$48,000.

Producers learned about stem nematode, what it is, how to control it and why it is important to use good production practices such as crop rotation, washing harvesting equipment between fields, cutting newer stands first and getting rid of host plants in small grains.

In one county 18 workshop participants put out Codling moth traps to determine when to spray. Six participants also collected weather data during the season. All orchardists indicated they did a better job of timing their sprays for Codling moth control.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT, WY

Title: Integrated Pest Management

Key Theme - Agricultural Profitability

Description:

The deciduous tree fruit industry was the primary target of IPM programs, and during the past several years other communities such as small grains, forage crops, and onions have been increasingly targeted. The economic production of agricultural crops is greatly influenced by numerous insects, mites, diseases, weeds, and mammals. Commercial growers have adopted many IPM techniques while attempting to maintain their economic vitality. Insecticides have been important tools for IPM programs, especially in tree fruit

production. Use of these materials may be severely limited or eliminated by the food quality production which makes development and evaluation of alternatives crucial. In Box Elder County, the Extension agent used biophenometers and insect traps to determine when to spray for four major insects and made this timely information available to the fruit growers through a telephone recorded message system. The system is updated on a weekly basis from March to October and is available 24 hours a day. Biophenometer readings were recorded weekly during the summer months.

In one county Extension trained 52 farmers and ranchers in proper pesticide application, handling, storage, etc. at annual private pesticide applicator training with Extension specialists and Dept. of Ag. Personnel. Eighty-one people were trained on the safe and effective use of pesticides. Conducted pesticide applicator training workshops and assisted applicators with certification procedures. Twenty-nine farmers in another county attended pesticide training and learned the importance of looking at other control methods besides chemicals.

Impact:

In one county farmers saved \$50,000 by not treating for Army cutworms in 2001 and did not use pesticides unnecessarily. In Box Elder County there is a reduction of chemical spray used by the fruit growers applied to apples, pears, peaches, and plums. By following the recommendations made by the USU Extension Service growers can eliminate at least one spray from their program each year. One spray per year on 1,800 acres of fruit equals 3,380 pounds less chemical that is sprayed into the environment.

Received a \$4,000 GLCI rancher grant to Stuart Johnson, which application was submitted last year, to conduct weed control demonstration. Established Johnson Ranch Rocky Mountain Iris weeds control demonstration with Utah and Wyoming Extension weed specialists. Demonstration is a complete randomized block design with three replications and six treatments to be evaluated in June 2002. The County noxious weeds control program was well managed and provided routine recommendations for herbicides. Results of potassium alfalfa fertility research with soil Specialist determined 50-75% yield increases when adding potassium to deficient soils, but not cost effective when using commercial sources of K. Established new potassium research demonstration in corn and alfalfa to evaluate effect of soil test potassium over a 4-year period and cost effectiveness of using animals manure as source of K to correct K deficiencies in Sevier County. Season evaluation presently occurring at report time.

Source of Funds: Smith-Lever, State
Smith-Lever, State

Scope of Impact:

UT

Title: Soil Sampling

Key Theme - Agricultural Profitability

Description:

USU Agriculture agents teach soil sampling through farm visits, provide probes for sampling, send samples to the USU Soils lab, interpret results, and track the number of samples and acres tested. Evaluation of the economic impacts of soil testing and University fertilizer recommendations is done at the local level by County Agents. In 2000-01 more than 250 producers were taught how to take soil and/or manure samples. Soil sampling and testing by the USU Analytical laboratory give producers unbiased fertilizer recommendations and have a record of improving profitability and protecting water from nutrient pollution. One agent tested soils for 16 farmers and fertilizer recommendations were given that covered 4,567 acres.

Impact:

In the past, isolated examples of the cost-savings associated with the use of soil testing and accurate fertilizer recommendations have amounted to approximately \$25,000 on larger farms and \$3,000 - \$5,000 on smaller farms. In one County, comparing cost of using the USU Soils lab and private lab recommendations showed the private lab recommendations exceeded USU recommendations an average \$22.66 per acre. In another county producers improved their profitability by \$103,488 on fertilizer costs.

Title: Drought Assistance

Key Theme - Agricultural Productivity

Description:

Farmers and ranchers suffered from drought during the summer of 2000. Results were decreased crop yields and reduced feed supplies. USU Extension agents assisted disaster committees and the Farm Service Agency to document losses and apply for relief. Extension agents met with the Farm Service and NRCS and completed forms to apply for a Drought Designation for their counties from the U.S. Secretary of Agriculture.

Impact:

In Uintah County producers received \$403,097 to help them cope with the losses they incurred.

Description:

In one County a hog farmer, had a bin of 100 tons of corn that was heating and spoiling. The Ag Agent assisted the farmer in determining that the damaged corn could be fed to hogs over 100 lbs. He informed the farmer that tests for mycotoxins could be done through Vet Diagnostics labs if desired.

Impact: The hog farmer saved \$4,000 by feeding the damaged corn compared to the loss if it had been discarded.

Title: Early Frost Damage Consultations

Key Theme - Agricultural Productivity

Description:

A late spring frost on June 13 damaged nearly 5000 acres of corn. It damaged field corn that was 12 to 18 inches tall at the time. Based upon information from Extension crop specialists and conditions in Utah County the Ag Agent advised growers that the corn would survive and did not need to be replanted. The Ag agent in another county assisted three farmers to assess the damage and alternatives for minimizing the damage. Two farmers were advised not to replant because the damage was minimal compared with the cost and anticipated return of replanting. It was recommended not to replant two of another farmer's fields (155 acres) and to replant a small 25-acre field. Another Ag Agent had many growers who were concerned about the condition of winter grains after two nights of freezing temperatures. He carefully observed developing kernels of grain from various parts of the producers field under the microscope and determined that many of the fields had escaped frost damage and they would not need to green chop the winter grain to salvage it.

Impact:

Based upon the recommendations of Extension Agents producers saved money in not replanting corn crops or green chopping winter grain to salvage it. Based upon avoiding the costs of replanting 5000 acres of corn at \$55/acre the growers saved nearly \$275,000. In the case where the grower did not replant two fields (155 acres) and did replant a small 25-acre field, the frost damaged corn was uneven, short and averaged only 100 bushels per acre. Still, it netted \$120 more per acre than the replanted corn. The grower's losses were \$18,600 less in the two fields not replanted than in the one that was.

Title: Onion Growers School

Key Theme - Agricultural Profitability

Description:

Extension agents worked with the onion growers in four northern counties to conduct a winter annual meeting and a summer tour. On this tour producers are able to see new varieties, drip irrigation systems, row spacing, and placement of fertilizers.

Impact:

Onion growers report that they have learned and tried at least one new practice that they have either seen on the onion tour or reported at the winter annual meeting. Many of them are using new varieties that they have seen in trials sponsored by seed companies. One grower is using drip irrigation; others are looking into it. Another grower used wide row spacing with five rows of onions per bed, and is raising as many onions on 160 acres as he did on 220 acres previously. Onion growers value the information they obtain from the meetings that are held each year. Ninety-five people attended these activities.

Title: Dairy Options Program (DOPP)

Key Theme - Agricultural Profitability

Description:

Extension provided numerous workshops concerning risk management alternatives. Most workshops involved the use of futures and options including the Dairy Options Program (DOPP). The DOPP program was available to dairymen in Cache, Box Elder, Weber, Utah and Millard counties. Pre-DOPP programs were offered in each of these counties which were open to any type of producer or agri-business firm. The workshops focused on working with brokers, using USDA reports, the Chicago Board of Trades, knowing when to sell puts and calls, and using the Internet to track and find information. During the last two years more than 1,000 people have received training in meetings relating to risk management. DOPP training was also provided by the USU Ag Extension Economist in Idaho, Oregon and Nevada. The Millard County Extension office had 12 farmers, and commodity dealers and dairymen attend the 2-day workshop.

Impact:

While the impact of these programs cannot be determined in total, several operators reported significant returns. For example, three grain producers in Millard County reported that each of them made in excess of \$20,000 using the concepts taught. Several dairymen also reported that they had made several thousand dollars each using the concepts taught. In fact, one dairyman indicated that with the low prices for milk that existed in late 2000, his use of milk futures and options was the only thing that kept his net income positive. In one county participants reported a 65% increase in knowledge about futures and options. Participants learned the basics of trading and how to watch trends. The Dairy Option Pilot Program (DOPP) has resulted in Utah having one of the highest adoption rates (on a percentage basis) of DOPP by farmers attending these seminars.

Description:

Extension works closely with members of the Utah Bankers Assn. Agriculture Committee in presenting a workshop for members of the committee at their annual meeting. The UBA Ag Committee is enthusiastic about this effort and report that it has improved lender/borrower relationships. This will likely have a high payoff for agriculture because lenders have the ability to initiate change.

Impact:

Extension provided input for the Public Service Commission concerning a Utah Power and Light proposal that would have resulted in a significant increase in the rates charged farmers of power used to irrigate. Extension's testimony, with that of others, resulted in a reduction in the rate increase from a 22.4% increase to a 5.4% percent increase. In addition, the rate increase was changed to be equal for all user groups--- the original proposal would have increased the power rates for irrigators higher than almost all other users. The net impact was a savings of about \$1.2 million annually for irrigators from the original proposal.

Title: Utah's Famous Fruitway

Key Theme - Niche Market

Description:

Each week the Extension Service in Box Elder County contacted roadside stands for information on what fruits and vegetables were available that week. The information was put on the Internet site which is entitled, "Utah's Famous Fruitway." This update took place weekly from the middle of June to the end of September. The information was also sent to newspapers, radio and television stations in Utah, Idaho, and Wyoming so they could let their customers know what is available at the roadside stands in Box Elder County.

Impact:

The roadside stand owners report that there was an increase of 20% in sales from the use of the information that was provided on the Internet. With the calculation of population figures from northern Utah, Idaho, and Wyoming, there is a potential for customers numbering close to one million. Many people use the Internet site, and a few have let us know by e-mail. Others tell the fruit stand owners. Without being able to put a counter on the site we have no idea how many hits this site takes.

Title: Livestock

Key Theme - Agricultural Productivity

Description:

A concern was expressed that beef calves from ranches in southern Utah were especially susceptible to pneumonia (bovine respiratory disease - BRD), perhaps due to an element deficiency or lack of mineral supplementation. Extension received Grant funds from the USU Mineral Lease program to conduct a field research project. An Extension Specialist and three county agents participated in the study, collected blood samples from 788 calves, from eight herds that were going into three feedlots. Records were kept on those which became ill. The analyses of sera for 29 elements and vitamins A and E were compared with sera from calves of similar breed and weight, which did not become ill. Some herd deficiencies were identified but there was no correlation between individual calf deficiencies and illness.

Impact:

A summary of information has been provided to the cooperators and agents involved. The results of the project will now be published in the national veterinary literature and also in state producer publications. The emphasis will be that element and vitamin deficiencies can be identified in individual herds and then measures should be taken for correction. However, cow-calf producers and feedlot operators should not look to supplementation as a method of preventing BRD. Rather, they should focus prevention efforts on management procedures and vaccinations near weaning.

Description:

Extension participates on a statewide Johne's Disease Advisory Committee to the Utah Department of Agriculture and Food. The committee meets regularly to develop a program to address the concern that Johne's Disease of cattle may be linked to Crohn's Disease of man and that dairy animals and products

could pose a human health threat. This perception could be devastating to the dairy industry. Greater national efforts have been made to help herds deal with JD to control and eradicate it from their farms.

Impact:

The National Voluntary Status program has been adopted in Utah so producers who desire to begin testing and certification of their herd for JD may do so. Special funding was obtained by the Committee for the UDAF. . These funds will allow testing of 30 cows from each of more than 200 herds in Utah, through the Utah Veterinary Diagnostic Laboratory. Twenty -one herds have now entered into this program. A seroprevalence study was conducted on blood collected from cull dairy and beef cattle at their slaughter. This showed that the incidence in Utah is similar to the levels found in other states from like studies. This should help convince producers that JD is a problem here and that many of them can avoid it if they will implement specific management procedures.

Description:

A local cattle slaughter facility expressed the perception that cattle they obtained from Canada had less liver condemnations than did cattle obtained locally from Utah and other western states. Data collected by Extension from the company's records was summarized to analyze for the actual liver condemnation rates. A senior pre veterinary student assisted with the data handling and summary.

Impact:

Extension provided data and charts to the company and discussed the results. No difference was found in the mean percentage of liver abscesses of the U.S. and Canadian cattle (13.7%). There were a lower mean percentage of liver fluke condemnations in Canadian (12.04%) vs. U.S. cattle (16.6%). These results suggest that although there are fewer liver condemnations due to liver flukes in Canadian cattle vs. U.S. cattle, the general quality of livers in both groups of cattle are similar. The great variation in liver fluke condemnations for the different lots of U.S. cattle (0.00% - 72.50%) suggests that some of the cattle had been infected with liver flukes since they were at the cow -calf production facility. Some U.S. cow -calf producers need to implement better methods for control of liver fluke infestations in their herds. This information has been provided to Utah veterinarians and producers.

Description:

Extension has been involved with the increased threat of foreign animal diseases into the U.S. The ADDS Department has several animal production farms at USU. A project was initiated to make these operations more biosecure and reduce the risk from outside diseases. Areas for public access were designated as well as restricted areas where visitors should not go without proper clothing and someone to accompany them. An email list server system was established through Extension to aid in communication during an outbreak of a severe animal disease problem. The list includes approximately 180 veterinarians throughout Utah and enables any on the list (including the State Regulatory Veterinarian) to get a message sent to all the others at one time. It is called "Utah Veterinary Alert."

Impact:

The materials, guides and fact sheets have been posted on the Extension Animal Health web page and County Agents and veterinarians have been directed to them. This should enable Utah producers to implement similar practices on their farms. With all the visitors anticipated for the Olympics as well as the current terrorism threats, this precaution is very timely. The Utah Veterinary Alert system has been used to keep veterinarians informed about several disease outbreaks in recent months, 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), and the anthrax bio terrorism problem in the mail system. Their awareness and experience with it enable rapid communication whenever needed.

Title: Feed Rationing, Marketing Pools, Livestock Selection

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Key Theme - Animal Production Efficiency

Description:

Extension agents and specialists work with agriculture producers to maximize livestock production and profits. Extension agents provide feed rationing analysis, assist with marketing pools, explore alternative winter feed options, work with feedlots, livestock selection, range supplements, and predator control. They also work with numerous ranchers on weaning calves, branding calves, vaccinating cows, and a variety of management activities.

Extension worked with the National Ram Sale management on the sifting committee to determine the breeding and conformational soundness of 450 rams being offered for sale to commercial sheep producers from throughout the intermountain region. Extension educates the seedstock producers as they evaluate their animals. As Extension finds animals that have deficiencies they take the time to ensure that the producer understands what the problem is, what causes it and how he can correct the problem in the future.

They assist counties in applying for grants, helping one county receive a \$20,000 sheep predator control grant from the Utah Department of Agriculture and Food. One county Extension office helps a committee organize a lamb pool each year with scheduling, weighing, shipping and record keeping.

Turkey growers have expressed interest in receiving production information and research findings from Poultry Extension and the USU Turkey Research Center (TRC). A three-ring binder, entitled "Growers' Resource and Research Reports," has been made available to interested growers. This resource book can be continually updated with new research findings, newsletters, etc., as they are published or distributed through Poultry Extension.

Extension has been involved in upgrading the TRC facilities with modern \$160,000 growout facility. This new growout building is equipped with state-of-the-art environmental control for totally confined turkey production. USU now has a research growout facility capable of evaluating turkey production practices under enclosed environmentally controlled conditions. This additional growout building increases potential turkey production at the TRC by at least 40%, and creates the ability to raise turkeys year round.

Impact:

In 2001, the Summit County Lamb Pool (30 members) shipped and sold 1,245 lambs. The pool received \$.46/lb for their lambs. When you compared sale expenses and prices received by the producers with the local auction prices and expenses, the producers received \$10,536.00 in additional income by pooling their lambs together.

Extension helped, two operators in checking (palpating) their 144 rams for epididymitis. Of the 144 rams checked, nine were detected having epididymitis. The nine rams were separated from the rest of the ram herd and culled. By doing this each year, these two operations have reduced the incidence of epididymitis from 15% down to 6% since the beginning of the program a few years ago.

Rationing - Extension helped a feedlot operator by teaching him how to run Taurus, a least cost rationing program. In most situation Extension helped reduce his feed costs by five cents per pound of gain. He is feeding 600 head of cattle and this will save him on the average \$60 a day in feed costs. Over a feeding period of 120 days that is \$7200.

Another operator changed his ration and cheapened it up by two cents per pound of gain per day. This feedlot is feeding one thousand head of cattle so this will save him \$4800 in feed cost over a 120 days feeding period. In working with another producer Extension was able to change his ration for cattle and get it to 38 cents per pound of gain per day. This was a savings of four cents per pound of gain per day. One dairyman improved his dairy ration which increased profit ability \$1.29 per day per cow for a 40-cow herd over 90 days resulting in increased profitability of \$4,644.

One Extension Agent consulted with several ranchers to design a least cost, balanced nutrition program for their operations using available forages and purchased supplements. Most of the producers consulted were able to shorten the time they feed expensive protein supplements saving \$8 to \$12 per head for the winter feeding period while maintaining sufficient body condition.

Some producers indicated that they would look at using whole cottonseed instead of their normal protein supplements based on an Extension entitled "Feeding Whole Cottonseed as a Range Supplement" at the Utah/Arizona Range Nutrition Workshop in St. George and Prescott, Az. Producers can save up to \$1.80 per head per month on protein supplementation costs. This can equate to as much as \$1,300.00 per month for some producers.

Extension assisted a cattle rancher in weighing his steers. His steers averaged 550 pounds, which was 30 lbs. heavier than what he had guessed and his heifers averaged 500 pounds, which was 20 pounds heavier than what he thought. By doing this he was able to market his cattle for five cents a pound more on his steers and three cents a pound more on his heifers. His income from his steers increased by \$1375 and the income from his heifers increased \$675.

One producer reported that because of an Extension workshop about using corn or a grain commodity to stretch out his hay for his cows, he had done so and saved several thousand dollars in hay costs. He bought millrun and mixed it with what hay he had raised instead of buying \$100 hay.

Thirty producers, including eighteen Native Americans were taught alternative feed resources for the winter months and after the program eight producers were given individual help to calculate rations for their individual operations. One producer at Fort Duchesne found that he could substitute 10 lbs. of hay in his daily cow ration with 6 lbs. of whole corn and save \$150 per month for his 50 cow herd.

Extension worked with two feedlots to decrease the incidence of acidosis. In one of the feedlots we calculated that the problem was costing five cents per animal per day. This meant an increase in feed costs of \$36,500 over a one year period. We feel that we have decreased this loss in efficiency by 25%.

Ninety-eight dairymen learned ideas that have had a positive effect on the success of local dairies. One dairyman had been losing a lot of his calves and had started sending his calves to a custom feeder. After the Extension training he decided to keep his calves and try some of the "tricks" he had learned at the seminar. One month later, he reported total success with all calves born on his dairy since the seminar. Six months later he had lost only one calf from a herd of almost 400 cows. He estimated a conservative net savings of more than \$30,000 annually with reduced death loss and availability of quality replacements to put back into his herd. Another dairyman said, "I am over 50 years old and I finally learned how to raise calves successfully."

Over the sixteen years that Extension has been involved with the National Ram Management the volume of problems has decreased by perhaps as much as 300%, which has led to several thousand dollars of increased productivity for the sheep producers that purchase these rams, in addition to the savings by increased productivity and decreased turnover of their ram batteries.

Title: Weed Control

Key Theme - Agricultural Profitability, Invasive Species

Description:

Extension established or continued weed control demonstration and research studies in four Utah counties and conducted GPS field surveys of invasive and noxious weeds on the Utah Division of Wildlife Resources' Hardware Ranch, Bud Phelps W.A., and Rich County. The Extension weed specialist served on the National Invasive Species Advisory Committee, the Center for Invasive Plant Management's Board of Directors, the Utah Weed Control Association Executive and Program Committees, and the WSSA Local Arrangement Committee.

Extension, in cooperation with weed boards and county weed departments, conduct annual public weed awareness programs. The program involved advertising to the general public the threat posed by the different weeds, what they can do to control them, and give 5 gallons of a pre-mixed herbicide to program participants. In addition to the herbicide, each participant received a product label giving the details of the herbicides. Five hundred thirty-one individuals picked up 2655 gallons of the herbicide.

Impact:

Weed recognition and/or weed management skills were improved in the 2261 individuals attending Extension presentations. Weed identification and control publications increased the knowledge level in thousands of additional individuals. The U.S. Forest Service, Bureau of Land Management, and the National Park Service have developed national weed management strategies built upon fundamentals outlined in the USU wildfire/weed management model. Local state and federal land managers have expressed increased commitment to weed management as a result of our cooperative weed mapping projects. Through efforts of the Invasive Species Advisory Committee, a National Management Plan has been created to further help public land managers develop local weed management programs.

In one county, participants in the Annual Weed Awareness program told Extension that they used to have large spots of Whitetop and now it is almost gone as a result of the program. During this year's program, nearly 266 acres of weeds have been sprayed. At a commercial rate of spraying around homes of \$40.00 for .5 acres, \$21,280.00 was saved by those participating in the program.

Title: Urban Gardening

Key Theme – Urban Gardening

Description:

Extension Agents and Specialist are involved in urban gardening. Extension helps home owners and community organizations understand what types of landscaping plants and trees grow best in their counties. Through individual visits, workshops and seminars Extension agents and specialists teach people about yard care, fertilizers, garden cleanup and preparations, pruning, frost damage, lawn care maintenance and watering. Extension also works with volunteers in the Master Gardeners Program. Horticulture classes are taught that present lawn and garden management practices. Extension sponsors community gardens and advises municipalities and counties on landscaping and lawn care maintenance. Extension personnel are involved in conducting water audits for communities.

Impact:

One Extension agent helped counties purchased conservation trees through the Utah Association of Conservation District's annual tree sales. He helped to distribute the trees and informed clients on proper planting techniques. More than 2,000 trees were planted in Kane and Garfield Counties. These trees represent an economic value of approximately \$275 per tree. Assuming a 75% survival rate, the value of these trees would be \$550,000.

In one county, thirty-three people saved more than \$33,000 by attending Extension Landscape class by improving their own knowledge of landscaping and designing and constructing their own landscape. One hundred people improved their pruning skills by attending one of four Extension workshops.

An estimated 50,000 people used the Ogden River Park during the past growing season. Many of these people gleaned new ideas from the gardens to implement in their own landscapes. They became aware of the programs Extension has to offer. The Parkway received more than \$2,500 in donations in plants and goods from private citizens to build the Japanese garden and other plantings. The gardens are a source of community pride as is evident from the letters received and written to the local paper throughout the year.

The Master Gardener Program in Weber had 52 people take the Master Gardener classes. Of the past year participants 15 completed their hours and graduated from the program. Seventy-nine Master Gardeners donated a total of 1,700 hours to their communities, Utah State University, and the botanical gardens. This service and expertise are valued at \$17,000. Seventy-nine Master Gardeners improved their skills at working with the public. These same Master Gardeners increased their own knowledge of horticulture through helping others. Fifty-two people who took the class improved their own horticulture practices in conserving water, in the proper uses of pesticides, and in making wise decisions when purchasing horticulture products.

Extension helped a local city save \$4,000 per year in lawn care services by working with their city manager and city employees who had pesticide licenses. Work that was being contracted to a private lawn care company that the city employees were capable of doing was reduced. This same Extension employee obtained a grant in the amount of \$500 to purchase landscape and shade trees for in front of the Garfield County Courthouse and replaced the dead trees at the Panguitch City ball park. Sixteen trees were purchased and planted. Currently, the survival rate is 100%.

Extension helped a commercial establishment save \$9,000 by midsummer as a result of an irrigation audit.

More than 400 volunteers completed three major community service projects at the Utah Botanical Center. The first project included trail clearing, dyers woad weed removal, old fence removal, and trash pickup around the four ponds at the site. Two 24 foot dumpsters were filled with trash. The second project included weeding the plant collections moved from the old Farmington garden and placing a gravel weed barrier along 2000 feet of vinyl fencing. The third project was to build a gravel sidewalk around the new greenhouse complex and to erect 2000 feet of construction fencing around the pond dredging project. Master gardeners served as project directors for all of the projects. Community volunteers were recruited with the assistance of five different church groups in Kaysville.

In Cache County participants in the community garden reported that the gardens gave them a chance to get outside, accomplish a specific task, to meet others in the community with similar interests, as well as raise garden produce they could use. The market value of vegetables produced in the garden plots was estimated at \$146.70/plot. Vegetables grown by one of the garden assistants to verify this estimation included zucchini, spinach, beets, tomatoes, corn, onions, and carrots. With 83 plots in the community garden this amounts to a total of \$12,176 worth of produce. Those gardeners who grew more than they could use donated fresh vegetables to the local food pantry. Four hundred pounds of vegetables were donated this

summer. Of the surveys returned by gardeners, 82% replied that they were satisfied or very satisfied with the gardening experience this summer.

**Utah Agricultural Experiment Station
Progress Report on Plan of Work Goals: 2001**

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 cannot identify a clear “program” for this POW. The specific projects do address various issues related to production, processing, and marketing.

Goal 2. A Safe and Secure Food and Fiber System

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Overview

Food safety issues are addressed on multiple levels by USU Extension specialists and county educators. 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. More than 600 Pressure canner gauges were tested by Extension agents. 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 statewide by satellite quarterly, 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 (89%) in passing the food safety certification examination. During the last year, 281 food service managers were trained. Prior to this we trained 673 managers. This puts us very close to our goal of one thousand food safety managers in the first two years of offering the course. 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 biosecurity 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), and the anthrax bioterrorism problem in the mail system. 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 who 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.

Fresh from the Heart: In the year 2000, 51,000 pounds of produce was collected statewide from home gardeners, farmers, and community gardens and donated to food banks, pantries, and the Navajo Nation.

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

Total expenditures and FTE:

Smith-Lever \$246,466
State Match \$212,594
FTE: 8.49

Utah State University Extension Accomplishments

Title: Food safety training, Food Safety Manager Certification

Key Themes - Food Handling, Food Safety

Description:

Mandatory training and mandatory certification for food service establishments became a legal requirement in Utah in 1999. Utah State University developed a training course and a certification exam that was approved by Utah State Department of Health. The USU Food Safety Managers Certification Course is offered statewide by satellite quarterly, 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 (89%) in passing the food safety certification examination. During the last year, 281 food service managers were trained. Prior to this we trained 673 managers. This decrease reflects improvement in availability of trained managers. In addition to English, the exam is also available in Spanish and Mandarin to assist minorities.

The Utah Coalition for Food Safety Committee, with Extension in the lead role, produced and disseminated a fact sheet on control of S. enteritidis to health inspectors, restaurant managers, bed and breakfast, hotels, food processing companies and consumers.

Impacts: Food poisoning from public food establishments has been on the rise in Utah in recent years; however, according to state statistics, the rate of food poisoning is on the decline because of food safety educational efforts and mandatory certification. Utah State University's teamwork with the Utah State Department of Health has paid off. The current S. enteritidis rate is less than a third what it was a year ago.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Food Safety/Food Preservation Training for Consumers

Key Theme - Food Safety, Foodborne Illness

Description:

Safe home preservation of food is an on going and important issue for Utah families because of the high interest in food storage and emergency preparedness. Extension is the only primary source of training in safe home food preservation and pressure canner testing. For those who home-preserve vegetables and meats, a pressure canner must be used for safe processing; otherwise there is an increased risk for food poisoning.

General activities Over 600 Pressure canner gauges were tested by Extension agents throughout the state. Altitude adjustment information is included with gauge testing. Over a thousand calls per year is conservative estimate of phone calls received pertaining to food preservation per year. Educations of clientele is through workshops, lectures, newsletters, newspapers, radio broadcasts and TV.

Impacts:

Approximately 6-20% of the pressure gauges tested by Extension staff do not give an accurate reading, which could lead to improper handling of food and subsequent food poisoning. 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.

Hand Washing and Personal Hygiene

Description:

The importance of washing hands has been taught to thousands of school children in Utah through the use of GloGerm in the schools and as part of the science curriculum workshop for sixth -grade teachers. One NEP Nutrition Assistant worked with 1,406 children.

Students and teachers learned about the importance of hand washing to prevent colds and other illnesses. GloGerm was used with a black light to show students if their hands had been completely washed and where they needed to wash more effectively. Children are more aware of the importance of washing their hands after going to the bathroom, coughing, playing outside, etc. to help eliminate the spread of germs.

Impact: A survey of 252 sixth-grade students reveals the following information regarding the washing of hands: Seventy-three percent will always wash their hands before each meal following time in the classroom. Fifty percent responded that they would always be careful not to touch other things when working with food compared to 13% who had indicated that they were always careful prior to taking the class. 60% of the students surveyed stated they would always take extra precautions not to pass germs to other after coughing or sneezing after their experience with GloGerm compared to only 4% who stated they were always careful prior to this educational experience. When cleaning up the counter top after working with meat, 52% stated they would take special care to use cleanser to wipe off the counter after receiving the GloGerm lesson compared to a total of 13% who felt they were always cautious to wipe down before the class.

Title: Beef and Dairy Quality Assurance

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Key Theme - Food Safety, Food Security

Description:

Objective: Minimize threats to plant and animal production. Beef Quality Assurance has become an emphasis in most beef producing states. Utah producers can and need to do better in several areas to maintain the excellent quality of the product they produce. An area of needed emphasis is reduction of injection site lesions in the prime cuts of meat. A chronically ill calf (which would not complete the feeding period) was injected with medications at appropriate and non appropriate sites. Eleven days later he was killed and the carcass used to demonstrate the type of lesion which come from injection of medications. A videotape was prepared from this demonstration for use with producer groups.

Impact: Copies of the videotape were provided to all the County Ag Agents in Utah and it has been used in other programs here. Additional copies have been sold throughout the western states and across the US.

General Activities: The threat of introduction of foreign animal diseases into the US has increased in recent years. Our producers need to change policy from that of an "open gate" to one of "biosecurity." Management procedures and barriers can be used to reduce the risk of introduction of animal diseases from neighboring farms or from outside the country. Steps have been taken to insure campus farm animals are biosecure and reduce the risk from outside diseases. Guidelines on biosecurity have been developed and an email list-server system established through Extension to aid in communication during an outbreak of a severe animal disease problem. The list includes approximately 180 veterinarians throughout Utah and enables any on the list (including the State Regulatory Veterinarian) to get a message sent to all the others at one time. It is called "Utah Veterinary Alert."

Impacts:

The Utah Veterinary Alert system has been used to 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), and the anthrax bioterrorism problem in the mail system. Their awareness and experience with it enable rapid communication whenever needed.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT, CO,

Title: Utah Pesticide Impact Assessment Program

Key Theme - Food Safety

Description:

Pesticide applicator training programs to prepare pesticide handlers for certification and re-certification training were conducted throughout the state. Utah pesticide applicator training programs train pesticide applicators to use pesticides responsibly.

Impacts: 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. Applicators who complete the USU sponsored training program report (79-80%) that the program is good or very good and that it helps them realize the importance of becoming a certified applicator.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Integrated Pest Management

Key Theme - Food Safety

Description:

The food safety program in Utah responds to public concerns about pesticide and drug residues in food. Proper use of pesticides in Utah helps reduce the chance that pesticides will enter water and that the pest management strategies will become part of a non-point source pollution problem.

General Activities: The IPM project leader collected weather data, ran weather-based models to use in predicting insect and disease activity, provided county agents with insect and disease advisories, and recommendations for managing pests. In addition, pest advisories and information concerning the timing of pesticide treatments were supplied to stakeholders via code-a-phone system, email, the world-wide-web (www), and workshops and seminary. Over 35 pest advisories were issued to our e-mail list and many more accessed the information on the IPM web site and via a recorded phone message in Utah County. More than 900 Utah citizens attended IPM training workshops and clinics. Fifteen county agents were trained at the week long Plant Pest Workshop. IPM and insect pest management information was delivered through public radio programs on four occasions. The Utah IPM web site was updated to include a greater amount of relevant IPM information. .

Impacts:

Commercial and home gardeners in Utah are being provided with training and resources to facilitate decreased and/or wise use of pesticides.

Title: Food Bank Assistance

Key Theme - Food Accessibility and Affordability, Food Recovery/Gleaning

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Description:

One of the objectives of the food bank assistance program is to improve access to an affordable, healthful, and culturally relevant food supply. Assistance in providing adequate food in Utah has a multi-prong approach. Financial classes taught in the counties have a major component on managing the food budget. Utah also has a higher home storage of food per capita than any state. This provided direct security to a family if for example the breadwinner becomes unemployed. However, it also means Extension has to accent appropriate storage conditions and times.

Every month 20,000 people in the Salt Lake Valley request emergency food assistance. An additional 20,000 are fed statewide. Thirty-nine percent of these are children. Every year thousands of pounds of fresh produce from fields, orchards, and home gardens are not used and spoils. This produce can be collected and donated to food banks and other organizations to fight hunger and improve nutrition of those receiving emergency food assistance.

General activities

Eating Better for. Less: A training tool being used is the "\$1.50 dinners." These dinners illustrate how much you can spend on the largest meal of the day, per person, if you are on food stamps. Participants in the programs must make decisions on what they can keep in the meal that will actually get to eat.

"FRESH FROM THE HEART" is an ongoing program to collect fresh produce and donate to emergency food systems. Donations drop off locations were set up in six garden centers in Salt Lake County from July through October. Public can drop off excess produce at these centers. Master Gardener volunteers collect the produce from the drop off sites and take it to the food bank. A teen coordinator and an Extension agent

wrote and received a National 4-H Council and Kraft “Feeding the Hungry” Grant to assist in funding the program. Teens distributed flyers and posters to public places such as grocery stores, city offices, etc. The program also encourages volunteers at food banks and implementation of community gardens to teach growing for self sufficiency and contributing to food banks. Volunteering promotes education of emergency food systems.

Impact

A video showing ways of living within a tight budget has been produced and more than one thousand families trained through financial classes, food storage workshops and “\$1.50 Dinner” presentations. This has resulted in stretching of food dollars and decrease in waste of food.

Fresh from the Heart: In the year 2000, 51,000 pounds of produce was collected statewide from home gardeners, farmers, and community gardens and donated to food banks, pantries, and the Navajo Nation. The program is still going through the end of October for 2001. At least 95 youth and adults volunteered at the food bank increasing their knowledge of the emergency food system and distribution of food. Eighty youth and adults participated in Salt Lake County community gardens, learning to grow their own food and contributing produce to the Utah Food Bank.

Utah Agricultural Experiment Station Accomplishments

Planned Program Area: 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

Brief Description/Impacts: 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 demonstrative that this is the causative mutation in SLS. 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, is 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: Research has been successful in developing a new *bluetongue* virus (BTV) diagnostic synthetic peptide-based immunoassay, e.g., SPIBE (Synthetic Peptide Immunoblot Assay). 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. In addition, 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), though no dollar estimates of impacts are yet available.

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

Brief Description/Impacts: 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 vaccinia virus vector. 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 and Productivity

Brief Description/Impacts: 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). 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. No estimates of reductions in environmental cost are available.

Plants -

Interactions Between Cereal Aphids on Crop and Non-crop Hosts

Brief Description/Impacts: 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 species (plant quality) and each aphid species' response to the same modification of the plant host. This research demonstrated that plant responses to herbivore feeding can vary even when two herbivores feed in the same way and are closely related. In agricultural systems, high specificity in plant responses means that the use of plant elicitors (such as jasmonic acid) to induce defenses should be preceded by a careful examination of their effects on a broad spectrum of insects. 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

Brief Description/Impacts: Studies continued on the mechanism of action of the plant bacterial cyclic lipodeptide and antifungal agent, syringomycin E. The findings continue to show a major role for lipid headgroups - particularly of sphingolipids (fats and related compounds widely distributed in animal tissues, particularly cell membranes) - in the antifungal action of syringomycin. This project will determine how a class of bacterial metabolites produced by a postharvest fruit biocontrol agent works to suppress fungal disease. Knowledge of the mechanism of action will provide clues for the development of safer and more effective antifungal biocontrol agents.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

153	468	537
180	513	607

Funding Level: \$369,701.24

SY FTE: 2.07

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. 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. Once again, this section is broken into “Livestock” and “Plant” components.

Livestock -

Control of Animal Parasites in Sustainable Agricultural Systems

Brief Description/Impacts: 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 cryptosporidiosis. 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. There are no good measures in terms of economic impacts to humans, but 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

Brief Description/Impacts: 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. While 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. Estimates of economic or social impacts are not yet available.

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

Brief Description/Impacts: 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. These studies verify that a mineral’s form significantly affects the toxic potential of the mineral. The iron concentration in the water in the ferrous form is much more toxic than dietary iron (which is in the ferric form). Similarly, the iron content of fertilizer is apparently not bioavailable, suggesting that it is in the form of an insoluble ferric salt. Since water iron content occurs as a soluble ferrous salt, the occurrence of high iron in ruminant water is potentially of great economic impact. 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 is estimated to be \$2 million/year. These findings will allow proper education of farmers, ranchers, and dairy owners as to the potential effects.

Gamete and Embryo Toxic Effects of Ammonium in Cattle

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: More than 35 minor food crops and a large variety of nursery and landscape crops are grown in Utah. The total value of Utah's minor crops is \$82 million and represents 45% of the value of all crops 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. 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

Brief Description/Impacts: 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*. 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. 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)

Brief Description/Impacts: 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 insect) 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. This research is still in progress and will form the foundation of information on which future applied studies will be based.

Plum Curculio Behavior, Ecology, and Management in Northern Utah

Brief Description/Impacts: Plum curculio (PC), a quarantine insect pest in Northern Utah, occurs in approximately 50 square miles, centered near Brigham City, in Box Elder County. PC is primarily found in unmanaged sites, home yards, and wild plum. However, the main host of the PC is sweet cherry. The existence of PC precludes the exports of fruit to outside markets. 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*

Brief Description/Impacts: 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. 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. Based on this information, tolerance of fungi as a biocontrol agent will be improved.

***Puccinia Thlaspeos* as a Biocontrol Agent for Dyer's Woad**

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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. Tillage type and timing appeared had little effect on JG infestations in succeeding wheat crops. 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 are effective for other weed species encountered in wheat besides JG.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

103	462	624
133	466	626
400	618	636
415	622	743

Funding Level: 2,298,0843.41

SY FTE: 6.82

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

Brief Description/Impacts: 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. It was recently demonstrated that an important mechanism of action of PAs in animal cells involves the formation of both DNA-DNA interstrand and DNA-protein cross-links. 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. One possible outcome of this research is improved animal, as well as human, health.

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

Brief Description/Impacts: 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. 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. Though younger birds are more susceptible than older birds, 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

Brief Description/Impacts: 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. 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: \$224,154.34		SY FTE: .80

Scope of Impact: National and International

Goal 3. A Healthy, Well-nourished Population.

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 faculty on campus and in the counties are responding very well to local and state-wide needs. The impacts reported here reflect a very successful program of work.

Total expenditures and FTE:

Smith-Lever \$185,793

State Match \$160,259

FTE: 6.4

Utah State University Extension Accomplishments

Title: Nutrition and Health

Key Theme - Human Nutrition

Description:

A healthy population is dependent on having sufficient nutritional knowledge to choose appropriate foods and to form desirable eating patterns. Teaching basic nutrition information was established as a priority for

Extension families in Utah and is part of every county's activities. Three USDA information sources are used—Dietary Guidelines for Americans, The Food Guide Pyramid and Nutrition Facts Label. Programs in the counties varied in duration, mode of presentation including mass media, technology and face to face, and included all age groups, infants, children, adolescents, adults and seniors. Nutrition information has been provided to specialized groups including mentally and physically impaired individuals, free living and those who were institutionalized. A special effort has been made to provide nutrition information to ethnic groups, especially Hispanic families who have immigrated in large numbers during the last few years. More than 10 percent of the population of Utah is Hispanic according to the 2000 census, an increase from 2 percent since the 1990 census.

Impact:

Improvement in diet quality and increase in knowledge is indicated by the Utah State University Customer Satisfaction Survey, 1999-2000. Thirty-four percent of extension customers sought information on family and consumer sciences. More than nine in 10 (94%) reported that their expectations were met. Seventy-nine percent said they had put the information into use, and 72 percent said they had shared the information with someone else. Eight counties have created ethnically sensitive nutrition education materials.

Source of Funds:

Smith-Lever

Scope of Impact

UT

Key Theme - Human Health

Description:

The role of good nutrition and a healthy lifestyle is central to the prevention and delay of chronic disease, increased life expectancy, missed work and school, and reduced medical bills. Because of current research extension customers request the newest information on health maintenance and disease prevention. Fact sheets, reliable web sites, publications, workshops and mass media messages were presented to more than 40,000 individuals. Programming included weight management, dining with diabetes, eating healthy, low fat cooking, healthy treats, use of food supplements and vitamins, osteoporosis and bone health, healthy heart diet, diet and pregnancy, fish in family meals, five a day, second adulthood – positive aging, taste in the senior years.

Impact:

One hundred and seventy-four individuals who participated in a weight management course reported reading food labels before making food purchases, more frequent exercise, and eating less fat. Ninety-eight individuals who took the dining with diabetes series reported an average weight loss of 10 pounds with some participants losing as much as 28 pounds. The average BMI (body mass index) decreased from 35.8 to 33.2, the average waist measurement decreased from 43.3 inches to 40.9 inches, average hip

measurement decreased from 48.1 to 45.8 inches. Self evaluation scores for knowledge and behavior improved from an average of 2.2 to 3.4 (on a scale of 1-5).

Nine nutrition articles were printed in the Salt Lake County newsletter (circulation about 3000), ten nutrition related articles were printed by the two major Salt Lake newspapers (circulation 70,000- 125,000), five nutrition articles written for professional association newsletter (circulation 125 -650), three articles in the Ensign magazine (circulation 800,000).

Source of Funds:

Smith-lever

Scope of Impact:

UT

Title: Expanded Food and Nutrition Education Program (EFNEP)

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Key Theme - Human Nutrition

Description:

EFNEP (USDA Expanded Food and Nutrition Education Program) was created in 1969 for the purpose of improving the diet and health of low income people. For more than 30 years trained para professionals have been teaching a concentrated series of lessons on nutrition and food management to Utah families enrolled in the program. Supplemental funding comes from the state of Utah and since 1998 a grant from USDA Food Stamp Program. These combined resources support programs in all counties in Utah targeted to low income families to utilize their food dollars and food stamps wisely to purchase and prepare nourishing foods and to provide a safe food environment.

Impacts:

- * Taught 1599 families (21% Hispanic)
- * Taught 5482 family members (53% had children 0-5 years old)
- * Taught 13,111 4-H youth at risk
- * 51% of families were enrolled in one or more food assistance programs
- * 94% of families had a positive change in food intake quality
- * The number of regular daily servings of vegetables eaten changed from 2.0 to 2.7
- * The number of calcium/dairy servings eaten changed from 1.6 to 2.2
- * Money spent on food/person/month changed from \$79.60 to \$73.10
- * 90% of homemakers showed improvement in one or more food resource management practices (plans meals, compares prices, do not run out of food, uses a grocery list)
- * 93% of homemakers showed improvement in one or more nutrition practices (plans meals, makes healthy food choices, no additional salt added, reads labels,

children eat breakfast)

*60% of homemakers showed improvement in one or more of the food safety practices (thawing and storing foods properly)

Source of funds:

Smith-Lever

Scope of Impact:

UT

Utah Agricultural Experiment Station Accomplishments

Planned Program Area: 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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?

Brief Description/Impacts: 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). An analysis of TTA characteristics suggests consumers are willing to pay most for additional assurances for food safety, then animal welfare, then traceability. In conducting economic experiments in the U.S. and the U.K., 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.

Identifying Markets and Market Niches for Utah Agricultural Products

Brief Description/Impacts: This project has been successful in developing a method for delineating market areas based on a spatial statistic. The method was used to determine market areas in the U.S. for feeder cattle, and more recently, for beef packers in the Texas Panhandle. Through the project, our initial ideas for examining systems for tracing red meat were developed. The result generated an expanded discussion in the U.S. about the implementation of traceability systems. Our work aided Utah farmers, ranchers, and agribusiness firms in making sound economic decisions.

Enhancing the Global Competitiveness of U.S. Red Meat

Brief Description/Impacts: 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 investment decisions by farmers and ranchers during cattle cycles. 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

Brief Description/Impacts: 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. 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.

Germ Cell and Embryo Development and Manipulation for the Improvement of Livestock

Brief Description/Impacts: This study investigated the effects of Pokeweed (PWM) mitogen (e.g., a substance that induces mitosis or the process of dividing a cell) and Phytohemagglutinin (PHA) on preimplantation bovine embryo development. Embryo development to morulae and blastocyst stages was much less in PWM medium than either PHA or the control. There was no statistical difference between PHA and the control. Preimplantation bovine embryo development will be adversely affected by mitogenic agents depending on their sources. The successful application of assisted reproductive techniques that utilize embryo transfer is dependent upon good quality embryos. In vitro produced embryos are inferior to in vivo produced embryos. Based on the results of this study, it is doubtful that mitogens will be beneficial for improving embryo development.

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

Brief Description/Impacts: 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. 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.

In Vitro Production and Manipulation of Domestic Animal Embryos

Brief Description/Impacts: The synthesis of foreign proteins can be targeted to the mammary gland of transgenic animals. These results demonstrate that potentially toxic proteins can be produced in milk of transgenic animals at levels that are economically practical for uses in other work.

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

Brief Description/Impacts: In muscle, Calcineurin (Cn) transduces signals that determine fibertype, growth, and hypertrophy, and commitment to the myogenic line age. 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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 cardiomyopathy (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 cardiomyopathy. 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

Brief Description/Impacts: 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 RGD-sensitive pathway in bovine oocytes. 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

Brief Description/Impacts: 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. 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 was 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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 effectively 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.

Investigations of Voluntary Dry Matter Intake by Transition Dairy Cattle

Brief Description/Impacts: In the first year of this project, the investigator has initiated two lines of research related to the overall project objective of understanding voluntary dry matter intake . The first line involves study of novel hormones that stimulate voluntary dry matter intake. These include, but are not limited to, ghrelin, orexin, and reistin. Preliminary steps have been taken toward the study of ghrelin. The second line of research involves study of the interaction of the immune system and anti -viral gene expression as they related to feed intake. No data are yet available. Information related to intake stimulating hormones and immune status of cattle will help producers understand what controls voluntary dry matter intake of their cattle. They will then be able to impose management strategies that allow them to optimize dry matter intake for their animals.

In Vitro Embryo Production

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

Methods to Add Value to Agricultural By-Products

Brief Description/Impacts: The overall goal of this project was to develop technology for agriculture products/byproducts of low or no value, including production and processing wastes. 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. 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.

Nutrition and Food Science -

Influence of Processing on Structure and Function of Milk Proteins

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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 overwrap 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. 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

Brief Description/Impacts: 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 transferrin (BTF) are major-iron transport and regulation proteins found in bovine whey. These two iron-related proteins were immobilized using different processes. Bioactive proteins such as lactoferrin and transferrin can be affinity purified from food processing waste. Immobilized gangliosides (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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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 contributes to the ability of taste cells to respond to nutrients. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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.

Water Use and Growth of Selected Vegetables with Emphasis on Onion

Brief Description/Impacts: Irrigation timing significantly impacts onion growth and yield. Three plant populations and two irrigation frequencies were used to assess plant growth and productivity. Irrigation amounts were based on available soil water, soil water depletion, estimated evapotranspiration, published crop coefficients, and precipitation. 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. Unfortunately, no meaningful data were collected due to cold weather experienced in the growing area at critical growth periods.

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

Brief Description/Impacts: 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. 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.

Assessment of Dietary energy Availability in Utah Forage Crops Via Near-Infrared Reflectance Spectroscopy

Brief Description/Impacts: Herbage samples for calibration of a near-infrared reflectance spectrophotometer (NIRS) were obtained from irrigated alfalfa, mixed perennial cool-season grass-legume pastures, irrigated corn, and an irrigated winter cereal crop. Samples were scanned to obtain NIRS spectra and corn samples were analyzed for starch concentration by reference wet chemistry procedures. This project is in initial stages, but is likely to improve the accuracy of commercial laboratory estimation of forage feed value once reliable NIRS prediction equations are established. These equations will offer a more direct assessment of energy availability of forage sources to ruminant livestock than is available from current laboratory estimates. More direct and accurate assessment of forage feed value should permit more cost-effective formulation of livestock rations. For instance, utilizing the forage feed value, USU Caine dairy was able to reduce costs by \$20,000 as compared to paying the average price for alfalfa hay. Considering all of the dairies in Utah, costs could be reduced by as much as \$6 million/year.

Biological Control in pest Management Systems of Plants

Brief Description/Impacts: Studies were continued on biological control of insect pests (weevils and aphids) in alfalfa, and on weeds in Utah rangelands. Adult ladybirds respond strongly to variation in aphid density among fields, but less so to variation in density of larval alfalfa weevils. Reproductive activity was compared in the laboratory between ladybird females provided conspecific eggs or pea aphids. Females fed aphids laid twice as many eggs as females fed conspecific eggs. In addition, long-term field experiments and establishment studies were continued for insect biological control agents for a number of Utah weeds. Dissections of squarrose knapweed seedheads revealed infestation rates of the seed-head flies, averaging 36% at individual sites. Analysis of long-term data revealed significantly clumped distribution of galls among

flowerheads that was related in its intensity to flowerhead quality. 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.

Predator Sharing Among Insect Pests: Increase or Decrease in Predation Pressure?

Brief Description/Impacts: Studies were conducted of ladybird beetles as generalist predators of major insect pests (aphids and weevils) in Utah alfalfa fields. In contrast to field experiment results in 2000, ladybirds did not aggregate in response to local density of alfalfa weevil larvae when such was experimentally manipulated in spring alfalfa, although the predators did aggregate in response to local aphid density. Sweep sampling reinforced the conclusion that local aphid, rather than weevil, density is the primary prey factor influencing local abundance of ladybirds. The invasive species *Harmonia axyridis* was again detected in low number in Utah alfalfa fields, where it fed on both aphids and weevils. Laboratory experiments revealed that reproduction of this species is similar to that of other ladybirds in that females do not engage in active egg production when fed alfalfa weevil larva unless they are also able to consume aphids. We will determine and enhance the impact of biological control insects (predators) on target pests in Utah alfalfa. More effective biological control of pest insects can enhance agricultural productivity while reducing the need (and associated economic and environmental) cost of pesticide application.

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

Brief Description/Impacts: 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 pseudo monads. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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, nitrogenase, that catalyzes biological nitrogen fixation. Findings from these studies will provide insights into how nitrogen (N_2) 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

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

Phosphoinositide Signaling in Plant Cells

Brief Description/Impacts: 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 animal cells that accumulate other phosphoinositides in response to similar stress. 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

Brief Description/Impacts: 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. 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.

Ionic Homeostasis in Alfalfa Exhibiting Differential Salt Stress

Brief Description/Impacts: An important mechanism of alfalfa's salt tolerance appears to be the ability to sequester salts from the cytoplasm by differential ion transport and compartmentation. Preliminary data support the concept that differential ion transport occurs across cell membranes in alfalfa and that plasma membrane proteins influence alfalfa's response to NaCl. Characterizing the effects of salinity on membrane systems allows for ion discrimination and should provide information necessary to understand the mechanism(s) by which alfalfa adapts to saline environments. Alfalfa maintains and improves soils, has persistence, rapid regrowth, adaptability of diverse soils and climates, and produces abundant essential amino acids and proteins. The ability to sequester salts from the cytoplasm is an important economic trait that needs to be better understood in order to determine its relevance to other agronomic plants of economic importance.

Plant Genetic Resource Conservation and Utilization

Brief Description/Impacts: 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. 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	223	358
011	230	423
016	232	460
017	231	461
019	234	464
023	236	465
085	241	470
099	279	472
164	292	473
166	328	479
170	337	483
217	344	524
222	357	527

533
583
628
630
632
637
735
760
762

Funding Level: 4,014,837.93

SY FTE: 13.40

Scope of Impact: National and International

Goal 4. Greater Harmony Between Agriculture and The Environment

Overview:

Some of the successes under Goal 4:

The report for Goal 4 addresses agriculture, natural resource-based tourism, solid waste management, education for ranchers to improve their management skills of their land, technical assistance to varied individuals about irrigation activities.

Efforts in Extension over the course of the year 2001 have focused on facilitating and conducting research activities related to outdoor recreation and natural-resource-based tourism. Efforts here have been in four areas: a) facilitating and assisting with the work of IORT research scientists in a number of research projects for the State Division of Parks & Recreation, Bureau of Land Management, and Forest Service; b) continuing analysis of data generated from a New Faculty Research Grant focusing on rural tourism development; c) finishing a final report on survey research for the Great Salt Lake Bird Festival, and d) research associated with the Statewide Telephone Survey associated with Governor's Trails Initiative.

Large and small communities throughout Utah are experiencing increasingly difficult problems disposing of municipal sewage sludge (biosolids). Land application of biosolids is an EPA-approved method of beneficial use and a lower cost alternative than landfill disposal. Prior to 1990, very little of the sewage sludge generated in Utah was disposed of using land application. Current estimates are that more than 50% of sludge produced in Utah is land-applied. The Utah Department of Environmental Quality relies heavily on USU Extension Agents and Specialists to assist treatment plant operators in identifying and working with cooperating farmers, collecting baseline soil samples, and calculating agronomic rates. Without this assistance and the land application outlet for biosolids, treatment plants would have to use higher-cost disposal methods, and pass along these higher costs to taxpayers through increased sewage disposal fees. Conservative estimates of the cost savings to small treatment plants for disposing of biosolids via land application are \$25,000 each. Larger treatment plants may save in excess of \$100,000 annually.

Ranches in Southern Utah and Northern Arizona are almost entirely all range livestock operations. There is an ongoing need expressed by these producers for current information on range land and livestock management. The need is reinforced by the fact that most ranchers in this area depend heavily on public land grazing for their ranch viability. It is critical that ranchers and agency managers continue to learn new and better management approaches as well as continue to foster good working relationships.

Approximately 75 ranchers, agency personnel and commercial sponsors attended these workshops. Ranchers learned how other producers are integrating environmental concerns and alternative sources of income into ranch operations. They also learned about the availability of commercial livestock and vegetation management products. They participated in an educational activity focused on beef quality assurance wherein they saw first hand the results of improper inoculation techniques and improper inoculation location. This improves their knowledge of techniques to reduce carcass damage which improves profitability.

Irrigation technical assistance was provided on 41 different specific occasions to numerous individuals involved in irrigation companies; individual farmers; consulting engineers; fellow extension specialists and county agents on topics including water measurement, irrigation methods (sprinkle, surface/surge, and drip), improvement of irrigation systems, pipeline hydraulics, irrigation water management, crop water use, irrigation scheduling, and water conservation. Six thousand dollars were saved for a client by a private engineering firm as a result of irrigation crop water use provided from already available USU Extension and Ag. Experiment Station sources. The total value of irrigation engineering assistance is estimated to exceed \$50,000 annually.

State Assessment: Utah has made excellent progress toward meeting its 5-Year Plan of Work goals under Goal 4 during this reporting year. Adoption of programs and management options has occurred much faster by the affected public than anticipated. Economic benefits have increased at a much more rapid rate than anticipated.

Total Expenditures and FTE:

Smith-Lever \$484,804

State Match \$418,176

FTE: 16.7

Utah State University Extension Accomplishments

Title:

Municipal biosolids research and education program

Key Theme – Agricultural Waste Management

Description:

Large and small communities throughout Utah are experiencing increasingly difficult problems disposing of municipal sewage sludge (biosolids). Statewide, many small to medium-sized communities are in the process of cleaning out treatment lagoons and sludge pits from facilities constructed in the 1970s. Larger facilities must dispose of biosolids on a much more frequent (e.g., daily) basis. The least expensive method of biosolids disposal is land application at agronomic rates; however, few treatment plant operators know how to determine the appropriate rate, or have the appropriate contacts and access to local farm land.

Impact:

Land application of biosolids is an EPA-approved method of beneficial use and a lower cost alternative than landfill disposal. Prior to 1990, very little of the sewage sludge generated in Utah was disposed of using land application. Current estimates are that more than 50% of sludge produced in Utah is land-applied. The Utah Department of Environmental Quality relies heavily on USU Extension Agents and Specialists to assist treatment plant operators in identifying and working with cooperating farmers, collecting baseline soil samples, and calculating agronomic rates. Without this assistance and the land application outlet for biosolids, treatment plants would have to use higher-cost disposal methods, and pass along these

higher costs to taxpayers through increased sewage disposal fees. Conservative estimates of the cost savings to small treatment plants for disposing of biosolids via a land application are \$25,000 each. Larger treatment plants may save in excess of \$100,000 annually.

Description:

Excess Poultry manure in Tooele County has contributed to odor and fly control problems. Extension teamed up with Fassio Egg farms and Rich Koenig to research proper compost management

Impact:

Increased compost production while decreasing odor and fly problems. Research is on going.

Description: Proper application of poultry compost will reduce landscape salinity problems. Output: Teamed up with Rich Koenig to produce a one page fact sheet on the proper application of poultry compost to landscapes and gardens.

Impact: This fact sheet is delivered to all recipients of Fassio farm compost and will greatly reduce over application and salt burn saving landscapers and gardeners thousands of dollars in damages.

Title:

Forest Landowner Education Program

Key Theme – Forest Resource Management

Description: Private landowners generally lack information on selling timber or its value, on stand regeneration, on caring for stands of intermediate age and size, and often are not aware of other benefits forests provide. Tree and shrub windbreaks and other agroforestry plantings have a potentially important place in Utah. Landowners, agency personnel, and the general public need to be educated about the value and management of forests, windbreaks, and agroforestry plantings. We conduct a Forest Landowner Education Program to address these educational needs.

Impact:

Produced four issues of the Utah Forest News newsletter that reached 1,500 landowners; awarded a Gold Medal in the annual Educational Materials Awards of ANREP and articles are being reprinted in the National Woodland Owners Association Magazine. Forestry Taxation and Estate Planning Workshop. Tours and workshops on aspen decline in the Cedar Mountain area of Iron County were rated 9.8 out of 10 by landowners who own or affect several thousand acres of forest land, and 80% said it will affect how they manage their forest land. A conservation tree distribution program partly sponsored by Extension in Iron County resulted in potential annual benefits of \$2.3 million (assuming published figure of \$275 a year per tree in benefits and a 70% survival rate.)

Title:

Urban and Community Forestry Program

Key Theme - Forest Resource Management

Description:

Utah's urban and community forests are very valuable, but often are neglected and declining due to poor pruning, pesticide misuse, poor tree selection and placement, and lack of planting. Citizen groups, and communities need education and assistance. Extension educates professionals and citizens in many aspects of urban forestry across the state.

Impact:

Taught sessions on trees and tree care to 90 Cache, Utah, and SL County Master Gardeners that will result in at least 240 hours of time donated by those volunteers. A six-part training course on Urban Forestry for community volunteers and city staff in Weber County, trained 13 city staff and volunteers from five different cities in correct urban forestry principles, and resulted in savings of \$5,500 in one city in a short time. Determined values for 9 Logan City trees removed by a business owner that were worth \$31,770 with possible damages valued at \$95,310. Asked by the SLC Forester to examine and advise him on possible removal of 69 large cottonwoods in a park and helped him obtain support for removal of the most hazardous ones.

Title:

Forest Ecosystem Restoration, Water Quality and Resource Supply for Forest Reliant Communities

Key Theme - Forest Resource Management

Description:

Forest Ecosystem Restoration, Water Quality and Resource Supply for Forest Reliant Communities Utah's forests, particularly those managed by public land agencies, are not healthy. This is a result of the reduced ability of federal land management agencies to adequately manage ecosystems in part resulting from litigation, legal expenses and staff time addressing conflict industries. Consequently Utah's timber industry is frequently unable to obtain needed resources from public land. Frequently merchantable timber resources are small-diameter having little economic value. The timber industry is somewhat neglected as a significant contributor to the tax base and general commerce of the rural part of the state. Various timber companies and sub contractors provide the primary tool for the USFS to manage ecosystem health.

Impact:

Public land managers better understands timber industry needs and concerns. Timber industry better understands agency problems and federal processes. A plurf forum has increased communication between user groups and public land managers. Written comments in submitted regarding impact on ecosystem health, forest industry and communities as a result of proposed in second round of roadless proposal. Obtained \$40,000 grant from Four Corners Initiative to conduct ecosystem restoration at Blue Springs, improve long term water quality and to obtain timber resources for community -based timber companies.

Baseline water quality has been established through monthly sample collection. Results of meeting between timber industry and State Lands and forestry hosted in June of 2000 regarding ideas for another attempt to implement Forest Practices Act in Utah, in part, lead to the act passage by the Utah Legislature in 2001 and an additional \$100,000 being made available to USU private land education program for logger education.

Title:

Urban Forestry Volunteers Program

Key Theme - Other Urban Forestry

Description:

Our small communities need well-trained volunteers and professionals to help them with their urban forestry needs and programs. With their limited budgets and staff, they are not always able to keep up with the growing demands of maintaining a healthy urban forest. Inputs: I organized a committee made up of representatives from the Ogden Urban forestry, Utah State University, U. S. Forest service, and other professionals to develop a six part-training course on Urban Forestry. Outputs: The urban forestry workshop was a six-week course taught in May and June, where we met for three hours every Wednesday. Of the six classes, three were held in the field for hands on training. Thirteen people (city staff and volunteers) from five different cities in Weber County were taught correct urban forestry principles.

Impact:

In July 2001, as a result of the class, the city of Roy re-evaluated their urban forestry program and made some changes to their suggested tree list. This was a change (improvement) made in their maintenance and tree program that will save the city in the long-run by eliminating some problem trees. This directly affects newly planted trees in one park. It is hard to calculate exact cost savings, but we figured it probably saved as many as 20 trees. These trees cost an average of \$150.00 at purchase time. This is a savings of \$3,000.00, not calculating the cost of the trees in five years and the time lost. In August, Roy city had an outbreak of the Spruce Ips, where about 10 trees had to be removed to save others. Because the employees were trained in pest identification, they were able to detect the problem before it spread to other trees, thus saving the city from more damage. Estimated savings of \$2,500.00. In August, volunteers from the urban forestry program for Marriot-Slaterville began developing a plan for a park. This park has wetlands, some native trees and areas that need cleaned up. Because of their training, they were able to make better tree selection decisions. Trees will be used that have a longer life expectancy and fewer pest problems. This will save the city money in years to come, and create fewer problems. Three other cities are redoing their policies to bring them into aligning with current urban forestry practices.

Description:

Utah's urban and community forests are very valuable, but often are neglected and declining due to poor pruning, pesticide misuse, poor tree selection and placement, and lack of planting. Individuals, citizen groups, and communities need education and assistance.

Impact:

Thirty-five attendees rated the tree appraisal workshop “good to excellent.” My input to Utah Power was used to help them do their job better and work better with cities and customers. Facility and Grounds Management Expo presentation rated 8.45 out of 10 by participants. Total value I determined for trees for Logan City is \$31,770 and possible damages are \$95,310. Advice on cottonwood trees in Liberty Park in SLC provided by others and me helped the City Forester obtain support for removing the most hazardous trees; the SL Tribune reported on this issue several times. Presentations to Envision Utah board on urban forestry resulted in the organization deciding to produce an urban forestry chapter for their planning toolbox; I was selected chair of the committee producing this chapter. The training that others and I do at the Utah Arborist Training Series is resulting in an increase in the level of knowledge of arborists in Utah and in the number of Certified Arborists.

Title:

The Institute of Outdoor Recreation and Tourism (IORT)

Key Theme – Land Use**Description:**

The Institute of Outdoor Recreation and Tourism (IORT), currently in its third year of activity at Utah State University, has three program functions of Research, Extension, and Teaching. As Director of IORT and an Extension Specialist in Outdoor Recreation and Tourism, I work with governmental agencies and officials, non-governmental organizations, and individuals in the private sector in the general topical area of outdoor recreation and natural-resource-based tourism. Efforts in Extension over the course of the year 2001 have focused on 1) continuing to increase awareness among a number of different constituencies in Utah of IORT’s mission and program functions; 2) providing information through presentations and other means on a variety of topics related to outdoor recreation and natural resource-based tourism development; 3) developing and cultivating relationships with federal, state, and local government agencies and officials, non-governmental organizations, and individuals in the private sector; 4) collaborating with other Extension Specialists; 5) consulting activities based on requests from a number of constituencies; and 6) facilitating and conducting research activities related to outdoor recreation and natural-resource-based tourism.

Impact:

With regard to 1) continuing to increase awareness among a number of different constituencies in Utah of IORT’s mission and program functions, twenty different presentations were made to a variety of groups. As a part of each presentation, IORT’s mission and program functions in Research, Extension, and Teaching were presented. In all, approximately 1,000 individuals were made aware of IORT through these efforts over the past year.

With regard to 2) providing information through presentations and other means on a variety of topics related to outdoor recreation and natural resource-based tourism development, presentations were made to a

number of different groups on the topics of outdoor recreation, natural resource -based tourism, nature tourism, agricultural tourism, and heritage tourism.

A special emphasis this past year involved work with the Utah Farm Bureau Federation because of this organization's interest in developing and promoting agricultural tourism in the state. Initially, I presented the topics of agricultural tourism, outdoor recreation, nature tourism, and heritage tourism with the theme of developing a package of activities and experiences for tourists to the Utah Farm Bureau Federation's Chief Executive Officer, Director of Field Services, Director of Communications, and Regional Managers. Additional presentations were made for County Farm Bureau Banquets in Washington and Sanpete Counties. In July, I was a part of a panel presentation titled "New Ways to Make Money from Your Land" at the Utah Farm Bureau Federation's Mid- Year Conference 2001. My part focused on agricultural tourism as a natural ally with outdoor recreation, nature tourism, and heritage tourism. In addition, two articles were written for the Utah Farm Bureau News in May and June titled "Agri - Tourism: Improving Your Bottom Line" and "Utah Agri - Tourism: Developing a Quality Package of Activities and Experiences."

Other presentations were made to such groups as the Bear River Association of Governments (BRAG) Land Trust Planning Committee, USDA Forest Service and USDI Bureau of Land Management professional participants in the Recreation Shortcourse, the junior class of Rich High School in Randolph, Utah, business leaders and county commissioners in Rich County, Southeast Region State Park managers, and gateway business owners, tourism planners and promoters, and National Park personnel in the southern Utah counties of Wayne, Garfield, Kane, and Washington.

In early May, Karen Biers, Extension Specialist in Entrepreneurship/Home -Based Business, and I co-presented a USU Extension Satellite Broadcast titled "Opportunities in Rural Utah Through Heritage, Nature, and Agricultural Tourism."

Another special emphasis this past year was IORT's involvement with the Governor's Trails Initiative Steering Committee. As part of his Quality of Life endeavor, Governor Mike Leavitt has initiated an effort to create a statewide trails initiative. The aim of this project is to develop a framework for future funding processes, planning, development, networking, and maintenance for motorized and non-motorized trails in Utah. IORT is a member of the Steering Committee for the Governor's Trails Initiative, sponsored by the State Division of Parks and Recreation, and has been involved in a series of meetings since July. In September 2001, IORT conducted a statewide telephone survey to substantiate Utahns' opinions on trails values and benefits, awareness and use of trails, and perception of needs and preferences related to trails in the state. Preliminary results of the survey were presented at the September 20 meeting of the Steering Committee. These results provide supporting elements for the Governor's Initiative and will be utilized by the Steering Committee to make recommendations to the Governor for legislation and funding needs to develop the initiative for the 2002 Utah Legislature. Results were also presented as part of seven different Trails Workshops held in each of the Planning Districts in the state which were attended by well over 200 people. Additionally, IORT will be hosting a statewide Trails Conference on the USU campus this coming fall as part of the Governor's Trails Initiative.

In addition, although ongoing, work was completed on IORT's website throughout the year, as a component of the College of Natural Resources website. The IORT website contains information on the mission and program functions, personnel, advisory board, affiliated faculty, annual reports, publications, research projects, presentations, educational programs, websites of interest, and contact information. More and more individuals and groups have been directed to the resources available on this website, and such efforts will continue in the future.

All of these efforts have increased awareness among a number of different constituencies in Utah of IORT and provided needed information through presentations and other means on a variety of topics related to outdoor recreation and natural resource-based tourism development.

With regard to 3) developing and cultivating relationships with federal, state, and local government agencies and officials, non-governmental organizations, and individuals in the private sector, efforts have been quite varied over the past year and have included work, consultations, and research with the Forest Service, National Park Service, and Bureau of Land Management at the federal level, with the State Divisions of Parks & Recreation, Wildlife Resources, and Travel Development, and the School and Institutional Trust Lands Administration (SITLA) at the state level, and a number of Associations of Governments at regional/local levels. Additionally, IORT has developed and been working in collaborative relationships with the Western Rural Development Center, Great Salt Lake Bird Festival, the Bear River Heritage Council, and Canyonlands Field Institute.

A major effort in this area continues to be the development of IORT's Advisory Board, which now has representation from the Forest Service, National Park Service, Bureau of Land Management, U.S. Fish & Wildlife Service, Utah Division of Parks and Recreation, Utah Division of Travel Development, Utah Division of Wildlife Resources—Nature Tourism Program, Utah Rural Development Council, University of Utah's Department of Parks, Recreation and Tourism, Brigham Young University's Department of Recreation Management and Youth Leadership, County-level Travel Councils and Economic Development, and the Commercial and Hospitality Services Sectors. I facilitated two meetings of this board in 2001, the members' roles have been identified and formalized as advisory, an informal needs assessment with respect to outdoor recreation and tourism issues in the state has been conducted, and future efforts will be directed toward the development of a plan to guide IORT in meeting its mission and program functions.

Additionally, IORT continues to be involved with the Western Association of Recreation Researchers and Professionals (WARRP) as a member of the Steering Committee and Planning Committee for the Human Dimensions of Natural Resources in the Western U.S. Conference which was first held in October. I am also a member of the Planning Committee for the National Extension Tourism Conference 2002.

With regard to 4) collaborating with other Extension Specialists, a number of efforts have occurred over the past year in this area. As mentioned previously, in early May, Karen Biers, Extension Specialist in Entrepreneurship/Home-Based Business, and I co-presented a USU Extension Satellite Broadcast titled

“Opportunities in Rural Utah Through Heritage, Nature, and Agricultural Tourism.” I have also participated in a number of meetings over the course of the year with other Extension Specialists from across campus who work broadly in the area of community development. The purpose of these meetings is to share our work and explore possibilities for forming team approaches in community development work in the state. As one example of an outcome of these meetings, several of us have been working together in the National Mormon Pioneer Heritage Area Initiative. In addition, I had the opportunity to attend the USU Extension Annual Conference to represent IORT and participate in the Extension Sharefair.

With regard to 5) consulting activities based on requests from a number of constituencies, again a number of efforts have occurred over the past year in this area. Consulting activities have taken place with Bear River Heritage Area Council, the State Division of Parks & Recreation, the Great Salt Lake Bird Festival, the Governor’s Trails Initiative Steering Committee, Canyonlands Field Institute, and the USDA Forest Service. Additionally, consulting occurred with several individuals in the private sector who were interested in developing their agricultural resources for tourism.

Finally, with regard to 6) facilitating and conducting research activities related to outdoor recreation and natural-resource-based tourism, efforts here have been in four areas: a) facilitating and assisting with the work of IORT research scientists in a number of research projects for the State Division of Parks & Recreation, Bureau of Land Management, and Forest Service; b) continuing analysis of data generated from a New Faculty Research Grant focusing on rural tourism development; c) finishing a final report on survey research for the Great Salt Lake Bird Festival, and d) research associated with the Statewide Telephone Survey associated with Governor’s Trails Initiative.

Title:

Natural Resource Management Programs

Key Theme - Natural Resources Management

Description:

Medusahead rye is an aggressive winter annual grass that is unpalatable to livestock and wildlife and builds up a thick thatch smothering all other vegetation. A native of the Mediterranean Region medusahead it has dramatically increased in the Northwestern U.S. and poses a serious ecological threat through recent invasion into Northern Utah. The associated loss of plant biodiversity, grazing capacity, wildlife habitat, and increased threats of wildfires, makes it imperative to control small isolated infestations before they take over large areas.

Impact:

Participants in tours and meetings learned about the threat of medusahead invasion, control techniques, and ongoing efforts to improve control and rehabilitate affected sites. They also learned how to utilize Coordinated Resource Management Planning (CRMP) to address common problems associated with invasive plants. Landowners learned what methods of control have worked for others and have been

working to implement these practices. Although there is much to do in controlling medusahead in Northern Utah, all have made significant efforts to reduce the social, economic, and environmental impacts of medusahead invasion.

Description:

Public and private rangelands in Utah are seriously devoid of adequate monitoring efforts and assessment techniques needed by managers to assess the effects of management. This is acutely reflected by the difficulties arising in Bureau of Land Management (BLM) environmental assessments associated with 10 - year grazing permit renewals. Adequate and practical methods of tracking and in terpreting changes in rangeland condition relative to management need to be applied in advance of points of critical decision - making.

Impact:

Extension agents and land users learned the value of photographic records in interpreting management effects. The implications are that controversy is reduced and more accurate interpretations of management impacts can be made where repeat photographs have added to monitoring records. This reduces the likelihood of unwarranted decisions being made that create negativ e social and economic impacts in rural communities.

Description: Ranches in Southern Utah and Northern Arizona are almost entirely all range livestock operations. There is an ongoing need expressed by these producers for current information on rangeland and livestock management. The need is reinforced by the fact that most ranchers in this area depend heavily on public land grazing for their ranch viability. It is critical that ranchers and agency managers continue to learn new and better management approaches as well as continue to foster good working relationships.

Impact: Approximately 75 ranchers, agency personnel and commercial sponsors attended these workshops. Ranchers learned how other producers are integrating environmental concerns and alternative sources of income into ranch operations. They also learned about the availability of commercial livestock and vegetation management products. They participated in an educational activity focused on beef quality assurance wherein they saw first hand the results of improper inoculation techniques and improper inoculation location. This improves their knowledge of techniques to reduce carcass damage which improves profitability.

Description:

Extension specialists worked within the Utah Grazing Land Conse rvation Initiative (GLCI) coalition to guide the Coalition. Eleven new projects were implemented with producers bringing the total to 23 active demonstrations focusing on innovative and creative ways for landowners to enhance rangeland and pasture. Demonstrations included fencing, water development, forage trial, pasture renovation, grazing management and vegetation manipulation. These demonstrations formed the basis for posters and presentations at producer meetings throughout the State and at the National Grazing Lands Conference held in Las Vegas in December 2001. Cooperating Organizations: Utah Farm Bureau Federation, Utah Cattlemen's Association,

Utah Wool Growers Association, Utah Farmers' Union, Utah Association of Conservation Districts, Natural Resources Conservation Service, Utah Department of Agriculture and Food, Utah Division of Wildlife Resources, Utah State University Extension, U.S. Forest Service, Bridgerland Applied Technology Center, Utah Section of the Society for Range Management, USDA Agricultural Research Service Forage & Range Research Lab.

Impact - More than one thousand people attended meetings and were introduced to programs and opportunities for improving management on private lands. Local tours attracted 150 people interested in grazing land conservation. Demonstration project producer - participants and other producers have expanded demonstrations to additional land.

Key Theme - Restoration and Protection

Description:

We completed the Greater Great Salt Lake Ecosystem Master Wetland Education plan and presented the plan at four open houses. The plan was placed on our web site www.utahwetland.org. We continued to work with the Utah Mitigation and Reclamation Commission and the Northern Utah Partnership to implement the plan. We developed a web site for Utah teachers that contains information regarding resources available to them to teach about the Great Salt Lake wetlands.

Impact:

Because of the planning effort, the Utah State Office of Education now requires 5th Grade teachers to teach about wetland as part of their core curriculum. We have more than one thousand visitors use the site each month.

Title:

Water Quality Programs

Key Theme – Water Quality

Description:

During the past two (2) years, Summit County has been working on a groundwater/septic tank study for the South Summit area of the county. Members of the local soil conservation district asked if I would get involved in this study. Time was spent with the county health department in planning an additional study for this area. A community enhancement mineral lease grant in the amount of \$20,500 with \$10,400 of this grant being provided by the county/Utah Department of Ag and Food and \$10,100 provided by the mineral lease grant. The grant included soil profile mapping work, groundwater well testing, establishment of monitoring wells and a written summary of the results along with a septic tank density recommendation for this area.

Impact:

Thirty-five (35) private wells and springs were tested for nitrate levels and a variety of other items for the groundwater study. Also, an engineering firm drilled and established seven (7) permanent groundwater monitoring wells which will be used by the county health department to monitor groundwater quality throughout the Kamas Valley for the next few years. A digitized soil's profile map of the area was provided by the NRCS and used in the study. Currently all the field work information is being gathered together and will be summarized in a report to be used by the county health department in helping them make future septic tank density recommendations.

Our office, along with the local soil conservation districts, NRCS and RCD sponsored a Weber Basin Watershed Meeting. This meeting was for local landowners to provide input on what type of conservation projects they would like to see implemented on the Weber River. Thirty-five (35) landowners and agency personnel were in attendance at the meeting. The information gained at the meeting will be used to help design a conservation plan for the river.

Description:

I provide 48 organizations and individuals with evapotranspiration data each week. It is printed for mailing and posted on the Salt Lake County Extension website each week. This information has been gathered for the past six years to meet water users needs. It helps give visibility for Extension as well. One water improvement district uses the information to bill water users. If they use more than 25% of the recommended amount of water, they received a large surcharge. So this information is being used well.

Irrigation and Water Resources Management for the Time period October 2000 through September 2001
Time

Spent: 110 days

Description: Irrigation technical assistance was provided on 41 different specific occasions to numerous individuals involved in irrigation companies; individual farmers; consulting engineers; fellow extension specialists and county agents on topics including water measurement, irrigation methods (sprinkle, surface/surge, and drip), improvement of irrigation systems, pipeline hydraulics, irrigation water management, crop water use, irrigation scheduling, and water conservation.

Impact:

\$6,000 were saved for a client by a private engineering firm as a result of irrigation crop water use provided from already available USU Extension and Ag. Experiment Station sources. The total value of irrigation engineering assistance is estimated to exceed \$50,000 annually.

Description:

Water measurement technical assistance was provided in 14 instances including one 3/4 day "Water Measurement Fundamentals Workshop."

Impact:

The value of improved water measurement as a result of these recommendations in Utah is estimated to exceed \$100,000 per year.

Description: Overseas Program Review, Development and Technical Support. This year a significant time commitment (84 days) was provided to the USDA-CSREES Marketing Assistant Project in Armenia. Actual in country working time was 67 days. The first trip in February was review and assessment of water management on Armenia's small farms and included the following recommendations for the USDA-MAP water management program:

Impact:

Soil Water Monitoring. Thirteen out of the twenty-five cooperating farmers were interviewed for impact assessments as of September 28. Three of the farmers documented financial benefits as a result of using fewer irrigations from wells by following the soil water measurements. One saved \$500 on 20 (\$25/ha) of grapes, another saved 3600 dram on 3000 sq. meters of corn (equivalent to \$22/ha), and the third saved about 8500 dram on 2000 sq. meters (about \$77/ha) of onions. Five harvested greater yields, from 133% to 170% of previous years yield on the same respective fields. Five more reduced their labor due to fewer irrigations.

Description:

This year is the second year that Utah County has participated in the Water Check program. We had an \$89,900 grant from the Central Utah Water Conservancy District that facilitated our program. I, along with Earl Jackson, trained 13 Water Checkers for the Salt Lake and Utah County program. Here in Utah County we had more than 465 home visits where homeowners received a 1-hour consultation and water system evaluation.

Impact:

For the past two years, with the data received so far, we have saved more than 25% of the water use of these participants. This program will continue for at least one more year in Utah County. This has been a great assistance for homeowners to receive an on-site visit and pressure check of their system as well as the uniformity and the precipitation rate of their system. I am looking forward to this program next year.

Description:

Water Conservation A WATER CONSERVATION PROGRAM - Slow the Flow, Save H2O In Salt Lake County, both water conservation and water quality issues are very important. Over the past four years, USU Extension has developed a partnership with many water districts (16 in the county) with the lead agencies being Jordan Valley Water Conservancy District (JVWCD) and the Central Utah Water Conservancy District (administers the Central Utah Water Completion Act). This partnership is also a financial one in which the program supports all of our Extension natural resources educational programs in Salt Lake County. Our legislature now requires each water district in the state to develop a water conservation plan. The model plan determined by the Utah Division of Water Resources is the one we assisted in developing with the JVWCD. We call the plan "Slow the Flow, Save H2O." In addition to

assisting in the development of radio/television advertising, use of 'Water Lou' with her little squirts and suggestions for residential demonstration gardens, our summer interns make personal recommendations for landscape irrigation schedules. USU Extension services the citizens who call the water district's water conservation telephone line (1-877-Save H2O). The water districts pay our interns to make an irrigation water check visit which takes about an hour for a residential property. To date, we have completed 2,772 residential water checks.

Impact: This one on one teaching results in citizens accomplishing an 11% to 20% reduction in landscape water uses the year following a water check.

Description:

Situation: Salinity (Total Dissolved Solids) and nutrients are identified as pollutants in lakes and streams of the Uinta Basin in Utah's 1998 303(d) List of Waters. Agriculture is considered to be a non-point source of these pollutants. Inefficient irrigation systems result in deep percolation and return flows which carry naturally deposited salts into lakes and streams. Since 1980, salinity control programs in the Uintah Basin have reduced but not eliminated the problem. In the 1996 Farm Bill, salinity control is authorized and funded as a part of the Environmental Quality Incentives Program (EQIP). A recent survey showed the most critical education and information needs in the Basin relating to salinity control was to educate farmers about irrigation water management (IWM).

Impact:

Participants learned how to fine tune irrigation pumps and sprinkler systems to increase energy and water use efficiency. 2. Real improvement in water quality is more likely with a good TMDL. 3. Because Todd Thacker voluntarily submitted to an evaluation of his dairy heifer feeding operation, the clock began ticking toward the need to make some changes to reduce pollution. At first the NRCS office told him they couldn't help.

But through pressure applied by the SCD board and Extension, an agreement was made to provide some technical assistance. Without assistance, Todd would probably go out of business.

Description:

In 1999, the USDA and USEPA introduced the Unified National Strategy for Animal Feeding Operations. The Strategy proposes several activities and programs designed to reduce non point source pollution from animal feeding operations. Implementation of this Strategy, as well as the continuing animal feeding operation water quality initiatives, is ongoing and involves a team of Extension Specialists (Nancy Mesner, John Harrison, Ron Boman, Rich Koenig), various University researchers, and most County Extension Agents.

Impact:

A total of 149 program viewers, or an average of 15 per program tuned into the satellite broadcasts. Of viewers, 83% were County Extension Agents and the remainder composed of other agency personnel

(NRCS and SCD). Individual program viewers were summarized in graph form but could not be included in this report. An e-mail survey of County Extension Agents was conducted in late May 2001. Questions and Agent responses are summarized below:

The live satellite programs were well-received but generally not well-attended. Since discontinuing the programs several dozen requests have come in for taped copies of select broadcasts, and a request to apply for grant funding to develop video tapes on targeted subjects (sampling, manure spreader calibrations). This suggests that the information was important, but that the time, method of dissemination, and/or advertising was wrong. Due to low attendance the programs were discontinued in July 2001.

The additional five thousand copies of the CNMP guide have been distributed to Extension, UACD, SCD, NRCS and Farm Bureau personnel in order to distribute them to producers. The guide has also received widespread distribution outside of Utah with several other western states adapting the guide for their use. As a result of recommendations provided in this guide and guidelines developed for manure sampling, the number of manure samples submitted to the University testing lab is up 700% relative to one year ago, and soil sampling is also up 8%. More farmers are sampling manure and soil in order to develop manure management plans.

The self-directed materials are complete and a trial run of this program is due on November 20, 2001. Fifteen producers per workshop are anticipated. In addition to workshops and printed CNMP materials, the grant called for manure/soil testing certificates. A total of \$8,000 (~150 samples) was reserved to pay for this testing on behalf of producers. To date, 21 samples have been received and analyzed under this program.

Description:

With the help of Robert Hill, USU Extension Irrigation Specialist, we created a peer reviewed fact sheet on Sprinklers, Crop Water Use and Irrigation Time - Millard County to assist growers with sprinkler management, irrigation scheduling, crop water use, how to calculate an irrigation interval. With the help of Lee Woolsey, NRCS Conservationist, and the Delta Soil Conservation Board, we applied for a \$13,640 grant through the Bureau of Reclamation to assist with a demonstration activity on waste management technology through the use of soil moisture meters on irrigated crop land and improve producers understanding of good water use practices and principles. The USU Extension office, several area dairymen and feedlot owners have participated in a series of satellite broadcasts on waste management systems. Many of these producers are going through the process of obtaining their CAFO permits from the UDEQ and Water Quality.

Impact:

To date, three businesses have obtained the proper permits.

Description:

The goal of Utah State University's Water Quality Extension Program is to provide accurate, science-based information about the many water quality issues which affect Utah's citizens and communities. The program draws on the strengths and the cooperative efforts of Extension professionals throughout the state. In addition, the program benefits from many active partnerships with state and local agencies, teachers and educational organizations, and citizen groups.

Water quality programs are offered through the counties, through state-wide efforts and through various regional projects. Statewide efforts include planning, policy development, and education and information materials and programs on a wide range of issues. We continue to address watershed education and water quality impacts from confined animal feeding operations, storm water and other non point sources. We use a variety of approaches to informing the public about these issues, including environmental education, citizen monitoring, our web pages, publications and more traditional workshops.

Impact:

Workshops on Utah's emerging animal feeding operation strategy, nutrient management planning and available tools:

12 satellite programs (Koenig and Harrison)

New materials on CAFO strategies and nutrient management planning: (Koenig and Mesner) two printings, five thousand printed.

Workshops for teachers on using stream monitoring techniques and other tools for water quality education: 5 workshops

Fifty-five Educators were trained on water quality educational materials.

Presentations on watershed education activities:

Utah Stream Team document distributed (first month): 100

Students reached through educational and other outreach activities: 15 classrooms, 16 summer camps, Envirothon, field days with a total of thirty-eight hundred students reached directly

New materials on urban runoff: three fliers, one report, one booklet

Bear River Watershed Education Project currently has 18 schools actively involved in stream monitoring, entering data into web-based database, sharing ideas and information with their community.

Utah Stream Team being incorporated into more than 30 other schools throughout the state. Many more schools and citizen groups are expressing interest in training and taking action.

Site assessments for pollutant control activities on five farms in Northern Utah

Producers adopting best management practices throughout the state.

Farms adopting best management practices: Funding for demonstration sites and implementation of best management practices being obtained for several watershed projects:

Changes in teacher awareness and educational programming to integrate watershed issues and water quality into their lesson plans. Increased awareness of youth on water quality issues and how our activities within watershed influence water quality.

Increased awareness throughout the state on watershed management and impacts to our waters from activities within the watersheds.

Changes in planning and design for storm water runoff in small communities in northern Utah. Reduction of nutrients, salts, sediments and other pollutants statewide through implementation of best management practices and nutrient management plans.

Title:

Wildlife Management

Key Theme: Wildlife Management

Description: We continued to evaluate the effectiveness of temporary signs to reduce deer vehicle collision. Our evaluation will conclude in 2002.

Impact:

The signs have reduced collisions from 30-70%. The estimated cost saves more than \$500,000. I was a panel member on a National Satellite Teleconference produced by the Center for Transportation Ecology at North Carolina State University. The panelists addressed the topic of transportation system impacts on ecosystems.

Description:

I continued to work with USU county agents and private landowners to reduce damage to agricultural crops caused by wildlife. We responded to 153 requests for technical assistance and information about managing wildlife damage.

Impact:

Our assistance saved agricultural producers an estimated \$200,000.

Description:

We continued to work with the Animal Welfare Task Force of the International Association of Fish and Wildlife Agencies to assist public and private wildlife agencies and organizations better manage the controversy surrounding wildlife management activities. We developed and evaluated an interactive web site www.winteractive.org that provides wildlife managers with ideas and information to better manage wildlife management challenges.

Impact:

The site receives more than two thousand visitors a month.

Description:

We continued to expand our program efforts to assist local communities in addressing endangered species issues. In 2000-2001, we organized two additional sage group working groups in Garfield, Kane, and Box Elder County.

Impact:

We secured more than \$120,000 to implement and monitor sage grouse habitat improvement projects in San Juan, Wayne, and Piute Counties. We enhanced more than 2,000 acres of rangeland habitat in Wayne and Piute County and more than 2,200 acres in San Juan County. Our efforts to implement the San Juan County Gunnison Sage Grouse Conservation Plan continues to fuel the local economy to the tune of \$1 million annually.

Utah Agricultural Experiment Station Accomplishments

Planned Program Area: Pasture Development, Reclamation and Quality

Key Theme: Other - Intensive Pasture Management and Use

Brief 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.

Impacts: The seasonal distribution of dry matter production has been identified following three years of study and those grasses and grass/legume mixtures adapted to intensive rotational grazing have been identified. A comprehensive guide for the management and use of small irrigated pastures has been developed. This is directed primarily at the small pasture owner. It has been demonstrated that dairy heifers can be efficiently grazed under an intensive pasture management scheme, even following lactating dairy cows, suggesting additional benefits for intensive pasture utilization under irrigation. Finally, water use for intensively managed pastures has been found to be quite different from that of traditional row crop production. Water is needed more often, though in lesser amounts, and must be available upon demand or rotated such that it does not become a limiting factor. The cost of pasture establishment is higher than that for alfalfa with no cover crop or alfalfa with a cover crop. However, the O&M costs for pasture are approximately \$100/acre less (primarily due to the reduced need for harvesting and storage equipment). Utilizing pasture, the annual per cow cost is approximately one-fifth less than traditional methods. For

sheep and horses, the reduction in costs of feed are similarly reduced for pasture grazing. There is not as significant a difference in the case of beef cattle due to the availability of public grazing (which traditionally is less expensive on a per AUM basis). Net returns for dairy cattle are increased approximately \$50/animal, whereas losses (or returns) for sheep and beef are reduced (or increased) by approximately \$35/head. The extent of pasture availability has yet to be determined given that in an environment such as found in the Intermountain West, there is a need for the feeding of some harvested forages.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

008	331	362
013	332	418
179	352	797

Funding Level: \$719,458.13

SY FTE: 1.04

Scope of Impact: Intermountain West

Planned Program Area: 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

Brief Description/Impacts: 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. The evaluations for Rich County suggest that the 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

Brief Description/Impacts: 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. It can reasonably be concluded that 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. These conclusions were robust across three different demand growth scenarios. We also examined the feedback effect of the stimulated foliage production on atmospheric carbon. This effect was found to be negligible.

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

Brief Description/Impacts: 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. 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. Because this project focuses on the performance of characteristics of alternative specifications of rights-based management systems, the findings will enable managers to design management systems that will better align individual interests with social objectives.

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

Brief Description/Impacts: 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.) 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. The findings will enable resource management agencies to design rights-based management systems that meet conservation and economic objectives.

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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: Fish consumption advisories in Tennessee reservoirs were analyzed using a model that linked a model of “perceived hazard” to a model of recreational site choice. The results suggest a more reasonable pattern of welfare estimates, were the costs of advisories are greater for consumption anglers than for catch-and-release anglers. This model provides an alternative approach for policy makers to assess the efficacy of issue fish consumption advisories. Anglers who know about the advisories are likely to perceive greater hazards associated with consumption of fish at a given reservoir.

Social Equity and Ecosystem management: Integrating Social Science in Resource Planning and Policy

Brief Description/Impacts: These studies present social science data collected at the regional level, rather than for one site or administrative unit. This approach increases the results for (1) setting management objectives, (2) providing a spectrum of recreation opportunities, and (3) meeting both ecosystem and social equity goals in natural resource planning. The results from this project 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 limitation in heavily used areas, and this approach may actually exacerbate, rather than reduce, both economical and social impacts of recreation use of public lands.

Social and Biological Aspects of Community Forests

Brief Description/Impacts: This research involved the evaluation of an environmental education teacher outreach program at Teton Science School called Journeys. “Journeys” helps teachers incorporate place-based concepts into their teaching. Teton Science School’s “Journey” educational approach is very effective, though our findings will help them refine the program. Other work should help maintain trees in minimally irrigated landscapes and improve forestry Best Management Practices (BMPs) in Honduras.

The Economic Value of Open Space in the Intermountain West

Brief Description/Impacts: During the past year, much of the project has focused on a DOD-EPA-funded Mojave Desert Alternative Futures study. This project developed a GIS database for the 7.5 million hectre (ha) Mojave Desert. Population projections to 2020 were combined with a regional logistic growth model to predict where future development was likely to occur based on municipal status and proximity to roads and existing development. These growth patterns were then compared to existing land uses and wildlife species ranges to anticipate future conflicts between development and conversation. Regional growth projections under the Mojave and Wasatch Front Projects will allow 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.). 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 the BLM, are also interested in assessing how future development will affect the habitat of species of key concern like the desert tortoise.

Public Responses to natural Resource Management Practices and Conditions

Brief Description/Impacts: 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. There are three areas of specific inquiry. First, what factors affect the adoption of practices intended to improve ranch sustainability. Second, public beliefs, attitudes, and prospective behaviors with respect to wildland fuels management practices in the U.S. Third, public beliefs, attitudes, and prospective behaviors with respect to invasive weeds and their management in Southwest rangelands. Studies of ranch innovation can assist outreach practitioners and ranchers by showing how their peers have succeeded in switching to more sustainable range management practices. We will show what worked, what has not worked, and how significant obstacles were overcome.

Changing Values, Beliefs, and Behavior of Public Natural Resource Agency cultures and their Employees

Brief Description/Impacts: The focus of this research has been to develop and apply broad, integrative conceptual models of managing public and private forest ecosystems for diverse, expanding social values of urban post-industrial societies in the USA and Western-world. Work at headquarters-level of USA and European forest resource management agencies in training, policy, and planning applications of sustainability concepts and organizational culture adaptation. The results derived from this study should assist public natural resource agencies and professionals in USA and Europe to better understand, accommodate, and manage conflict in the many diverse values and uses of forestlands, for sustained rural socioeconomic development.

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

Brief Description/Impacts: The main objective of recent work has been to determine, using a linear programming approach, what combinations of forage improvements on privately-owned land would be most profitable for beef producers in Utah under conditions of price and weather risk and the threat of losing access to public grazing. Final results indicate that while all operations typically prospered under the favorable scenario, variation occurred under the unfavorable scenario. Medium-sized operations were most vulnerable to cuts in public grazing access overall, and large operations were the most risk tolerant. The results indicated that most operations invested in a diversity of irrigated and rain-fed forage improvements including wet meadow, alfalfa hay, pasture, and crested wheatgrass. This reflected seasonable constraints of feed and water supplies, and the need for producers to cope with dynamic patterns for prices and weather extremes. This work indicates that producers should invest in a diversity of forages to better manage risk. Higher risk/higher return investments like pasture or alfalfa hay should be balanced with lower risk/lower return investments in native meadow and upland range. The economic utility of public grazing permits is most manifested during periods of lower beef prices and lower precipitation. Net returns for small and large ranches were reduced by approximately 25% under the “no grazing” assumption, whereas net returns were reduced by more than 50% for medium-sized ranches that rely more heavily on public grazing lands.

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

Brief Description/Impacts: Wildlife damage costs the U.S. economy billions of dollars annually. Much of this loss is suffered by agricultural producers. Yet wildlife are so valuable that lethal means of control are unlawful or inappropriate in many circumstances. Hence, we need to develop nonlethal techniques to reduce damage that are also effective. This project examines whether bird damage problems can be reduced using diversionary food or closely-spaced overhead wires. These studies 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 setting management objectives, providing a spectrum of recreation opportunities, and meeting both ecosystem management and social equity goals in natural resource planning. If successful, these techniques could help reduce wildlife losses to agricultural production.

Livestock/Wildlife -

Development of Co-Existing Livestock and Wildlife Enterprises in Aspen Landscapes

Brief Description/Impacts: Research is ongoing with respect to the interactions between livestock and wildlife, as well as to their respective vegetation resources. Specifically to evaluate elk and deer response to livestock presence, cattle and sheep were placed on the study site in separate deferred-rotation grazing systems for each species. Livestock were weighed at initiation, midpoint, and termination of the grazing season. GPS positions were collected on seven mule deer and six elk during two summer grazing seasons to assess their distribution in relation to landscape features, livestock, and each other. 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.

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

Brief Description/Impacts: Six lactating cows were used in replicated in an experiment to study the influence of diet on methane emissions. The results from this study suggest that energy loss in the form of methane from cows fed a high grain diet was similar to those fed high quality pasture-based diets. Dairy cows grazing on high quality grass emit similar amounts of methane into the environment as cows fed diets containing conserved forage and grain inside a barn.

Application of Behavioral Principles to Management

Brief Description/Impacts: We determined (1) if turpenes 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. These findings clearly indicate that (1) management by livestock can convert sagebrush into a source of forage, thereby enhancing and maintaining biodiversity of sagebrush-steppe ecosystems, with substantial long-term benefits economically and (2) different systems of management alter how animals forage. Light stocking encourages selective foraging, whereas heavy stocking for short periods encourages diet mixing. Rotational grazing at low stock densities may have trained generations of livestock parent and 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.

Characterization and Preservation of Germplasm from Agraliform Wild Sheep (*Ovis ammon* spp.) and Selected Breeds

Brief Description/Impacts: The phylogenetic relationship of several subspecies of *Ovis ammon* were analyzed by comparing DNA sequences within the entire mitochondria D-loop region. Five putative subspecies of ammon were sampled from four provinces in China and two from Uzbekistan. The argali sampled represent most of the currently recognized putative subspecies of argali. Mitochondrial DNA analysis has established phylogenetic relationships among Chinese argaliforms and suggest the direction of evolution from nigrimontana stock. This information may be used in the conservation management of argali wild sheep.

Plants -

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

Brief Description/Impacts: Dew and fog play major roles in providing atmospheric moisture to plants and animals living in arid regions all over the world. Studies are needed to discriminate between dew and fog, especially when making a measurement of dew. A radiation system has been developed that utilizes the incoming and outgoing (terrestrial) longwave radiation using two pyrgeometers (continuously since 1995). These instruments are ventilated with heated air to prevent precipitation of dew and frost on the sensors, which otherwise would disturb the measurements. Based upon these measurements and an algorithm developed, the cloud base height, the cloud base temperature, and percent of cloudiness can be parameterized at local scale. A cloud base height around zero would indicate fog at the local scale. In 1999, a Bowen ratio system was added to measure the evapotranspiration, dew, and frost continuously throughout the year at the same location. Combining these two systems (radiation and Bowen ratio) has yielded a reasonable approach to differentiate between the atmospheric moisture collected by dew and fog. The proposed algorithm showed a promising approach for evaluation of cloud base height, cloud base temperature, and more important, the percent of sky covered by cloud. The cloud base height is a good indication of the closeness of the cloud base to the surface. Whenever the height is around zero, formation of fog is guaranteed. On the other hand, having the Bowen ratio and radiation stations close to each other, dew formation can be evaluated easily.

Sustainable Cropping Systems Utilizing Low-Cost Precision Agriculture Techniques

Brief Description/Impacts: This project used a remote-sensing approach and “precision agriculture” techniques to study sustainable cropping systems for the Intermountain region. It also serves as the umbrella project for the NASA Geospatial Extension Specialist applied research program, the USDA Western SARE program, as well as the NASA Stennis Space Center Ag 20/20 cooperative project with the National Association of Wheat Growers and ITD Spectral Visions of Urbana, IL. While this is only the third year of this project, it is estimated that \$2.2 million dollars could be saved through the broader adoption of remote sensing technologies.

Dynamics of Rhizosphere Chemistry: Influence on Sustainable Agriculture

Brief Description/Impacts: Little information is available on the survival, uptake, and dry mass production of vegetable seedlings and maturing plants in arsenic (As) enriched environments. However, such information is important to producers growing edible food crops in environments with As contaminated soil and water. Iodine (I) is a potent sterilizing agent that is being studied as a methyl bromide alternative in soils and as a general disinfectant in hydroponic systems. Results are expected to predict the impact of arsenic (As) and iodine (I) additions to soil environments. Specifically, the studies track the movement of As and I from soil to plant systems and assess potential impacts on the human food chain.

Western Regional Sustainable Research and Education (SARE) Program

Brief Description/Impacts: The Western SARE program continues to implement research and education projects, as directed and authorized by law. Research and education dollars were awarded to sustainable agriculture and pollution prevention research projects. Additional funds were allocated to professional education efforts for extension and over \$200,000 was split among 8 farmer marketing projects and 20 farmer-rancher-initiated projects in the Western U.S. This is a multi-state, multi-agency project. The impact of the program is best measured on farms and ranches. A survey of stakeholders was conducted in 2001 by Washington State University. Almost 60% of the cooperators indicated a positive cash flow due to WSARE technologies. Fifty-four percent continued with the method during the second year. The dollar value was estimated at over \$50 million to these 237 growers.

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

Brief Description/Impacts: The goal of this research 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 appropriate agronomic rate of nitrogen (using the U.S. EPA guidelines) produced 68% as much dry matter as a comparable inorganic nitrogen fertilizer treatment. 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. Insufficient nitrogen is available from biosolids due to slow organic nitrogen mineralization 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 formula for calculating biosolids application rates may require adjustment in the ammonia volatilization factor to produce yields comparable to inorganic fertilizers. This project demonstrated that municipal sewage sludge (biosolids) with low heavy metal contaminant content can be safely used to produce irrigated grass forage for livestock consumption. Forage yield will not be as high as a comparable inorganic nitrogen fertilizer rate, probably due to higher rates of ammonia volatilization from biosolids.

The National Atmospheric Deposition Program

Brief Description/Impacts: Participation in the National Atmospheric Deposition Program primarily 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 result to the Central analytical Laboratory (CAL). We also perform regular site maintenance, including the periodic changing of the “dry -side” 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. 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

Brief Description/Impacts: Irrigation timing significantly impacts onion growth and yield. Three plant populations and two irrigation frequencies were used to assess plant growth and productivity. Irrigation amounts were based on available soil water, soil water depletion, estimate d evapotranspiration, published crop coefficients (Kc), and precipitation. Due to low plant stands and the late time of year, the experiment was abandoned.

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

Brief Description/Impacts: Several investigations were continued that centered around reducing turfgrass water use in the urban landscape of the arid West. Our evaluation of common and alternative turfgrass species using a linear gradient irrigation system provided data on several species. Overall, the best performing species were tall fescue and buffalograss. Turfgrass is the largest component of most urban landscapes by acreage. Our efforts are designed to provide management practices to reduce water use and to provide alternative grasses that managers can use in the cool-arid West. Irrigations 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

Brief Description/Impacts: Turfgrass field plots were established to assess the combined effects of clipping return, nutrient management, and irrigation on soil moisture and water use. Within each plot, soil moisture access tubes were installed. Following installation of the access tubes, a Kentucky bluegrass sod was laid over the entire field site. As experimental treatments are applied over the next growing season, soil moisture in the field plots will be monitored, turfgrass quality will be evaluated and tissue samples will be analyzed. Turfgrass and landscape irrigation is being heavily targeted for water conservation in the Intermountain West. The results of this research will provide a scientific basis for turfgrass management recommendations that minimize irrigation water use. In addition, the utility of ion exchange membranes for optimizing nitrogen use in turfgrass management will be assessed.

Water Management in Woody Landscape Plants

Brief Description/Impacts: This project primarily dealt with water management in grass and woody landscape plants. Several grasses were tested and it was determined that buffalograss had deeper roots than bluegrass and could extract water to lower water content such that it could maintain acceptable appearance without irrigation 3-4 times longer than bluegrass. For precision-irrigated trees established in buffalograss sod, longer intervals between irrigation did not result in detectable water stress compared to

trees growing in bluegrass irrigated more frequently. Other work has focused on the production and use of Intermountain West native shrubs and perennials for low water landscaping. These projects will accomplish two goals. The first is quantifying water use of trees. The second will encourage the production of drought-tolerant, Intermountain West native plants for use in low water landscapes.

Factors Controlling Vegetation Structure in the Great Basin

Brief Description/Impacts: 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. 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 N -cycling rates, rather than gross N -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

Brief Description/Impacts: 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 revealed 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. 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.

Spectral Balance, Spectral Weighting functions and the Ozone Reduction Problem

Brief Description/Impacts: In biological research on the ozone depletion issue, action spectra are typically used as biological spectral weighting functions (BSWF). Seldom, however, has the appropriateness of different BSWFs been tested. A new BSWF function was developed which proved to be the most appropriate weighting function for the responses we measured in oat plants in two seasons of field experiments. If this new photomorphogenic BSWF proves to be appropriate for most plant species, it implies less ozone depletion because the biologically effective UV radiation will only show a modest increase.

Effects of Woody Vegetation on Plant Recruitment in Utah Rangelands

Brief Description/Impacts: 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. 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

Brief Description/Impacts: We presented five new approaches to monitoring rangelands to the public in 2001. Except for bare ground and major plant species, it is difficult to come with any sub-sampling approach to yield statistically significant differences for all but bare ground and major plant species (i.e., Australian field sampling technique). Four other techniques (time series of changes in life form dominance, vegetation recovery following return of wet periods in gradients from representative water points, a model of soil erosion, and landscape composition, structure and pattern expressed in landscape metrics) proved reliable and complement the limitations of sparse point sampling on the ground.

Cool Desert Range Ecology

Brief Description/Impacts: Studies continue on responses of four major cool desert life forms to normal precipitation events and associated changes in available soil nitrogen. 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 can control areas once it is established is highly important for management.

Electromagnetic Characterization of Soil Electrochemical and Geometrical Properties

Brief Description/Impacts: Models are required to interpret the relaxation spectra of moist substances. A number of models have been proposed in the literature; however, there have been few systematic evaluations of the proposed models and modeling approaches. We investigated the ability of three common modeling approaches to fit both real and imaginary components of impedance spectra and to provide a physical interpretation of the spectra. Our results suggest that both real and imaginary components should be considered in model parameterization and validation. We demonstrated the limitations of current theories of the interactions of electromagnetic fields with soil materials and indicated the areas in which improvements are required. We are now initiating experiments that focus on the weaknesses in theory and we hope to produce the data, and subsequently, the models that will bridge to applications.

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

Brief Description/Impacts: We have continued our work linking the community composition of the ammonia oxidizing bacteria (AOB) to their functioning in the nitrification process in agroecosystems treated with animal waste. 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.

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

Brief Description/Impacts: 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. 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 tillage management, and improving conditions for compliance with EPA regulations for agrochemicals transport.

Biogeochemistry and Management of Salts and Potentially Toxic Elements in Arid-Zone Soils, Sediments and Water

Brief Description/Impacts: Traditional irrigation management practice is to irrigate with a greater quantity of water than required to refill the soil reservoir. The additional water is thought to be necessary to prevent salt accumulation within the soil that might result in yield loss. This practice results in water waste and potential degradation of groundwater resources. We have demonstrated that irrigation water can be reduced by nearly one-third, relative to traditional management practice, without a field-measurable loss. Moreover, these experiments have shown that crops growing under field conditions are much more salt

tolerant than greenhouse lysimeter data in the literature and theoretical crop response functions might suggest.

Mechanisms and Mitigation of Agrochemical Impacts on Human and Environmental Health

Brief Description/Impacts: The mechanism by which white-rot fungi degrade environmental pollutants is being investigated. New enzymes with better properties have been generated by site-directed mutagenesis guided by x-ray crystallography and computational chemistry. The degradation of chemicals, including synthetic polymers, has been shown to result from free radicals generated by cellobiose dehydrogenase. This research should result in a very economical hazardous waste or environmental cleanup technologies. This can result in far less risk to environmental pollutants.

Watershed Scale Variability of Organic Soil Nitrogen Dynamics in the Southern Appalachians

Brief Description/Impacts: This study evaluated spatial variation in the release/retention of nitrogen (N) within a saturated catchment, the Noland Divide Watershed, in the high-elevation spruce-fir forest of the Great Smokey Mountains National Park. This project characterizes spatial variability in nitrogen retention capacity of high-elevation forested watersheds impacted by high atmospheric deposition and natural disturbance. It will establish a critical link for spatial extrapolation to the larger landscape and will provide background data for assessment of current and future pollution effects on terrestrial and aquatic systems in the Southern Appalachians.

Chemical Application Strategies for Surface Irrigation Systems

Brief Description/Impacts: 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. 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

Brief Description/Impacts: 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. Preliminary results indicate that zeolite was not effective at reducing in-house ammonia concentrations.

Seed Dispersal by Livestock: A Revegetation Application for Improving Degraded Rangelands

Brief Description/Impacts: This project investigates the use of livestock to disperse and promote the establishment of desirable plants on degraded rangelands in the Great Basin Region. Currently, cattle are being used to introduce native species into near monospecific stands on burned areas in a sagebrush-grassland community in the west desert of Utah. Using livestock animals as seed dispersal agents could be less costly and less disruptive to soils than using seedbed preparation and seeding equipment on many rangelands. Fecal seeding could be used to gradually increase the biodiversity of plant communities over time.

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

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

Brief Description/Impacts: 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. 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.

Farm and Landscape Water Allocation and Conservation at the Rural:Urban Interface

Brief Description/Impacts: The objective of this study was to determine the amount of potentially conservable water landscape and agricultural irrigation water in a rapidly growing suburb of Salt Lake City. Excess irrigation was generally related to newer-automated irrigation systems for residential users. Most residential users did not have automated systems and, thus, did not irrigate in excess of landscape water needs estimated from local evapotranspiration rates. Most commercial users had automated systems and had greater excess irrigation than residential users, and they felt that competitive and client pressure forced them to over irrigate. Commercial water users, particularly retail business with high appearance

expectations, irrigated their landscapes in excess by 20:1 compared to residential water users. This project will affect water agencies in arid, and possibly, humid regions, that need greater water conservation in irrigated landscapes. The historical practice of applying water conservation measures to all water users is unfair to those already practicing water conservation and provides a direct subsidy to those who do not. The techniques developed in this project will allow water agencies to be able to identify egregious water wasters and target them with specific conservation measures.

Development of Economical Rangeland Monitoring Systems

Brief Description/Impacts: Data from the watersheds were summarized and laboratory analysis was completed. In addition, the protocol tested on Watersheds in Arizona, Wyoming, and Idaho has shown which parts of the protocol will be feasible. Currently, a three-tiered protocol is being finalized. Such information supports the adoption of improved management practices by producers and assists the EPA in development management practices to reduce and/or prevent nitrate contamination of groundwater.

Integrated Facultative Ponds (IFP) for Agricultural Wastewater Treatment

Brief Description/Impacts: The Integrated Facultative Pond (IFP) reached equilibrium in September. The objectives of this research are to demonstrate that IFP treatment of wastewater will result in reduction of pollution potential, manure nutrient content, and gaseous emission/odors associated with animal waste disposal. Our current work has been focusing upon increasing the nitrogen retention of manure, from deposition to finished compost. This information is useful for managing animal production facilities, has the opportunity to increase the value of compost as a soil amendment, and provides a more environmentally friendly means of disposing of animal waste.

Hobby or Hazard? Assessing the Environmental Impacts of Small Farms

Brief Description/Impacts: Nearly 60% of Utah's farms have gross sales of less than \$10,000. This indicates that many of these farms are also part-time farms. A survey is currently being developed. This survey will identify the awareness and 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

Brief Description/Impacts: The goals of this project center on the evaluation of water quality from turkey production facilities. Water quality will be compared with subsequent performance of turkey flocks. Water used for turkey production in Sanpete Valley can come from wells, springs, or city water. Each of these sources will be evaluated throughout the valley to determine differences and what effect they have on performance. Production parameters that will be measured include body weight, livability, and processing information. Typically, only city water sources are routinely chlorinated. The effect of chlorination of water on turkey production will be evaluated. 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.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

007	705
010	706
015	707
018	709
025	710
052	712
173	713
278	726
322	727
323	729
324	730
329	746
330	810
335	861
338	
340	
344	
345	
347	
348	
351	
356	
359	
360	
390	
416	
431	
434	
442	
446	
449	
463	
471	
627	
701	
703	

862	921
905	922
910	923
911	924
917	941
919	942
920	943
	960

Funding Level: 7,045,782.98

SY FTE: 9.61

Scope of Impact: Intermountain West, National, and International

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

Overview:

Utah State University Extension provides a wide range of programs to assist Utah citizens in enhancing their economic opportunities and quality of life. More than 16,500 people participated in sponsored or partnered with USU Extension in 2001.

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. Residents want to increase their knowledge of technology and the Internet to be successfully wired to the world even though it is often hard for rural farmers and ranchers to obtain information and services. Extension is involved throughout Utah in providing educational classes, workshops, exhibits, and opportunities for residents to

gain an understanding of computer programs, technology, and the Internet through the Applied Internet Mastery (AIM) program. 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 Utahns 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 \$702,531

State Match \$605,891

FTE: 24.2

Utah State University Extension Accomplishments

Title: Basic Financial Management Education

Key Theme - Family Resource Management

Description:

The Take Charge of Your Money program is Utah's component of Money 2000. Money 2000 is a Cooperative Extension System program designed to help people increase their net worth significantly through better spending and saving habits. Individuals or families enroll as a MONEY 2000 household at their nearest participating Cooperative Extension Office. Five Extension agents in Utah have adopted the program and are actively assisting people with reducing their debt and increasing their savings. Money 2000 classes were taught by Extension to increase financial management skills of individuals and families. Five hundred and seventy-four people took classes covering basic budgeting techniques, goal setting, evaluating current spending habits, wise use of credit, and saving for retirement and emergencies. Single mothers, low income families and individuals, church groups, state housing clients, transitional housing clients, senior citizens and the general public attended these classes.

Every office has a copy of the updated PowerPay program which is covered in one of the units of Take Charge of Your Money and most have set it up so that clients can come into to their office, use the software, and come up with a plan that will help them reduce credit debt. Extension also provided instruction in PowerPay to financial counselors from the military and CCCS and independents as well as Extension educators at a national Personal Finance Seminar for Professionals sponsored by the University

of Maryland. This program was recognized by the Association of Financial Counseling and Planning Education (AFCPE) as the best educational program. Members of AFCPE come from the military, Extension, universities, and private practice in the USA, Canada, and Europe. Military counselors hope to use PowerSave to help enlisted personnel make better decisions about whether or not to take the new lump sum retirement option. The PowerPay program is being used on five Navy bases in the northeast and in the Marine Corps Community Services in Iwakuni, Japan. The Commonwealth of Virginia Department of Corrections requested permission for the use of the PowerPay credit payment worksheet and associated forms for use in "Productive Citizenship: A Vision Beyond Survival," an instruction manual currently under revision by the Virginia state Department of Corrections and partner offender-care agencies.

The Utah Family Resource Management Specialists also serves as the national coordinator of Money 2000 (name changed to Money 2020). The Money 2000 web site was transferred to Utah State University and USU Extension continues to collect data from states whose programs extend past December 2000, to recruit new states, and to train in those states which are just beginning the program.

Impact:

Five hundred and seventy-four people increased their knowledge related to goal setting, tracking spending, setting up a budget, planning for irregular spending, managing credit more wisely, avoiding credit traps, and how to save for emergencies and retirement. More than 50% of the participants in one program indicated the activities of the program helped them better identify financial goals. Nearly a fourth of the participants in a different Extension program indicated that since attending the workshop they now plan to pay their bills on time. Estimated savings reported in surveys returned from 244 past years' PowerPay users reported savings in interest of \$41,668,430. In Beaver County, recent impact studies of these workshops indicate that Extension clients in Beaver County save at least \$1,000 per year from what they learned in the workshops. In addition, the majority (80%) of these participants report several new budgeting and money-saving practices are learned and adopted into their lifestyles as a result of money management principle awareness.

Practices that people learned in taking Extension basic financial management classes are documented in impact studies by written comments such as: "We continue to pay off our debts. This class has encouraged me to stay on the right path." "We've cut back on extras. More money is invested in savings." "We don't buy on impulse anymore. We plan, budget, save, and then buy."

"I'm paying more attention to where my money is going. Writing everything down. Organizing bills." "We paid down our debts, have more savings, and started a Roth account." "We changed how we pay the bills. We now fight over money less." "I'm using the tightwad gazette ideas, balance my checkbook monthly, and have a fireproof box for important documents."

Nationally, Money 2000 was conducted for six years, from 1995 through 2001. Over this time, there was a total of 13,671 participants in 26 states. Participants voluntarily provided periodic progress reports over that time span, documenting a total savings of \$11,250,052 and total debt reduction of \$8,731,363 for a total impact of \$19,981,388.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Financial Management for Youth

Key Theme - Family Resource Management

Description:

The Family Resource Management Specialist serves as State Coordinator of the High School Financial Planning Program (HSFPP), a financial education program for high school students jointly sponsored by Extension and the National Endowment for Financial Education (NEFE). This program is for high school teachers who use the seven-part curriculum in financial management as part of their high school classes. One of the reasons Utah's bankruptcy rates are so high is a lack of knowing how to manage money. The thinking is that by integrating money management into a variety of high school classes, we can cut into those bankruptcy cases. In June 2001, NEFE introduced a new, more interactive curriculum and Extension presented the new curriculum at the state conference for high school teachers of FCSE.

Impact:

In 2000-2001, Utah had 31 schools offering HSFPP, and 1435 students learned financial management skills.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Financial Management Education for Prospective Homeowners

Key Theme - Promoting Housing Programs

Description:

Extension provides financial management education classes for prospective homeowners in housing education programs to prepare them to purchase a home and to help them manage the payments as well as repairs after they have moved into their homes. Twenty-eight classes have been taught to 310 area housing authority self sufficiency clients, Habitat for Humanity clients, USDA Rural Development Housing participants, clients being assisted with affordable housing loans through area community nonprofit programs and lending institutions, and the general public. Three of the classes were Spanish-speaking workshops.

Impacts:

Two hundred and eighty-three participants increased knowledge about managing credit and understanding their credit history, planning for emergencies and home maintenance savings, shopping for homeowners insurance, repairmen and paying mortgage on time, paying extra payments to cut interest over life of loan, using a financial notebook to organize important papers financial information. Of 62 households who participated in programs in Weber County, 75 percent were able to get into a home. It is conservatively estimated that if each household saved \$3000 due to down payment assistance a total of \$138,000 was saved by the households. In a very rural county, where housing prices have climbed and many residents are experiencing income losses, the Extension Agent taught the housing certification course to 10 families and all ten families qualified for housing loans and are in their houses.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Retirement and Estate Planning

Key Theme - Estate Planning, Retirement Planning

Description:

Extension teaches classes to help people organize their finances and financial papers to make preparations for retirement. Extension developed and distributed the program “Who Gets Grandma’s Pie Plate - Distribution of Personal Property” that teaches people skills on distributing their personal property peacefully. This program was delivered using traditional classes and via satellite broadcasts. Worksheets were developed and are used to help family members sort through various aspects and issues associated with transferring personal property to others.

Impacts:

Seventy-three people learned how to organize financial papers, prepare for retirement and control their spending. One hundred and fifty-one indicated the skills they learned on how to distribute personal property fairly, taking into account the sentimental meaning of objects, and handle conflict was valuable to them in helping to handle this delicate subject. People who are Executors of relatives estate found the program particularly timely and beneficial. Twenty-eight additional people learned powerful strategies to save money, time, and in dealing with the probate process and legal pitfalls, and when it becomes necessary to distribute property. A follow-up study of participants in Beaver County showed that 75% have prepared and organized their financial information and funeral wishes and shared it with their families.

Source of Funds:

Scope of Impact: Smith-Lever, State
UT

Title: Bankruptcy

Key Theme - Family Resource Management

Description:

Extension has worked with the Utah Division of Family Services case workers involved with transitional and homeless clients who are suffering severe financial difficulties. The curriculum developed by USU Extension teaches the case workers about financial tools their clients could use to help manage their finances and when bankruptcy is needed. The debt reduction program called Powerpay was taught and used in individual counseling to help 111 people learn ways to reduce their debt. This program demonstrates the savings in interest by paying off the highest interest credit card first, and once that debt is payed, adding the amount that was being payed for that loan, to the payments being made on the second highest interest card. Through this process individuals pay off debt more quickly, thus saving interest charges.

Impacts:

One hundred and eleven people learned financial management techniques and the PowerPay concept for quick debt reduction. Ten people found ways to save more money by reducing interest paid on credit card loans using extra monthly payments and some using once a year payments. Participants gained knowledge on financial management, ways to save for a down payment, cleaning up credit, shopping for a realtor, finding the right funding package, working with a loan officer, working with a title company, hiring an inspector, purchasing homeowners insurance and realizing the responsibilities of home ownership.

Extension received a Community/University Research Initiative Grant for \$12,000 and they were able to get a fee waiver from the bankruptcy trustee's office in Salt Lake to use the PACER files of Chapter 7 and 13 bankrupts from 1997 forward.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Home Ownership Training Program

Key Theme - Promoting Housing Programs

Description:

Forty-seven participants, including several Eastern European emigrants attended Extension classes to prepare them for the work of home ownership. Many potential homeowners have never had the experience

of repairing or maintaining their homes. Clients are referred by local housing authorities, nonprofit housing assistance agencies, Habitat for Humanity and the general public to enhance their knowledge and skills regarding finances, maintenance and repair.

Impacts: 47 Participants improved knowledge and skills in managing their finances, understanding basic maintenance and repair of heating and cooling systems, electrical systems, plumbing systems, wall repair and painting, home security, household cleaning, hiring a repairman, indoor air quality and the purchase of homeowners insurance. One homeowner indicated during the classes he had already saved money by doing some electrical repair he would have previously hired an electrician to fix. They also learned how to de-clutter their homes and cleaning techniques to clean their homes more effectively.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: USU Small Business Development Centers

Key Theme – Promoting Business Programs

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Description:

Marion Bentley, Community and Economic Development Specialist, is involved in the development and maintenance of extension-based regional Small Business Development Center (SBDC) networks in northern, eastern, and southeastern Utah that provide the award-winning Next Level Entrepreneurship Program and other programs covering accounting, QuickBooks, marketing, advertising, taxes, financing, and customer service. They conducted 12 entrepreneurship, micro-business, and “quick-start” business training programs. They also, in cooperation with Chambers of Commerce and Association of Governments conducted 10 small business management and business workshops for retail and service businesses. Topics included marketing, customer services, employee relations, financing, and competing with discount giants.

Impact:

One hundred and eighty people learned the advantages and disadvantages of starting new businesses and more than 200 retail and service business employees learned about marketing, customer services, employee relations, financing, and how to compete with discount giants.

More than one thousand people participated in Entrepreneurship training that USU Extension sponsored or cosponsored. Forty-four percent received additional counseling in one of three USU sponsored Small Business Development Centers. In a statewide competition of small business plans, three of the top five plans were business plans developed by people using skills they learned in USU Extension Small Business Development Center programs.

The Logan campus counseled 260 individuals on business programs and conducted 20 workshops and educational programs and helped raise more than \$4 million in capital, representing more than 21 loans to private businesses. A College of Business E-Commerce Center is co-located with the Logan SBDC and is providing services to SBDC clients with the potential service delivery area expanding to include other SBDC and extension offices statewide.

The Uintah Basin campus (Roosevelt and Vernal) counseled 120 individuals and held 12 workshops.

The Moab campus counseled 60 individuals and held eight workshops.

A satellite broadcast from the three USU SBDC sites to extension and county offices throughout the state encouraged accessibility of USU SBDC services by extension agents.

Source of funds: Smith-Lever, State

Scope of Impact:

UT

Title: Business Retention and Expansion Program

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Key Themes - Promoting Business Programs, Jobs/Employment

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Description:

Marion Bentley assisted communities in developing community and economic development strategies, including business retention and expansion projects. Business services have also targeted minority issues, and training and counseling have been provided in Spanish.

Impact:

Community and economic development strategies were developed for five communities. This included a strategic plan for tourism in Wasatch County; a business retention and expansion project in Sanpete and Box Elder Counties; a targeted industry project in San Juan County; and heritage tourism assistance in three regions.

Description:

Two hundred and fifty people are employed by South Central Railroad and by the Sevier Power Plant SUFCO coal mine. These two companies are significant employers, providing 27.8% of the Sevier County tax base. In addition, two trucking companies that transport coal on 100 miles round trips provide an additional 250 jobs. Due to the long highway haul to the rail head in Juab County, and the fact that bulk truck transportation costs four times that of rail, the SUFCO mine is becoming increasingly noncompetitive with other mines. To help the mine stay competitive, the long highway hauls need to be shortened by building a short line railroad for coal bulk transportation.

Jody Gale, the Director of USU Extension in Sevier County participated with the Six County Association of Governments, Sevier County Commissioners, and other public entities to determine the process, feasibility, and public sector preparation needed to construct approximately 40 miles of short-line railroad. Jody hosted field trips for area residents and local, state, and Congressional dignitaries, wrote grant applications, and prepared a Request-for-Proposal for selecting a company to do a feasibility study. He assisted in collecting data and preparing presentations to build financial and political support for the project and held public meetings to dispel rumors. Route impact on private land was an ongoing concern, so Extension organized a private landowner subcommittee to assist with concerns. Jody also completed the application to the National Surface Transportation Board to obtain the construction permit.

Impact:

These efforts showed that the project is feasible and would be positive for Sevier County. Eighty-three percent of participants support the project. The county has obtained grants totaling \$100,000 from SUFCO, Redmond Mineral, and USDA to conduct detailed engineering and economic feasibility studies and an Environmental Impact Statement.

Key Theme – Agricultural Financial Management

Description:

Several dairies in Cache County have sold their cows due to low milk prices while other dairies have expanded operations in an effort to increase cash flow. Clark Israelsen, Cache County Extension Agriculture Agent provided consultations with producers to explore leasing of facilities, sale of assets, lease/purchase agreements and futures marketing training, and taught financial management classes to USU dairy students.

Impact:

Workable arrangements were created that are beneficial to both parties, ensuring longevities. Based on these arrangements farms have continued to be productive and existing farm facilities have remained in farming.

Extension assisted three producers with an economic analysis to consider transition from Holstein to Jersey dairy cows. Jersey cows have an increased value per unit of milk, and due to the limited size of these producers facilities, making a switch enabled them to have more units. Producers who made the change report a significant increase in cash flow.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Home Based Business Development

Key Theme – Home-based Business Education

Description:

Verl Bagley, Extension Agent helped two homemakers in Piute County secure access to restricted chemicals necessary in the manufacturing of some pioneer ointment local families use on cuts, scrapes, and sunburn. The Home-based Business Extension specialist assisted the new startup business with ideas and publications that helped determine labeling information and marketing possibilities.

Impact:

As a result of their marketing efforts, a herbal supply merchant in Colorado wants to distribute the product.

Description:

In Duchesene County, Troy Cooper, USU Extension Agent conducted a Home Employment and Ag Direct Marketing Workshop.

Impact:

Twenty-three Ute tribal members and 60 other individuals learned about increasing income by direct marketing of agriculture products and enhancing the farm income by the use of recreation activities on the farm.

Description:

Heidi LeBlanc, the Extension Agent in San Juan County works with small home-based businesses to provide their products and crafts to the Blue Mountain Holiday Fair.

Impact:

Due to the Fair there are 18 vendors who are able to sell their home made items and gifts to locals and tourists.

Description:

More than 100 people in Davis County learned about the legal issues of starting and operating a home based or other type of business, developing a business plan, cash flow, and marketing research through a Home-based Business/Agri-Tourism Seminar organized by Davis County Extension Agents Joann Mathis Ross and Shawn Olsen.

Impact:

Of the 47 evaluations completed by participants, two thirds (66%) indicated they were more confident about starting their own business, 32 percent planned to start their own business, 19 percent decided to delay starting their business, and 9 percent decided to expand their current business.

Description:

The Extension Christmas Open House Booths allowed local home-based businesses and crafters a place where they could advertise and test market their products and services. Marjorie Memmott, the Juab County Extension Family and Consumer Science Agent worked with a local Internet Service Provider (ISP) and set up a booth. The ISP showed people how to use the Internet and customize it to fit their needs. People who visited the booth received hands-on training and opportunities to surf the web during the open house.

Impact:

The ISP reported that approximately 25 local residents signed up for the Internet service as a direct result of the booth.

Description:

USU Small Business Centers served an advocacy function for businesses in Utah and were a motivating force behind state laws affecting home businesses.

Impact:

State law was changed allowing businesses to operate out of homes without a license if sales are less than \$1,200/year.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Economic Development Planning

Key Theme – Jobs/Employment

Description:

In Piute County, the dairy milk prices and the cost of production caused a dairy family to quit the dairy business. Verl Bagley, the Piute County Agent, with help from a USU Agricultural Engineer, assisted the couple in laying the foundation for a meat cutting and wrapping business, to utilize the husband's skills in this area. The county agent secured copies of rules and standards that meat cutting and wrapping businesses are required to follow. The Agriculture Engineer provided plans and specifications that the owners could adapt to their site. Zoning and water rights changes from livestock to manufacturing enterprises were secured.

Impact:

The family has begun construction on their old dairy site for a meat cutting and wrapping business.

Description:

Boyd Kitchen, the agriculture agent in Uintah County worked with Roosevelt City and area economic development officials in gathering information on converting an idle oil refinery to produce ethanol from corn or other grains. The agent gathered information on grain production and livestock feeding in the Uintah Basin, as the project is more feasible if the grains needed for the ethanol refinery are grown locally and the high protein animal feed by-products from the refinery are used in the Uintah Basin.

Impact:

An information meeting on the project educated 50 local farmers, elected officials, and citizens on the possibility of converting the oil refinery to an ethanol refinery.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: USU Extension Feasibility Studies

Key Theme – Jobs/Employment

Description:

Economic feasibility studies are completed by Extension economists and are used to help people who are exploring agricultural markets and/or opportunities in Utah. Dee Von Bailey, Extension Marketing Specialist, and Bruce Godfrey, Extension Farm Management Specialist conducted an economic feasibility study for a proposed soybean crushing facility in Utah

Impact:

The conclusions of the study indicated that such a plant would not be economically feasible at this time, so plans to go forward on the project were not implemented.

Description:

Dee Von Bailey, Extension Marketing Specialist, and Bruce Godfrey, Extension Farm Management Specialist conducted a survey of sheep producers concerning their willingness to form a cooperative.

Impact:

Almost half of all of those responding indicated willingness to form a cooperative. This information is also being used by a sheep rancher in Sanpete County to help get a cooperative organized.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Utah Heritage Highways Program

Key Theme – Supplemental Income Strategies, Tourism

Description:

Profit margins in the Agriculture sector are becoming tighter and tighter. Often young farms close because they cannot make enough profit to sustain a family. When farms close, through retirement or because of economic reasons, they are often bought by expanding farms trying to become large enough to be viable. In Sanpete County they are losing 30% of farmers every ten years. Alternative or supplemental enterprises are needed to help rural areas survive economically. Extension is working with the Heritage Highway 89 Alliance to help artisans, crafters, tour operators, small businesses, and others to become successful in producing and marketing their products.

Impact:

Gary Anderson, Extension Agent in Sanpete County developed, applied for, and received a \$30,000 Mineral Lease Grant that assisted in the creation of brochures about the corridor and a catalogue of products. He has assisted with grass roots efforts in counties along the Highway 89 corridor in promoting heritage products, services, and experiences, and in obtaining grants to upgrade storefronts. The Heritage Highway 89 Alliance is in the process of working with state and national legislators to designate the Heritage Highway 89 corridor as the Mormon Colonization Experience National Heritage Area.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Applied Internet Mastery Program and Smart Sites

Key Themes: Workforce Preparation - Youth and Adult, Jobs/Employment

Description:

In Sanpete County, Gary Anderson, Region Heritage Highway 89 Specialist, worked with the County Economic Development Director, the Small Business Development Center Director, and others to develop a proposal seeking designation as a Smart Site. Smart Sites is part Governor Leavitt's vision for an expansion of jobs and companies from Silicon Valley to Utah, especially to rural Utah.

Impact:

This team had a Smart Site plan approved for Sanpete County. They were able to obtain the use of a vacant Sanpete School District building at the rate of \$10.00 per month plus utilities to house the Smart

Site. They also obtained a grant from the EDA Administration to finish 20,000 sq. ft. of unused warehouse space for use as an incubator for technology startup companies and started a nonprofit 501C-3 Community Development Corporation to assist the startup of technology businesses.

Description:

Gary Anderson, Region Heritage Highway 89 Specialist partnered with Smart Utah, Sanpete County Economic Development, and the SBDC Office at Snow College, and Snow College technology staff to put on the Sanpete County Technology Expo.

Impact:

More than one thousand participants attended the workshops and exhibits and learned basic computer skills, home page building, investing and banking on the Internet, and about other aspects of technology. The Expo raised the awareness of technology in Sanpete County.

Description:

At a Business Symposium in Duchesne County, Troy Cooper, Extension Agent held workshops on E commerce.

Impact:

Twenty individuals learned and increased their knowledge of E -business, how it works and how they could use E commerce in their own businesses.

Description:

Margaret Hopkin, the Extension Agent in Morgan County organized and helped teach community computer classes in Morgan County School District facilities.

Impact:

Close to 500 residents attended afternoon or evening classes and learned about the basics of computers, Windows 95-98, Basic Word Processing, Desk Top Publishing, Print Artist, DJ Inkers, Spreadsheets, Intermediate Databases, PowerPoint, the Internet, and E Commerce. More than 75% of the students were over 50 years old. Participants reported using their new skills at work, in workforce education and training classes, and in seeking job advances and promotions.

Description:

In Juab County, Jeff Banks, the Extension Agent co-hosted the 'Internet Know -How'" training course.

Impact:

Twenty people learned the history of the Internet, how it works, how to use search engines, filter and block methods, and tips on how to make the Internet work for them. As a result of the training, eight participants signed up for Internet service.

Description:

In Tooele County, Mathew Palmer, Extension Agent set up an Internet lab in the Extension office from surplus computers. Residents who cannot afford Internet service use the lab to access the Internet. The lab aids in teaching residents in the county about resources available through the Internet.

Impact:

In Tooele County 35 elderly people learned basic computer functions, about the Internet, and how to use e-mail. These individuals now use e-mail to communicate with friends and family.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Community Organization and Leadership Development

Key Theme – Leadership Training and Development

Description:

Stan Guy, 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 18th 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. Twenty-eight Youth City Councils, comprising 442 youth and advisors, participated in the three-day conference.

Impact:

A majority of participants completed an evaluation of the Leadership Institute. Ninety-three percent (93%) of participants indicated they plan to adopt one or more recommended practices taught at the leadership institute. In addition, 56% rated the overall conference as "Excellent" and 34% rated it as "good." The youth councils provided many hours of service that benefitted their communities. Organizational ideas, raising funds, gang prevention, and other aspects of Youth City Councils strengthen organizations in Utah communities.

Description:

Marion Bentley, has provided Management and leadership training through Extension workshops to elected county and municipal officials throughout the Rocky Mountain region.

Impact:

More than 200 elected officials and municipal employees learned communication, conflict management, and interpersonal skills in one of five Extension workshops.

Seventy-five managers and supervisors learned basic and advanced management skills through a State of Utah Certified Public Manager (CPM) training program partnered with Extension.

Description:

USU Extension Agents work with and mentor citizens who volunteer on numerous councils in communities throughout Utah. Extension works with these volunteers to increase their leadership skills, to improve life skills, encourage lifelong learning, and to improve the quality and effectiveness of citizen volunteer boards.

Impact:

Margie Memmott, Juab County Consumer Science Agent organized and acted as an advisor to the Juab County Home Economics and Family Life Advisory Council (HEFLAC). The council played a key role in identifying areas of need for local Extension efforts and in providing programs to help improve the quality of life for residents in Juab County. The 16 community volunteer members of HEFLAC developed and demonstrated leadership in planning, organizing, advertising, and co-hosting six educational programs in the county attended by 482 residents.

Description:

In Juab County, Margie Memmott worked with the Fair Board and volunteers who organized the annual Juab County Fair. She provided instructions and supervision to visiting judges and local fair workers in the home arts and 4-H divisions. She also provided training, instruction, and supervision to local volunteers who judged neighboring county fairs.

Impact:

More than 4,000 people attended and participated in the fair put on by 200 volunteer workers. Twenty-four of the volunteers trained, practiced, and demonstrated their skills by providing and judging the 4-H and Open Class exhibits at a neighboring county's Fair.

Description:

Heather Rasband, with the Salt Lake County Extension 4-H Outreach Program encourages youth to attend National training opportunities, State 4-H Leadership Training, community youth leaders training, Teen retreats, and participate in teen council meetings. Some youth are trained and serve as camp counselors for younger youth attending three-day camps. Eighty-eight 4-H youth from Salt Lake County were substantially involved in local, state, or national leadership training.

Impact:

Teens reported increased knowledge of leadership and communications skills, improving their confidence and abilities as leaders in their community. A 4-H volunteer leader received the Governor Leavitt's Points of Light Award, which is given to outstanding volunteers who, through voluntary and ongoing community service, address unmet human, educational, environmental or public safety needs.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: Community Planning and Design

Key Theme – Community Development

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Description:

Working with local elected officials, city staff, economic development boards, and county agents, Stan Guy, USU Extension Community Development Educator, developed public opinion surveys that addressed a variety of planning, operational, and policy issues facing elected officials. Community surveys were conducted by Extension in Castle Valley, North Ogden, Clinton, and Hyrum City. Opinions from 1677 citizens were gathered on public issues affecting their quality of life. These included neighborhood issues, parks and recreation, city services, planning and development, a historical museum, trail systems, open space, agriculture preservation, and the environment.

Impact:

As a result of these surveys, elected officials became aware of the public's attitudes and opinions on planning, recreation services, agriculture preservation, and other issues. Many of the opinions were incorporated into public policy documents, such as the city general plans. Results from the survey for the Castle Valley area of Grand County were used in a joint citizen/state school trust lands planning effort to mitigate the impact of developing school trust lands in this scenic valley.

Since 1992, 17,817 Utah households have been surveyed using 54 USU Extension Community Needs Assessments. Local officials reviewed citizen opinions to make informed decisions. The surveys provided primary research for parks and recreation development, infrastructure planning, growth strategies, Utah wilderness debates, and many other public issues.

Description:

Dave Rogers, USU Extension Community Resource Development Specialist, and Stan Guy, USU Extension Community Resource Development Educator, conducted four focus group interviews and three mail surveys for the Utah Department of Health on rural health care and hospital issues. Focus group participants represented the elderly, persons with disabilities, low-income persons, minorities, uninsured, single women with children, home care and nursing care employers and schooled children.

Impact:

Reports generated from the focus groups and mail surveys are being used by the Utah Department of Health in determining costs and benefits of some rural hospitals converting to critical access hospitals.

Description:

Extension staff is involved in a wide range of activities and conferences geared toward preserving open space, farms and ranches, and enhancing Utah's natural, cultural, and economic heritage. Clark Israelsen, Cache County Extension Agent cosponsored the "Protecting Our Agricultural Heritage" conference.

Impact:

More than 130 Cache County residents increased their awareness of the economic and aesthetic value of agriculture, learned about tools available to protect agriculture lands, and the need to provide the necessary political will and financial support to make preservation efforts successful.

Description:

A telephone survey of Cache County residents conducted by Dave Rogers and Stan Guy and the Logan City Economic Development Department resulted in a report titled "Cache County Underemployment Telephone Survey 2000." The report showed that between 5,365 and 5,847 employees felt they were underemployed because they had more training experience or education than was required to perform their present jobs. The majority of these underemployed workers said they would change jobs to get higher wages, to make better use of their skills, to have more promotion opportunities, or to secure better benefit packages.

Impact:

Logan City, the Cache Chamber of Commerce, and other economic development agencies use the report in business recruitment activities. They show businesses being recruited, that despite the low unemployment rate, there are workers available for higher paying, better benefit jobs in the local area. In addition, the local Human Resource Professionals are using the information to better understand the local employment market and in analyzing their benefit packages and employee retention activities.

Description:

Working with Mayors, City Councils, Planning and Zoning Commissions, citizens, and other local and state agencies, Dave Bell, the Extension Landscape Architecture Specialist assisted with or completed three downtown and six general community plans, eight parks and recreation projects, and six landscape design projects involving 13 communities and 21 counties in Utah. Many rural communities have limited human and financial resources to adequately develop provisions for comprehensive planning so Extension provided training, assistance, and design work that addresses local community needs. USU Extension conducted site visits, attended startup meetings, and gave presentations using illustrated examples to explain the planning and design process. In addition, base information was gathered and assembled for planning and design work.

Impact:

Payson City property owners are using plans to landscape and develop their property based on downtown plans completed after analysis and alternatives developed by Extension were submitted to Payson City. The Utah Department of Transportation is using some of these plans to finalizing their road and transportation plans for the Payson City area.

Helper City is now in a position to adopt a final downtown master plan that they can use to generate funds to start revitalizing their downtown. Helper City officials worked with the Extension Landscape Architect and a graduate student who put together inventory information, analysis information, three conceptual alternatives, three alternative development plans, and a consensus plan. Three community workshops were held to as part of the downtown planning and design process.

In American Fork presentations and alternative streetscapes have been generated to improve the business climate and the general appearance of their downtown. American Fork's downtown is similar with other older and smaller downtowns along the Wastach Front so working on and resolving their downtown issues will be of great value to other cities with downtowns in similar situations. Streetscape plans are nearly complete for one of the two entries into American Fork. After they are completed property owners will be able to install a landscape plan within the public right of way that is consistent with the rest of the street.

Tooele City is in the process of installing a demonstration garden based on one of the alternative plans created by Extension to demonstrate native and drought tolerant plant material.

Perry City is providing construction to implement a neighborhood park with trails, picnic areas, playgrounds, open play areas, parking and landscape based on a consensus plan developed by Extension with citizen committee input.

Based on a Master Plan and other detailed plans developed by Extension, the Bureau of Land Management (BLM) developed budgets and schedules to implement improvements to the Cleveland Lloyd Dinosaur Quarry. Based on the Master Plan, there have been fences, walkways, trails, and other improvements completed at the quarry by approximately 200 volunteers.

Key Theme – Workforce Preparation – Youth and Adult

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Description:

Curtis Crittenden, the USU Extension Agent in Wendover Utah/Nevada is a member of the Wendover Education Center Advisory Council. This Council involves many community leaders who work together to create programs and opportunities for the community.

Impact:

The Wendover Education Center Advisory Council helped create a Culinary Arts class that is being taught at West Wendover High School. Plans are being made to expand the class into Wendover High School. The class brings together the schools, community leaders, and local Casinos' chefs to give students an opportunity to study something in school that will benefit the students in the future by training them for an occupation that is in demand locally.

The West Wendover Teen Council initiated the planning of a skate park, working with the West Wendover Recreation District and the City planners and Council to begin the process of establishing the skate park.

Description:

Carol Williams, the Extension Agent in Wayne County has worked with the Utah Education Network, the local school district, and Wayne County officials to open the Wayne County Community Education Center.

Impact:

Thirty-one students enrolled in 52 classes offered during the calendar year. The first person to graduate from the site is now furthering her education and is enrolled in Graduate School.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT, NV

Title: Youth Opportunities for Community Involvement

Key Theme - Youth Development/4-H

Description:

With more than 700,000 Utah residents age 18 and younger, Utah has the highest percentage per capita of children in the nation (Utah Kids Count Data). Utah has 135,280 youth enrolled in 4-H, being led by 8,940 adult volunteers and 1,909 teen volunteers. Recent surveys indicate that less than 20 percent of American youth under 18 have opportunities for meaningful citizenship and community participation. As potential state and national leaders, youth need opportunities to become actively involved in community affairs. Such opportunities provide first-hand experiences in problem solving and decision-making. By actively working on community issues with elected and appointed officials, youth learn to appreciate and understand their own communities. Utah 4-H has provided citizenship, leadership and community involvement opportunities through the following programs:

Impacts:

Mock Legislature - 92 4-Hers took the leadership in the House of Representatives in the State Capitol Building in Salt Lake City and experienced the legislative process by presenting actual bills dealing with

teens that were used in the previous legislative session. These youth participated in committee work and debated and voted on the bills in the House floor.

Guide Dogs - continued 4-H support of the citizenship Guide Dog program. We have 43 dogs in Utah and we had 210 Guide Dog participants during 4-H Day at the Utah State Fair.

Youth City Council Networking - This year a concentrated effort was made to re-involve 4-H and Youth City Councils. The 4-H program was presented to the Association of Youth City Councils as a vehicle to help their program. This collaboration has resulted in the combined group participating in Mock Legislature, and the coordination of Ribbon Week with the Youth City Councils and 4-H Teen Councils in 17 counties.

Youth Federation for Youth - 4-H State Ambassadors have been involved with the Federation, and ten counties are currently working on the statewide Ribbon Month Committee designed to stop drug and violence in our youth. This work provides us with the opportunity to collaborate with many youth serving agencies.

Teen Leadership Training (TLT) - 83 youth and 20 adult leaders attended the three-day TLT program. Workshops included creating youth/adult partnerships, team building, asset building, service learning, ambassadorships, teen council development and teen ambassador development. For the first time adults were invited to attend workshops specifically designed for them on asset building and working with teens. Montana sent six youth and one adult delegate and Idaho sent four youth and two adults.

Ambassadors - The current ambassador program was expanded to include District Ambassadors. Our State Ambassadors and Ambassador Advisors have been heavily involved in the expansion of the Southwest District Ambassador program. Last year we had 140 youth and 60 adult mentors involved as District Ambassadors in ten counties, an increase of 47% over the previous year. Two hundred twelve 4-Hers attended the last District Ambassador Retreat. One of the main objectives of the Southwest District Ambassadors has been service.

Utah hosted the Western Region Leadership Camp for Teens on campus at Utah State University. One hundred and sixteen youth and adults attended the conference from nine western states. Leadership and community involvement were the main themes of the camp.

Adventure Camp - A statewide camp held for the first time on the USU campus for youth in the 7th and 8th grade. This camp is designed to develop leadership, citizenship and teamwork skills. Older teens and Ambassadors serve as group leaders and mentors and 53 youth and adults participated.

Bake and Take Week - 23 out of 28 counties reported Bake and Take activities during State 4-H Week. They held special programs to recognize business leaders, government officials and organizations that support 4-H.

Utah's 4-H youth enrolled in citizenship, civic education and personal development and leadership totaled 44,412.

Source of Funds: Smith-Lever, State

Scope of Impact:

UT

Title: More and Better Trained 4-H Volunteers

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Key Theme - Leadership Training and Development, Youth Development/4-H

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Description:

Our Utah 4-H Volunteers are making a difference in the lives of our young people. Our Extension agents cannot reach all youth without the help of volunteer leaders. In Utah, volunteer leaders are the corner stone of the 4-H Youth Development Program. At the present time we have approximately 21 FTE (full time equivalent) Extension agents working in 28 counties. Of those, only four agents have full time 4-H responsibilities, most have dual assignments. Our last reporting period showed 4-H had 8,940 adult volunteers and 1,909 teen volunteers. This is an average of 517 volunteer leaders per Extension agent! With 135,280 youth enrolled in 4-H projects in our state, each Extension Agent has responsibility for approximately 6,442 youth! The volunteer leaders work directly with the youth and truly make a difference in their lives. There is a continuing need to recruit, train, and mentor both new and current volunteer leaders. The success of the 4-H program really depends on these volunteers.

Impact:

We have helped with the volunteer leadership program by:

- * Cooperating with western states volunteer recruitment marketing campaign.
- * Developing and distributing new recruitment materials for new 4-H volunteer leaders.
- * Training and working with older teens to serve as 4-H leaders - Teens Reaching Youth (TRY).
- * Working with Leadermete committees (a volunteer leader training program) to implement this annual statewide training for 4-H volunteers and agents.
- * Working with the Utah 4-H Volunteers Association to keep their State Council organized and functioning; to publish three to four newsletters each year; to sponsor volunteer leader awards, the State 4-H Talent Show and Contests, Space Camp and events such as the Green Foods Contest and Fashion Show at the Utah State Fair.

Source of Funds:

State, Smith-Lever

Scope of Impacts:

UT

Title: Preparing Youth for Employable Futures

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Key Theme - Workforce Preparation - Youth and Adult

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Description:

Young people, whether pursuing a career path in entrepreneurial ventures or seeking employment opportunities in the future, need to build core competencies and foundation skills. In the U.S., among counties with populations more than 10,000 having the highest share of residents under the age of 18, 7 out of 10 are found in Utah. This alone indicates a great need for work force preparation.

Impact:

World of Work (WOW) - A 4-HCCS workforce preparation activity guide for grades K-6 has been given to 28 Utah counties. Emphasis has been given to counties to incorporate this curriculum into existing Teen Councils and District Ambassadors programs, using teens to present work force preparation activities to younger 4-H'ers. Seven teen councils are currently using these materials. Counties have been supplied with additional resource material and have been encouraged to become involved in this program. Information was presented at State 4-H Contests, Teen Leadership Training (TLT) and at Western Region Teen Leadership Camp.

World of Work Contest - This year at the State 4-H Contests a world of work contest was held. Each 4-Her who entered the contest had to fill out a job application (most of the youth had never filled one out before.) They were shown a film about the world of work while waiting for their interview. They were also given handouts on job interviewing, effective cover letters, and preparing for the world of work. They went through a ten-minute mock interview. Each individual was scored on his or her interview and application. U.S. Savings Bonds or State Contest jackets were given as awards to the top individuals. Eighty-one youth participated in the contest.

Master Your Future - We introduced a program called "Master Your Future," which deals with financial responsibility for high school students. Our teens got excited about this program and its potential for use throughout the state. MasterCard developed this program to help educators address financial responsibility in the classroom. To date, it has won eight major awards for excellence. The program consists of a 15-minute video and a 12-page teacher's guide covering budgeting, checking and savings, credit and credit history.

MasterCard International was contacted and they donated one complimentary copy, along with 30 student supplements, for each county. This is a great educational world of work program for teen councils and teen audiences in each county. Agents in all Extension districts have been trained in the Master Your Future program. To date, more than 800 4-H'ers have participated in this program.

Currently there are 8,127 youth enrolled in Utah 4-H work force preparation programs.

Source of Funds:

State, Smith-Lever

Scope of Impacts:

UT

Title: Developing Youth Through 4-H Horse Programs

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Key Theme - Youth Development/4-H

Description:

The challenge of the 4-H Youth Development Program is to prepare young people for adult responsibilities. 4-H horse projects are a natural for developing responsibility in youth.

Impact:

Forty-four percent of the 41 Extension agents have indicated that their work in the 4-H Horse Program shows it to be one of the most highly involved and popular 4-H programs in the state. The 2000 ES-237 statistical report indicated that more than 6,389 youth participated in horse projects. Each participant owns or has access to a horse, and develops skills in proper care, feeding, grooming, riding and showing, as well as participating in other horse related activities. 4-H youth participating in the four State Horse Shows and numerous county and regional competitions gain valuable learning experiences, increase knowledge and showmanship skills, exhibit and practice the horsemanship skills they have learned, and develop behavior skills through winning and losing gracefully. Youth also learn the reasons for, and the value of following rules, the value of health and safety and decision making skills. 4-H horse projects have the potential to teach responsibility through the care and keeping of their project animal and equipment, concern for others, record keeping, the value and importance of good ethics and hard work, and they help build self confidence and the ability to express oneself. All of these are quality life skills.

Source of Funds:

State, Smith-Lever

Scope of Impacts:

UT

Title - Developing 4-H Youth Through Junior Livestock, Dairy and Goat Programs

Key Theme - Youth Development/4-H

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Description:

State 4-H and FFA Junior Livestock Shows were available to exhibitors from throughout the state, in addition to the many County Junior Livestock and Dairy Shows and the Utah State Fair. Each show has

their own rules and guidelines, but they must also follow the state rules. These shows provide opportunities for youth to greatly expand the scale of their livestock and dairy project. 4-H youth participating in Junior Livestock and Dairy Shows increase their knowledge and showmanship skills, exhibit and practice the showmanship skills that they learn, and develop behavior skills through winning and losing gracefully. They learn the value of following rules and why those rules are made, record keeping skills, the value and importance of good ethics, hard work and decision-making skills. 4-H Junior Livestock and Dairy projects have the potential to teach responsibility through the care and keeping of their project animals and equipment, build self confidence and self esteem, develop concern for others and the ability to express oneself. All of these are essential life skills.

Impact:

According to the ES-237 statistical report, more than 10,933 youth participated in beef, sheep, dairy, goat and swine 4-H projects which is an increase of more than 300 percent over the previous year. An additional 25,915 youth participated in the Ag in the Classroom program through embryology and agricultural farm field days school enrichment projects, which allow both urban and rural youth to be informed about agricultural science. This is an increase of 255 percent over the previous year.

Source of Funds:

State, Smith-Lever

Scope of Impact:

UT

Utah Agriculture Experiment Station Accomplishments

Planned Program Area: 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

Brief Description/Impacts: 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. 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

Brief Description/Impacts: A statewide survey on the health, nutrition, and lifestyle of Utah residents 50 years of age and older was developed and tested. Surveillance systems are the best way to monitor health and establish norms in free-living populations. They provide estimates of the health and quality of life of a population by collecting data on a wide range of variables known to be associated with public issues from a probability sample of people from the target population. Epidemiological studies (case-control studies, clinical trials, etc.) cannot provide the same information because they are designed to study specific health problems and must select participants accordingly. Of great importance to local, regional, and national service providers is the use of survey data to identify major health problems and the sub-groups at greatest risk. From this information, remedial interventions and educational programs can be implemented in a timely fashion. This survey also augments the Utah needs assessment and satisfaction survey on aging conducted in 2000 by the Utah Office on Aging and Adult Services and USU, by providing quantitative data on the health and lifestyle status of older people in Utah.

Interdependencies Among Community, Agriculture, and Social Change in Nonmetropolitan Utah

Brief Description/Impacts: Our research has uncovered a dialectical paradox in the prevention of childhood diseases. Results from existing models suggest that early successes in public health action are contingent on the visibility of disease. This situation appears to be especially pronounced in Utah where recent data shown of the lowest immunization rates in the country. Our findings continue to be shared with local agencies through applied technical reports.

Physiological Roles of GTPase-Activating Proteins (GAPS)

Brief Description/Impacts: γ -type calcium channels are essential for neurotransmission in the brain. Our experimental results have shown that Regulator of G protein Signaling protein 2 (RGS2) can block or slow muscarinic (an ammonium base that acts directly on smooth muscle) inhibition of neuronal γ -type calcium channels while leaving fast muscarinic inhibition of these channels intact.

Relationship Between Androgen Receptor Genotype and Epidemiologic Factors

Brief Description/Impacts: Additional data analyses on the relationship between body fat distribution in older adults and androgen receptor gene CAG and GGN polymorphisms occurred in 2001. Strong associations were observed between the combined CAG and GGN genotype and central fat distribution, particularly among women.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

209	227	841
220	237	
221	638	

Funding Level: \$136.835.71

SYFTE: .88

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.

Rural Economic Development: Alternatives in the New Competitive Environment

Brief Description/Impacts: To maintain sustainable economic enterprises, rural communities must maintain economically viable access to health care, financial services, and education. This project is designed to contribute to our understanding of how the first two elements of this economic dynamic are sustained in the new competitive environment. Analysis of rural health care systems in the new competitive environment has continued. Research this year has focused on broader regional markets for rural health care service. We are also extending our assessment of how federal, state, and regional health care policy impacts the scope of health care services available to rural residents. The rural health care study and rural financial markets study are both policy oriented. Presentations to rural policy makers in the state of Utah this year to inform them of our work has generated significant excitement. When presentations are made in local communities, there is always broad-based interest in participation in on-going research and dissemination of work already completed. We have also been in contact with researchers from Montana who are interested in partnering on a broader scale to look at rural development issues, and in particular rural health care issues, that are common to the rural West.

Impacts of Structural Change in the Dairy Industry

Brief Description/Impacts: 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. 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

Brief Description/Impacts: During the past year, efforts on this project have been divided between analysis of previously-collected data and new data collection activities in several study sites in Utah, Wyoming, and Nevada. Analysis of previously collected data reveal that social disruptions associated with rapid population growth and economic expansion tend to be relatively short-lived after rapid growth has ended. Also, analyses of fear of crime levels in areas affected by rapid change indicated that there is little

distinction between long-term residents and new in-migrants with respect to this measure of social well-being. Results from this study will help policy makers and community officials to better understand the social impacts of rapid population growth and economic transformations affecting many areas of rural America. These 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

Brief Description/Impacts: Researchers completed the longitudinal analysis of the Mormon Culture Region (MCR). The major finding is that the MCR endured as distinct cultural entity even as it was transformed in the midst of tremendous national social and economic changes. This research is important for showing the capacity for regions to persist in the face of modernization. These findings contribute to a better understanding of factors associated with changes in Utah's population. This is helpful to local and national policy makers in the development of policies and programs for better serving the needs of the state's growing and diversifying population.

Factors Influencing Willingness to Continue Family Farm Operations in Utah

Brief Description/Impacts: During the past year, project efforts included continued analysis of data from previously-conducted surveys of farm operators in areas of northern Utah and southern Idaho, as well as new data collection activities focused on dairy farm operators. Results indicate that while many farm operators perceive adverse effects on their operations from urban encroachment and land development pressures, relatively few believe that agricultural land protection programs have the potential to alleviate those problems. Results from this project help to clarify the nature of pressures affecting farm operator decisions regarding the continuation of their operations. The results also provide information regarding the potential effectiveness of policies and programs intended to help maintain agricultural activity in areas affected by growth and land development pressures.

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

Brief Description/Impacts: Project efforts to-date have focused on the collection and organization of available data pertaining to the siting of high level nuclear waste (HLNW) storage facilities on Native American lands in general, and on Utah's Skull Valley Goshute reservation, specifically. 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

Brief Description/Impacts: We conducted an extensive empirical and theoretical literature review on the association between identity and well-being of family members. Understanding how people adjust, or do not adjust, to transitions in identities in both work and family environments will aid practitioners in facilitating adaptation. These challenges have the potential to be particularly problematic for families not of the

dominant culture. With the increase in the Latino population in Cache Valley, a better understanding of identities and transitions has important implications for both the mental and physical health and well-being of recent migrants.

Adoption and Adolescent Well Being

Brief Description/Impacts: Adopted adolescents are at higher risk for school achievement problems, substance use, psychological well-being, physical health, fighting, and lying to parents when compared to non-adopted peers. It has been found that adopted adolescents were twice as likely to have received mental health counseling than their non-adopted peers. This would suggest that clinicians should be sensitive to issues that are especially salient to adoptive families and that the prevalence of problems, adoptive family characteristics, and adoptive status should be taken into account to understand adoptive adolescent mental health counseling. This research will help professionals, as well as parents, understand special issues that will aid adoptive families.

Promoting Life Management Skills to Enhance Employment Among Family Support Service Recipients

Brief Description/Impacts: This project deals with promoting life management skills to enhance employment among family support service recipients. The researchers are nearing the completion of the longitudinal phase of data collection. We believe that our attempts to isolate meaningful differences among women who receive public assistance will be useful to change agents who are tasked with facilitating welfare to work. Interventions that are tailored to the needs of this population, that take into account individual values and goals, and that are carried out in a sensitive manner could identify and enhance skills that would assist in the attainment and retention of employment.

Family Business Viability in Economically Vulnerable Communities

Brief Description/Impacts: Cash flow problems within family business are common with more than one-half of the family businesses sampled. Family businesses with cash flow problems are more likely than those without cash flow problems to use business income to meet household needs. They also are more likely to use real estate in order to secure loans to finance family needs. Wives with husbands who are both household and business manager spend a higher number of hours working in the family business than wives in other types of business-owning households. For almost 14% of the population, a major source of family income is a business that is owned and managed by family members. Family businesses contribute a major portion of the country's production, employment, and income. It is important to determine what factors contribute to continued economic viability of such enterprises.

Health-Wealth connection and Institutionalization of the Very Old

Brief Description/Impacts: The recent literature related to health status, health care use, and financial status of aging populations had been searched and was reviewed to revise the conceptual framework of the study. Preliminary data analysis was conducted to verify the accuracy of the downloaded data. When the accuracy of the data set is checked, variables for the study will be drawn and analyses completed.

Source of Federal Funds: Hatch Act

Utah (UTA) CRIS Project Numbers:

074	844	974
353	846	985
421	869	990
839	971	
843	972	

Funding Level: \$554,128.32

SYFTE: 2.6

Scope of Impact: Intermountain West, National

Cross-Cutting Management Initiative or Goal:

No accomplishments or results

Focus Areas Identified in FY 2001 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 166: The ability to understand the mechanism associated with bovine oocyte activation could be applied to the nuclear transfer technology to increase the efficiency of embryo production. In addition, results of transgenic milk production experiments provide the feasibility of producing potentially harmful proteins at commercial levels in the milk of transgenic animals.

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 snow mobiling 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 704: Ecosystem management research has been and is being done to reconstruct the conditions of past ecosystems in the American West, for periods within the 150-year period I examined. But no research has been done to gauge what people as naturalists of the times thought was proper and improper management of their ecosystems. From this, judgment can be made as to how these people of the past would, if brought back to life, react to the state of present ecosystems and the current visions of managing these ecosystems. Second, judgment can be made as to how much of an ecosystem management perspective these people had.

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 snow shoe 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 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 benefitted 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 446: The benefits of this project are information on the amount of potentially conservable water in both agriculture and landscapes, and a means for estimating landscaped area such that the amount of water actually used in landscapes can be calculated. This project has a potentially large impact on urban water use in the West. The approach to water conservation developed from this project will serve as a model for other urbanizing areas in the arid West. Water purveyors in the West, and the rest of the country, can use methodology developed from this project to analyze landscape water demand and determine the amount of landscape water that could actually be saved if the need should arise. The outcome of this project will increase their awareness and give them tools to fine-tune their water demand.

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

Utah has developed an integrated process for securing stakeholder input into perceived needs, program implementation and assessment. Extension Advisory Councils function in each of the 28 counties of Utah. Many counties additionally have specialty councils involving commodities, issues, and other special interest groups. A newly formed 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. An Accountability in Action Program has been established to facilitate listening sessions for individual stakeholders.

The Utah Accountability in Action Program was established in 2000 with the express purpose of providing opportunity for urban and rural residents to provide stakeholder input to Extension. In 2001 a cross section of ten (1/3 of the state) urban and rural counties were randomly selected to participate in this assessment-based program. 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 Plan of Work revision session.

Each of the ten counties participating conducted a random sample survey of customers to determine future needs based on identified program issues. Respondents were asked to rate how important these identified issues were to them and their families in the next five years. To date more than 970 respondents have told us about the importance of each of these identified issues. 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; adults' ability and willingness to nurture and guide youth; youth abilities 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.

Special efforts were made by each county to insure that undeserved 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. One hundred and ninety-seven participants attended the ten meetings held across the state. Attendance records from these stakeholder input sessions indicate that the majority of Utah's ethnic groups were represented in the discussions.

Internal stakeholders have refocused the Utah Plan of Work further. An institutionally driven process called Compact Planning has been influential in considering priority initiatives identified by Utah State University. This process, which is a form of strategic planning, has provided an opportunity for closer scrutiny of existing plans of work and how they might integrate with the university high priority initiatives.

Stakeholder input into the programs of Utah Extension 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 spaces⁴
- 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

An expansion of effort to reach the underserved with USU Extension programs has been a high priority in 2001. Twenty-eight counties received Civil Rights update training where special emphasis was placed on serving the underserved. County training programs involved county directors and staff in reviewing data from Census 2000. Ethnicity parity goals were reviewed and emphasis was placed on maximizing techniques for reaching underserved populations in all areas of the state. Additional emphasis was placed on programs designed to meet the particular needs of an aging population in Utah.

Output Indicators

Contact Summary of Underserved Utah Populations Served in 2001

	Nat Res/Agriculture	Comm Development	Home Economics	4-H
Am Indian	1012	247	420	2132
Hispanic	2185	1284	3578	7104
Asian/PI	819	83	488	1871

Representative Statewide Outcome Indicators:

A proposed rail project alignment in central Utah threatened to impact cultural and archaeological resources on non tribal lands of the Piute, Hopi and other Native American tribes. Tribal leaders, railroad representatives, archeologists, and community leaders were able to discuss openly railroad project alignment issues. Trust building among Native American populations increased and credibility for cultural sensitivity was significantly enhanced as a result of bringing interested parties together to find resolution to a complex issue.

Collaborative efforts with Utah Workforce Services and USU Extension have resulted in more than six statewide programs enhancing the connection with Hispanic communities. These programs serve Latinos with a computer-assisted Literacy Program for Non-English Speakers, provide nutrition and family finance publications in Spanish, and assist with legal documentation toward US citizenship. All of these program areas in turn increase the likelihood of enhanced employability experiences among this population. Many Latino youth are being introduced to 4-H and teen groups are exploring continuing their education after high school as an added outcome.

Twice weekly Hispanic mothers and some of their children attended ESL/Computer classes at a local elementary school during the summer. The FNP teacher took the children and taught them a food lesson and gave them a food experience. Hispanics tend to isolate themselves with people who they are like in our community. This class has encouraged them to get out of their groups and go out into the community more frequently. They speak English very haltingly, but they will attempt it. At first they were afraid, but soon began introducing their family and friends to others.

In southeastern Utah many Native Americans are faced with nutritionally related challenges. The Family Nutrition Program partnered with the Utah Diabetes Control program to teach healthy eating by following the food guide pyramid. Weekly workshops were taught during dialysis so diabetics and those picking up commodities could attend. The outcome is that more Native Americans participated in the program learning nutritionally sound principles to improve their health status at a time conducive to the populations need.

Great efforts have been made to guarantee a positive contact is maintained with underserved audiences residing in Northeastern Utah. Children are included and frequently transported (at no expense to them) to participate in county activities.

Underserved patrons displayed One hundred ninety-seven projects as part of the County Fair. Ninety-four (94) youth submitted projects for display and a much larger number of family members representing the Native American population attended at the County Fair to see their child(ren)'s projects which had been placed on display. For these individuals, this association serves to increase the "trust levels" and provides a much-needed basis for future contacts with under served audiences within our community.

We have two people on our staff that speak Spanish and are able to converse with our Spanish clientele in their native language. Spanish publications have been developed and provided to the Spanish community. During the County fair, our office had several publications available in Spanish for our Spanish populations that addressed issues of raising children, child health and raising teenagers. We have a brochure written in Spanish that explains our 4-H programs and how to get a club started or involved in a club. During the spring, a visit to the community of Eskdale (about 95 miles west of Delta in the West Desert) was made to assist with some problems they were having with small grains. Several soil samples were taken and analyzed for nutrient content. Discussions with the agriculture community resulted in improved cultural practices with small grains in the community.

An urban-based Extension county organized WOW (Wonderful Outdoor World) CAMPS Through a partnership of 4-H and Utah Federation for Youth, 120 youth attended four WOW overnight camps held in South Salt Lake. WOW is a national program sponsored by Disney and Coleman Co. Utah is the fifth state to hold WOW camps. The purpose of the WOW program was to give urban youth a chance to experience camping and outdoor activities in an urban setting where sleeping outside is not as scary for the youth, show youth camping and outdoor activities they can enjoy as an alternative to drugs and gangs, promotes environmental stewardship, believing that youth are the catalyst for change.

4-H was incorporated as part of the summer education program for children of Hispanic migrant farm workers in Midvale. One hundred youth participated in the seven-week project on Family Folklore. The folklore project was selected because it connects the youth to stability through family and culture and promotes literacy, which has been identified by education professionals as needs for this population. All of the youth and teens were given the chance to display completed project work at an ending banquet and awards ceremony where the youth received 4-H certificates and ribbons. School district staff reported this program was a great success. They said the program was able to reach an audience through 4-H that has been difficult to reach in the past. They commented that this summer's program proves the benefits of 4-H and Extension to this population and are anxious to continue and expand similar programs in the future.

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.

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'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 Summaries Multi-State Extension

Agronomy and Crops

Asparagus Research Outcomes

Asparagus research was shared with growers in California, Washington and Japan on cultural practices and plant varieties that would improve the economic value of asparagus harvested and reduce expenditures associated with water and fertilizer applications.

Weed Control Demonstration Project Output Indicators and Project Outcomes

USU Extension established and conducted a two-year weed control research demonstration with weed specialists in Utah and Wyoming. We advised county noxious weed control programs and advised weed supervisors. An established Johnson Ranch Rocky Mountain Iris weed control demonstration with Utah and Wyoming Extension weed specialists was conducted. This demonstration is a complete randomized block design with three replications and six treatments to be evaluated in June 2002.

Working with weed managers from Idaho and Wyoming, encouraged the establishment of cooperative weed management programs with the Highlands Weed Management group in Caribou, Bear Lake Counties of Idaho, and Lincoln County Wyoming and possibly with Rich County.

A management plan was developed to control invasive weeds on BLM managed land in Uinta and Lincoln counties, Wyoming and Rich County Utah. This cooperative management area plan involved collaboration with BLM land managers and local grazing associations.

Livestock

Dairy Program Output and Outcome Indicators

Assisting milk producers in understanding risk in highly volatile markets has been an ongoing project with Utah dairy producers. Workshops have been expanded to provide assistance to Idaho, Oregon and Nevada dairyman in the Dairy Options Program (DOPP) that assists producers in understanding and applying the principles and practices of futures and options in marketing dairy products.

Through a memorandum of agreement with several western states Utah Extension Dairy Specialists have evaluated dairies in Idaho, Nevada, Montana and Wyoming through reviewing DHIA records from more than 25 herds, conducting producer workshops, and dairy specialist training sessions. This new way to evaluate DHIA records and best practices in managing dairies has led to increase production efficiency,

improved profitability, tightened biosecurity, better dairy complex planning, improved reproduction, and improved dairy herd management in these western states.

Beef Cattle Outputs and Activity Outcomes

Fifty-seven seed stock producers from Utah, Idaho, Colorado and Nevada entered 304 bulls into the 2000-2001 Bull Test sponsored the Utah Beef Improvement Association and USU Extension sponsored All-Breed Bull tests. The process of improving quality in slaughter animals through genetic selection will improve the product for the consumer and help assure higher profits for livestock producers.

Ranches in Southern Utah and Northern Arizona are almost entirely all range livestock operations. There is an ongoing need expressed by these producers for current information on rangeland and livestock management. The need is reinforced by the fact that most ranchers in this area depend heavily on public land grazing for their ranch viability. It is critical that ranchers and agency managers continue to learn new and better management approaches as well as continue to foster good working relationships. USU Extension sponsored the Arizona Strip/Southern Utah Rangeland Workshop, which involved 80 farmers and ranchers in sessions on production management techniques, and marketing opportunities. Ranchers learned how other producers are integrating environmental concerns and alternative sources of income into ranch operations. They also learned about the availability of commercial livestock and vegetation management products. They participated in an educational activity focused on beef quality assurance wherein they saw first hand the results of improper inoculation techniques and improper inoculation location. This improves their knowledge of techniques to reduce carcass damage, which improves profitability.

Veterinarians from throughout the state and western states have received information from the USU Extension via the Utah Veterinary Alert system, which has helped alleviate fear, paranoia and concern among Utah citizens since September 11 on such topics as viral hemorrhagic disease of rabbits, chronic wasting disease of elk, West Nile Virus, Scrapie, and the anthrax bioterrorism problem.

Youth and 4-H

4-H Outputs and Outcome Based Activities

Utah and Oregon Extension cooperated in developing youth curriculum materials for a 4-H Outdoor cooking publication. Youth from both states will benefit from the expertise jointly shared in these outdoor cooking materials development also with the potential of national adoption and nationwide impact.

Youth in border towns of Utah and Nevada have benefitted greatly from the 4-H programs, which have brought Hispanic youth and others together to explore 4-H projects and cultures. Language barriers have been reduced as Utah Extension has worked with youth and adults in Elko, Nevada to strengthen language and cultural understanding in a no-cost course on English as a second language.

Youth from Nevada and Utah involved in the Junior Livestock Programs were surveyed to determine what they learned from their project and to see what influences the project may have had on their value system. As result of their participation five core values were learned or reinforced significantly. 1. To accept responsibility. 2. To value contributions of other. 3. How to gain self-confidence. 4. Ethics - "Doing the Right Thing." 5. To be a friend with those different from me. The Junior Livestock Program contributed to youth core value strengthening and also helped leaders to assess and improve program aspects for the future.

4-H youth from Utah learned about diversity in an exchange program with youth from Bland County, Virginia in the summer of 2001. In this six-day experience youth and leaders discovered both the commonalities and differences in their backgrounds, which helped to promote understanding between Utahans and Virginians. Utah youth will travel to Virginia in the summer of 2002 to further the process of understanding diversity.

Youth Ag Literacy Output Indicators

Research with Oklahoma State University on a project to determine agricultural literacy benchmark standards began in the fall 2002. The study will determine if teachers that have had AITC training have students who are more agriculturally literate versus students whose teachers have had no exposure to AITC in our programs. There are 13 schools participating in the study. Initial data was collected in September, and comparative (post-test) data information will be collected in the spring. Results will help agriculture educators further understand curriculum and training implications for building a youth knowledge base of man and the land.

Economic Development and Business Retention

Project output and outcome indicators

Strengthening the economy in central and southwest Utah has been a primary motivator for assisting dairymen interested in relocating dairy operations to Utah. During the past year this program has been successful in relocating major dairy operations from California, Texas, Georgia, and Connecticut. It is anticipated that the combined economic impact will be more than 25 new jobs, an increase tax base in the communities of approximately \$25,000 and \$9.6 million invested in dairy production infrastructure.

Management and leadership training programs in the Rocky Mountain region have reached more than 200 participants in five workshops covering topics on communications, conflict management and interpersonal skills. A regional targeted industry project with pilot test sites in Nevada and Montana are being cosponsored with USU and the RUPRI. The expected outcome of this project is strengthening leadership with elected county and municipal leaders in the western states served.

Brief Summaries Multi-State 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

- 190 - Increased Efficiency of Sheep Production
- 103 - A National Agricultural Program to Clear Pest Control Agents for Minor Uses
- 114 - Improving Turkey Production Through Management Nutrition and Environment
- 157 - Improving Ruminant Utilization of Low - Quality Forages via Genetic Animal Selection
- 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
- 249 - Crop Improvement Through Seed Certification
- 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 - Multidisciplinary 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
- 023 - Identifying Markets and Market Niches for Utah Agricultural Products
- 785 - Improved Management Options for Cattle Ranches: Coping with Risk and Federal Rangeland Policy Change

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

828 - A National Assessment of Wildlife Damage to American Agriculture

956 - Coyote Sterilization as a Method of Reducing Depredations on Domestic Lambs

958 - Effects of Range Manipulations and Grazing on Rangeland Productivity and Biodiversity

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
- 847 - Western Rural Development Center
- 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**
- NCR-190, 2006**
- NE-183, 2004**
- NRSP-03, 2002 (Up for Renewal)**
- NRSP-4, 2004**
- NRSP-8, 2003**
- W-006, 2002**
- W-045, 2005**
- W-102, 2004**
- W-130, 2003**
- W-171, 2004**
- W-177, 2002**
- WCC-020, 2006**
- 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-122, 2007
W-130, 2003
W-181, 2004
W-191, 2002
W_Temp101, 2007

Goal 4:

NCR-170, 2006
NCT-188, 2007
NE-132, 2004
NE-162
NRSP-3, 2007
NRSP-8 (Up for Renewal)
W 045, 2005
W-133, 2002
W-184, 2002
W-185, 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-060, 2002

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_Temp082, 2007
W-167, 2005
W_Temp041, 2007
WCC-084, 2002

<p> NCA-013, 2002 Krannich, R. SSWA </p>	<p> Rural Sociology Cooperators: not available </p>
<p> NC-131, 2005 Carpenter, C. NFS </p>	<p> Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation (UTA00236) Cooperators: AZ, CA-D, IA, IN, KS, MI, MN, NE, OH, PA, SD, TN, UT, WA, WVA, WI </p>
<p> NC-140, 2002 Seeley, S.D. </p>	<p> Rootstock and Interstem Effects on Pome and Stone Fruit Trees (UTA00292) Cooperators: AR, CA, CO, GA, IL, IN, IA, KS, KY, MA, MD, ME, MI MN, NO, ND, NJ, NY, OH, OR, PA, SC, SD, TN, UT, VA, VT, WA, WI, WV </p>
<p> NC-185, 2007 Dhiman, T. ADVS </p>	<p> Metabolic Relations in Supply of Nutrients for Lactating Cows (UTA00417) Cooperators: AL, AZ, CA, FL, IL, IN, IA, KS, KY, MD, MI, MO, NH, ND, NMA, OH, PA, SD, UT, WA, WI </p>
<p> NCR-31, 2004 MacAdam, J. PSB </p>	<p> Physiological Aspects of Forage Management Cooperators: not available </p>
<p> NCR-101, 2006 Bugbee, B. PSB </p>	<p> Controlled Environment Technology and Use Cooperators: not available </p>
<p> NCR-170, 2006 </p>	<p> Research Advances in Agricultural Statistics </p>

Durham, S. Fisheries NCR-190, 2006 Cockett, N. ADVS	Cooperators: not available Increased Efficiency of Sheep Production 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
NCT-188, 2007 Bingham, H. ADVS	Diagnosis and Control of Mycobacterial Diseases of Livestock and Wildlife Cooperators: not available
NE-132, 2004 Miller, R. Snyder, D. ASTE	Environmental and Economic Impacts of Nutrient Management in 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. PSB	Multidisciplinary Evaluation of New Apple Cultivars (UTA00351) Cooperators: (being developed)
NE_Temp082, 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-4, 2004 Deer, H. ADVS	A National Agricultural Program to Clear Pest Control Agents for Minor Uses (UTA00103) Cooperators: AK, AZ, CA-D, CO, FL, GU, HI, ID, MT, NM, NV, OR, UT, WA, WY
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	Plant Genetic Resource Conservation and Utilization (UTA00762)

W-191, 2002 Gustafson, D. NFS	Factors Influencing the Intake of Calcium Rich Foods Among Adolescents (UTA00220) Cooperators: AZ, CA-D, CO, HI, ID, IN, MT, NM, NV, OR, UT, WA, WI, WY
W-192, 2006 Godfrey, E. ECON	Rural Communities and Public Lands in the West: Impacts and Alternatives (UTA0007) Cooperators: AK, CO, ID, NM, NV, OR, UT
W-195, 2005 Bagley, L. ADVS	Water Quality Issues in Poultry Production and Processing (UTA00471) Cooperators: AL, AR, CA-D, DE, GA, IN, KS, LA, MD, MI, MN, MS, NC, OH, OK, OR, PA, TN, TX, UT, VA, WVA
W_Temp041 Berry, E., Toney, M. SSWA	Population Change in Rural Communities Cooperators: (being developed)
W_Temp061 Evans, T. Biology	Biological Control in Pest Management Systems of Plants Cooperators: (being developed)
W_Temp101, 2007 Gustafson, D. NFS	Parent and Household Influences on Calcium Intake Among Preadolescents Cooperators: (being developed)
W_Temp161, 2007 Hill, R. MacAdam, J.	Managed Grazing Systems for the Intermountain West Cooperators: (being developed)
WCC-011, 2004 Johnson, P. PSB	Turfgrass Research Cooperators: AR, AZ, CA-D, CO, GU, MT, NE, NM, NV, OR, TX, UT, WA
WCC-020, 2006 Thomson, S. Biology	Virus and Virus-like Diseases of Fruit Trees, Small Fruits and Grapevines Cooperators: CA-B, CA-D, CO, HI, NYC, PA, SC, WA
WCC-021, 2004 Schupp, G.	Revegetation and Stabilization of Deteriorated and Altered 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-060, 2002 Brindley, W.	Science and Management of Pesticide Resistance Cooperators: AL, AZ, CA-D, CO, FL, IA, IL, IN, KS, LA, MI, MN, MS,

Biology WCC-066, 2006 Messina, F.	MT, NC, NE, NYC, OK, OR, SC, UT, WI Integrated Management of Russian Wheat Aphid and Other Cereal Aphids
Biology WCC-067, 2005 Rasmussen, V.P.	Cooperators: CO, KS, MN, NE, TX, UT, WA, WY WCC for Sustainable Agr.
PSB WCC-069, 2005 Alston, D.	Cooperators: AS, CO, GU, ID, MT, NM, NV, OR, WA, WY, UT Coordination of Integrated Pest Management Res. and Extension/ Education Programs for the Western States and the Pacific Basin Territories
Biology	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.	Biology and Control of Winter Annual Grass Weeds in Winter Wheat
PSB	Cooperators: CO, ID, KS, MT, NE, NM, OK, OR, UT, WA, WY
WCC-081, 2006 Hole, D.	Systems to Improve End-Use of Small Grains
PSB	Cooperators: ID, MT, OR, UT, WA
WCC-084, 2002 Berry, E.H.	Community, Institutional Change and Migration in Rural America
SSWA	Cooperators: CA-D, CO, IA, NV, NY, TX, UT, WA
WCC-091, 2004 Griggs, T.	Improving Stress Resistance of Forages in the Western United States
PSB	Cooperators: AZ, CA-D, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY
WCC-093, 2004 Boettinger, J.	Western Regional Soil Science and Inventory
PSB	Cooperators: AK, AZ, CA-B, CA-D, CA-R, CO, HI, ID, MT, NM, OR, UT, WA, WY
WCC-095, 2004 Schmidt, R.	Vertebrate Pests of Agriculture, Forestry, and Public Lands
Forest/Fisheries	Cooperators: AZ, CA-D, IL, LA, MO, NE, NY, TX, VA, UT, WA
WCC-097, 2005 Kropp, B.	Research on Diseases of Cereals
Biology	Cooperators: CA-D, CO, ID, IN, KS, MN, MT, ND, NE, OR, SC, UT, WA, WY
WCC-102, 2006 Jensen, D.	Climatic Data and Analyses for Applications in Agriculture and Natural Resources
PSB	Cooperators: AZ, CA-D, CO, ID, NM, NV, OR, TX, UT, WA
WCC-103, 2006 Kotuby-Amacher, J.	Nutrient Management and Water Quality
PSB	Cooperators: AK, AZ, CA-D, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY
WCC-110, 2004 Olson, K.	Improving Ruminant Use of Forages in Sustainable Production Systems for the Western U.S.
ADVS	Cooperators: AZ, CO, HI, MT, ND, OR, SD, TX, UT, WA, WY
WCC-201, 2004 Mass, R.	Feed Quality of Barley
ADVS	Cooperators: CA-D, ID, MT, ND, NYG, UT, WA

WCC-202, 2005

Kopp, K.

PSB

WCC-208, 2006

Harris, L.

Hinkamp, D.

AES

Climatic Data Applications in Irrigation Scheduling and Water Conservation

Cooperators: AZ, CO, KS, MO, ND, TX

Western Region Impact Statement Development

Cooperators: AK, AR, AZ, CO, HI, MT, NM, NV, OR, SAM, UT, WA

**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

Title of Planned Program/Activity	FY 2001
Agronomy/Crops	\$ 4,577
Livestock	\$45,032
Youth and 4-H	\$36,963
Economic Development Planning	\$ 9,272
Business Retention and Expansion	\$ 6,983

Total \$102,827

Fund Audit Salary Tracking:

Alan Young
Ron Bowman
Jim Keyes
Cynthia Zollinger
John Murphy