

2013 Utah State University Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 05/05/2014

I. Report Overview

1. Executive Summary

Executive Summary

The Utah Agricultural Experiment Station (UAES) and Utah Cooperative Extension Service (UCES) work in five major program areas: (1) Global Food Security and Hunger, (2) Climate Change and Natural Resource Use (3) Sustainable Energy (4) Childhood obesity, nutrition, and community, and (5) Food Safety. A 2013 progress report on each is briefly described below.

GLOBAL FOOD SECURITY AND HUNGER

AgrAbility of Utah

Farmers and ranchers facing limitations due to illness, injury, or disability often find it difficult to remain in agriculture. UCES provides education, and technical assistance on modifications and assistive technology devices to help them remain in agriculture. To date AgrAbility has helped over 220 agriculturalists and their families remain in agriculture.

Integrated Pest Management

UCES provides outreach education in entomology and integrated pest management (IPM). The program involves collaborative efforts of entomologists, plant pathologists, weed scientists, and horticulturalists. Outreach education is targeted to county Extension staff, agricultural producers, Master Gardeners, relevant federal and state agency personnel, and the general public. This program has had a positive impact on pesticide use in Utah, resulting in fewer unnecessary pesticide sprays, and an increase use of low-toxicity and non-chemical products. According to a 2012 fall survey, 55% of respondents say they have reduced their use of broad-spectrum insecticides and 47% have switched to using only selective/soft/organic materials. Respondents to the survey said they now monitor for pests before spraying (83%), monitor plant health (31%), and use degree days (17%). This outreach is supported by UAES research, which involves many of the same individuals as those supported by UCES funds.

Horticulture

UAES and UCES horticulture programs provide the latest research-based, non-biased, easily accessible horticultural information to homeowners; business owners; city, county, state and other agencies; and the green industry. A relatively high percentage of Utah homeowners have tree and berry plants in their home gardens. There is a large demand for information on proper care and maintenance of these fruiting plants. Research by UAES enabled raspberry growers and home gardeners to properly time insecticide applications and reduces the number of total applications from three to one or two each year.

A study of local demand and willingness-to-pay (WTP) for locally-produced packaged food products was conducted. The findings of the study indicate that brand names are extremely important in determining consumer WTP for packaged food items at the retail level. Further, the stated preference survey results indicate that local food designations such as the Utah's Own designation have real value at the retail level in terms of enhancing WTP beyond WTP for just the label. This was an important finding as it indicates the ability of a high quality, local product to compete well against store brands and even national brands, especially when a local designation (state-sponsored designation (SSD) or locally-produced) is placed on the product. Our results indicate that the SSD helped signal quality, especially for

less well-known local products. The findings offer encouragement for the development of local packaged food products in a retail setting that have local designations.

More than 375 acres of Utah's onions now use a reduced N-reduce spray program to help manage thrips resulting in reduced pesticide applications. Growers report saving approximately \$100/acre in nitrogen costs or about \$37,500 and \$200 or more/acre savings in insecticide spray costs totaling \$7,500). Reduced nitrogen losses off farm and significantly lower pesticides use makes onions on these farms more sustainable. UAES research has shown onions after corn have few thrips and less Iris Yellow Spot Virus (IYSV.) Growers are adopting and transitioning their production practices to take advantage of this research.

Most of the largest growers in Utah have indicated they have altered fertilizer management strategies to reflect the results of UAES studies. The tart cherry industry in Utah is the highest producing region in the US, accounting for \$6.25 million in production on over 1,300 hectares (over 3,200 acres) state wide. Our studies indicate annual application of fertilizer can increase the productivity of a cherry orchard by as much 200 percent over the life of the orchard (compared to unfertilized orchards). Such an increase, for a crop on average grosses more than \$4,800 per ha, could mean an increase of amount in gross income per ha on the lowest producing fields. Utah cherry growers learned how effective P and K additions can be, and traditional fertilizers were as effective as newer more expensive formulations. The ability of cherry trees to repeatedly produce large crops can be attributed to better fertility management, due in part to findings of UAES research. By using the lower cost traditional fertilizers in these aggressive programs, these growers are saving \$110 to \$240 per acre per year.

Utah peach growers increased their awareness of earwig population densities in orchards through use of earwig monitoring traps. Prior to this study, growers did not monitor earwig populations. Trapping results presented at fruit grower meetings and field days, and in a new fact sheet have contributed to increased knowledge on earwig monitoring and biology. It is anticipated use of traps will result in a decrease in injury to peach fruits resulting from optimal timing of effective insecticides for earwig control. In addition, growers learned both a reduced-risk and conventional insecticide (Success and Sevin, respectively) are effective in reducing earwig population densities and fruit injury.

A UAES project shows tree growth with legume alleyways, weed fabric and tillage was greater than in straw and living mulch with grass matching the conventional check. Available soil N was greater under legume and tillage, soil quality was best in legume treatments, while tree roots were more abundant in legume alleyways than grass. The straw mulch treatment with grass alleyway used the least water.

Crops

Efficient production of field crops and forages is essential to maintaining the economic viability of Utah's agricultural operations. Over the past few decades, agricultural producers in Utah and across the U.S. have faced unprecedented opportunities and challenges. Advances in science and technology have enabled growers to increase the productivity and/or efficiency of their farming operations. The UAES generates the information necessary for Utah agricultural producers to make management decisions to optimize crop inputs on their operations and to further the scientific knowledge base on managing crop inputs in the Intermountain West. On average Utah farmers that use UAES and USU Extension agronomy programs report increased yield of 7.4%.

Improving Sweep Net Sampling in Beaver County reduces insect control costs. Sweep Net Crop Schools were held that taught farmers how to better monitor for pests in their alfalfa. Forty-one percent of farmers who attended the school said the program helped reduce their chemical sprays and insect control costs. One farmer state that he reduced his insect control costs by \$6,250 due to improved monitoring.

Outcomes of the research are primarily cultivars are released and made available to producers.

Advanced material continues to improve on baking quality of previous cultivars. The highest yielding breeding line throughout all dryland locations was the line UT10210-123 at 39.1 bu/acre. The overall statewide nursery yield of the 36 common entries was 34.1 bu/ac; about 6 bu/ac higher than 2012. Bluecreek had the highest nursery yield at 55.4 bu/ac. Baking quality was determined on 100 advanced elite lines and check cultivars.

In the winter barley program, the breeding line UTWB10201-15 reported the highest average yield of

194.9 bu/ac was 30.1 bu/ac higher than UTWB9703-19, which is a release candidate. UTWB9703-19 has the pedigree Kold/86AB474 and we have planted breeders' seed for this line.

The highest average yielding line in the advanced spring barley yield nurseries was UTSB2183-85 at 133.2 bu/acre. The highest average yield for a released cultivar was 123.9 bu/acre for Goldeneye, followed closely by Statehood and Millennium at 123.2 and 122.6 bu/acre respectively. In the winter barley program, the breeding line UTWB10602-15 reported the highest average yield of 200.2 bu/ac. This was 39.9 bu/ac higher than UTWB9703-19 which is a release candidate. The most recent release from the spring barley program, Goldeneye, yielded 15.1 bushels per acre higher than the commonly grown cultivar Steptoe under irrigated production in 2013. This increase in yield for 30,000 acres (2013 harvested acres for Utah) at December's price of \$6.26 per bushel would be valued at \$2.8 million dollars in 2013.

Overall, individual Farmers/Ranchers who implemented operational changes (suggested by SARE research/education grants) increased their net income per farm per year by \$6,000 to \$30,000. The yearly dollar impact ratio, calculated using total contracted grants per state/protectorate is now over 21.1, impacting 50.33 million acres of total 279.76 million farm/ranch acres in the Western Region (this estimate based on data in the WSU-SESRC reports).

Researchers determined that fire blight can be spread from tree to tree by using contaminated pruning tools about 50% of the time. However, wiping the blades with disinfecting wipes can eliminate the spread of the bacteria. This simple practice reduces the spread of fire blight significantly.

Western cherry fruit fly (WCFF) populations were high in a tart cherry trial to evaluate new reduced-risk insecticides. Fruit infestation was eliminated by a new Class 28 insecticide, cyclaniliprole, and a rotation with imidacloprid applied first. Both insecticides have systemic activity that can kill eggs and larvae within fruit. Spotted wing drosophila (SWD) was not active in the study orchard until after the trial was completed.

Isomate mating disruption dispensers for the California prionus root-borer applied to six sweet cherry orchards reduced trap capture in pheromone-baited bucket traps by 51-94%. The 30 mg commercial lure (Contech) was more efficient in trapping males compared to the 0.1 mg research lure. The Isomate dispenser appears to be effective in reducing root-borer populations. There are no other effective controls, except orchard removal and pre-plant fumigation.

Seven fields had been selected based on grower practices and planting dates of onions (for better comparison of IYSV incidence, onion fields with similar planting dates were selected). Of the seven fields six had very few weeds on field edges and the weeds that were present were not hosts of IYSV in Utah. The IYSV incidence in these field in mid-August (towards the end of the growing season) ranged from 0-14%. One field had numerous weeds growing around the field edges including mature prickly lettuce and common mallow that have been identified as hosts for onion thrips and IYSV. The IYSV incidence in this field was 64%. Plants from all fields had been sampled twice but they were negative in the July sampling. Keeping the field borders clean from these weeds will most certainly reduce the IYSV incidence in orchards.

Beef

BQA is a national, industry motivated program sponsored by the National Cattleman's Beef Association (NCBA). Beef Quality Assurance is a national program provides guidelines for beef cattle production. The program raises consumer confidence through offering proper management techniques and a commitment to quality within every segment of the beef industry. Producers are better able to provide a product suited for the wholesale and retail trade after taking this workshop. BQA continues to be one of our major beef themes in the state of Utah. The NCBA beef audits have determined that if beef producers utilized specific management practices as outlined by the BQA program they could capture up to \$125 more per animal. This workshop combines the classroom with demonstration and hands-on training. Beef producers leave this workshop having gained a tremendous amount of information is directly relevant to their farms and ranches. Approximately 275 participants have taken the workshop coming from Utah, Wyoming, Idaho, Montana, Colorado and Nevada.

For six consecutive years USU Extension has hosted a beef cattle reproduction workshop held in Alton, Utah (Kane County). Each year a different reproduction topic is selected. The topic in 2013 was on

all aspects of calving and ensuring a live calf. Beef producers from Kane, Garfield, Iron, Piute and Washington Counties in Utah and from Coconino and Mohave Counties in Arizona attended the workshop. The participants own or manage over 7,500 of livestock. Eighty-five percent of the participants rated the overall quality of the workshop as "Excellent or better". Forty-six percent of the participants indicated that they have implemented changes in their herd reproductive management and seen improvements in herd reproduction since attending the workshop. The data utilized in these seminars was developed using UAES researchers.

Approximately every year Extension holds IMB 3910 workshops. Producers are better able to provide a product suited for the wholesale and retail trade after taking this workshop which combines the classroom with demonstration and hands-on training. Beef producers are able to leave having gained a tremendous amount of information that is directly relevant to their farms and ranches. Written evaluations for the course have all been in the outstanding to above average category. There have been approximately 275 participants from Utah, Wyoming, Idaho, Montana, Colorado and Nevada in sixteen workshops. Evaluations indicated that participant understanding in all 15 areas/subjects taught increased significantly from before the workshop to after. Self-assessed understanding in all 15 areas increased significantly ($p < .01$).

A UAES project conducted research examining the global competitiveness of U.S. beef and the results suggest traceability is a valuable characteristic by itself, but other characteristics can be verified with traceable systems, such as added food safety and animal welfare characteristics, are even more valuable than traceability alone. Research under this project also revealed U. S. traceability and tracking systems are less well developed than in other countries. This could contribute to a lessening of competitiveness for U. S. beef products as competitors are able to deliver tracking systems providing more information in a timelier manner than the U.S. system. Essentially, the project revealed U.S. beef marketing systems will need to evolve to maintain competitiveness in international markets.

Sheep

USU Extension is involved with livestock pooling to increase incomes of ranchers in Utah. The Summit County Lamb Pool shipped 1000 lambs. In Uintah County producers received \$10,259 for wool that would probably have been hauled to the landfill without the wool pool. UAES research shows supplementing the diets for forage-fed lambs with flaxseed treated to reduce hydrogenation by alpha-linolenic acid by ruminal microbes can increase the muscle content of omega 3 fatty acids. Addition of saponins and tannins to the diet of lambs for two weeks can affect meat volatiles and the fatty acid composition long after they are returned to a traditional diet. Overall these data will contribute to the body of knowledge existing on the relationship between an animal's diet and the subsequent product composition and quality.

UAES researchers learned that parasitized sheep consuming food in confinement or grazing legumes (sainfoin) with antiparasitic secondary compounds (tannins) are able to self-medicate. Ingestion of tannins reduced fecal egg counts, an indirect estimate of parasitic burdens. This has important implications for managing grazing animals as reliance on chemotherapy can be reduced while enhancing the health and nutrition of ruminants grazing diverse pastures. Results from another UAES project show lambs learn about the negative effects of ruminal distension and learn to prefer feeds associated with relief from distension. It may be possible to train animals to regulate the incidence of bloat by giving them access to tannin-containing plants. This has significant implications as bloat costs livestock producers as much as 100 million dollars/year in the U.S. Even with slight distension, cattle lose three-tenths of a pound of gain/day. Other findings from this project suggest mother influences the ability of offspring to self-medicate. This is of relevance for creating innovative management approaches to enhance self-medication in animals.

NIFA and UAES funded scientists at Utah State University have (a) developed supplementation strategies which enhanced use of medusahead by sheep and cattle, (b) assessed fertilization programs that may influence the competitive ability of the plant community infested with medusahead, thus reducing the invasiveness of the weed, and (c) made progress in understanding the human-related issues affecting weed control in the study area. The combination of the lack of perceived need, high cost, agedness of the

ranching population, and low ranching incomes all suggest that further uptake of these innovations will be limited. They are already at an "adoption saturation-point." Some improvement in making Extension information more accessible, as well as improvements in weather forecasting, might marginally improve drought management. Key impacts include a heightened awareness of these results among a small cadre of Utah Extension staff and drought specialists.

NIFA funded scientists at Utah State University found cattle grazing a choice between strips of tall fescue and tannin-containing sainfoin [SAN] or saponin-containing alfalfa [ALF], incorporated tall fescue into their diets (~30%) even when legumes of greater quality were available ad libitum. Animals grazed more sainfoin than alfalfa, and intake of tall fescue was greater in the ALF than in the SAN treatment. No differences in average daily gains were detected between the two groups of cattle (~1 Kg/day). Beef carcasses were lean (50% select, 38% standard, 12% choice quality grade). Samples were very well liked in a taste panel, with preliminary results suggesting a trend for greater texture and juiciness scores for animals under SAN. Results of this research will help producers develop plant mixtures build soil, reduce dependence of plants on fertilizers, herbicides, and pesticides, promote the nutrition and health of herbivores with lower reliance on antibiotics and anthelmintics, and enhanced meat quality and consumer acceptance.

Over 5000 calves were shipped from the Summit County Stockyards this past year where approximately 75% were sold by pooling them together as calf marketing pools. Several years ago UCES helped organize some of the larger calf pools. Again this year cattlemen were able to market their calves at a higher profit using the San Juan Calf Pool. The Summit County Food Coalition organized a program where local raised grass feed beef was sold to local grocery stores, restaurants and individuals in Park City. Through the assistance of the food coalition four producers sold 40 calves this past year to individuals, grocery stores and restaurants in Summit County. The calves are being marketed under the name of "Summit County Beef". The four ranchers involved received an additional \$.20/lb live weight compared to selling their calves over the traditional livestock video auction, resulting in \$5200.00 additional income.

Dairy

Feeding brown midrib (BMR) corn silage in high forage diet with a high concentration of good quality alfalfa hay maintained higher body weight after parturition even though feed intake was similar through peak lactation. Cows fed the BMR silage produced 1.7 kg/d more milk compared to those fed conventional corn silage, and therefore throughout total experimental period for 180 days, BMR silage fed dairy cows produced 306 kg more milk. Decreased urinary N:fecal N due to feeding BMR silage and/or quality of alfalfa hay highlights a great opportunity to improve efficiency of N utilization for dairy production by selecting forage crops use N more efficiently. Feeding forages higher in ruminal degradability such as BMR had better N utilization as evidenced by decreased concentrations of BUN, MUN, and urinary urea N, which can represent an environmental advantage over traditional sources of forages in lactation dairy diets.

CLIMATE CHANGE AND NATURAL RESOURCE USE

Water Conservation

Shrinking water resources in Utah and the nation have brought conservation efforts to the fore. UCES education of clientele groups to achieve water conservation is necessary to ensure adequate water supplies for the future. Improved evapotranspiration estimates of large irrigated areas using remote sensing techniques will lead to a more efficient use of water resources and better management of river systems such as the Colorado and Bear Rivers where significant diversions for irrigation occur. UAES research has shown better estimates of soil water content can be obtained using the hybrid ET methodology which combines results from remote sensing models for better estimates of spatial ET and ultimately irrigation water demands.

Recent drought had a major impact on increasing rancher indebtedness in Utah. This, in turn, has spurred more interest in drought preparedness in general.

Rangeland

Managers, agents, land users, and the general public seek information, expertise and assistance in many areas related to public and private rangelands and associated natural resources. A list of research and extension work within USU includes the following: range management and improvement techniques, rangeland productivity, grazing management, animal nutrition and supplementation, range condition and trend, measurement techniques, identification and characteristics of native and introduced plants, invasive species management, poisonous plants, fire, riparian management, wildlife-livestock interactions, coordinated resource management, additional sources of technical assistance and information, rangeland rehabilitation, and current issues on rangeland character and use arise. In addition, UCES agents, specialists and UAES researchers are providing specific information and assistance with issues related to rangeland resources, including management, capabilities, values and uses.

Maps showing the distribution and properties of soil are needed for sound land use planning and management, although many federal public lands in the western USA still lack initial or have only very coarse resolution soil maps. The digital soil mapping research in a UAES project is advancing the rate at which soil survey data can be produced on federally administered public lands in Utah and the western USA, and the rate at which value-added soil information can be derived for emerging land use issues.

Information generated by a UAES project is communicated to private land owners, public land managers, and professional peers. Two county weed supervisors applied several of the concepts to management within their respective counties. The adoption of preventative strategies to weed management has been estimated to provide \$17 of return on investment for every dollar spent on prevention.

Key findings in 2013 included: (1) the 1,329 landowners in our study area manage 302,000 acres; 65% of the properties are <20 acres and 45% of all landowners are non-residents; (2) considered overall, it is the larger, more commercially minded operators who are most concerned about medusahead; (3) more research-based weed control methods are needed, and success stories from ranchers who have managed to keep medusahead at bay need to be more widely disseminated; (4) herbicides are by far the most common method to attack medusahead in our study area, but treatment effectiveness is poorly documented; (5) there is a leadership gap in terms of people with the vision and skills to better coordinate the community in weed-control efforts; and (6) only 40 landowners control 80% of the land here; thus, mobilizing the skills and interests of this minority to tackle medusahead would be an excellent start in a comprehensive weed-control program.

Based on the first two years of research, we can now provisionally rank how the factors listed under objective 3 affect the prospects for medusahead control. The top constraint is proposed as technical plus economic--namely, a cost-effective, research-based control method is still lacking. If such an intervention was available, medusahead could be greatly eliminated as a threat here. The next constraint is institutional--there is a lack of a sustained and systematic approach for agencies to engage landowners in weed control. The last constraint is social. There needs to be a critical mass of landowners reliably involved in weed control so that vigilance is maintained and neighbors can be effectively mobilized to reduce the risks of recurrent weed invasion.

Research findings thus far show that, despite many studies discussing absenteeism in forest related issues, minimal research has been done that focuses on absentee owners. Little is known about how absentee owners make conservation and active land management decisions. Most absentee forest owners in the studies reviewed are from urban areas, own land primarily for non-production oriented reasons, and are less likely to be engaged in active management. They exhibit a 'disinterest' in the land and are less likely to have experience with natural resource professionals. Absentee owners differ from resident owners in regards to outreach, and new communication strategies need to be developed to better target the needs and concerns of absentee owners in order to promote sustainable forest management. Absentee owners of rangeland are often affluent, purchase land for investment and recreation opportunities over productive reasons, and engage in what they deem 'environmentally-friendly' practices such as construction of ponds, not treating weeds, and increasing wildlife populations. These practices, however, result in detrimental environmental impacts (and subsequent social issues). There's a great need

for developing outreach communications with these non-production landowners. The landownership change in rangeland presents challenges to natural resource professionals regarding how to communicate effectively with absentee rangeland owners. Outreach would also benefit from additional research on this landowner group. Overall, absentee owners of farmland in studies reviewed are not dependent upon the farmland for income and have a limited farming background. If they rent their land out to a tenant operator, they have little involvement in decision making on their land and rely heavily on the tenant operator for land management and conservation information. The findings indicate possible patterns as well as variation across study sites regarding absentee landowners and issues related to conservation and active land management. First, the absentee owners, as compared to those living on the land, appear to be much more likely to live in urban areas. They appear to be less dependent financially upon the land and much more likely to own land for amenity reasons (e.g. recreation, vacationing) than production purposes.

There is both a disinterest in conservation by some absentee owners and a strong interest in conservation by others. Absentee owners seem to be less likely to be engaged in active management practices and for those who own farm land, less likely to be involved in making decisions to adopt these practices. And in comparison to resident owners, absentee owners seem to be much less likely to have contact with extension and local natural resource agency program staff, therefore at times, lacking in scientific and traditional management knowledge provided by these resources.

There are also nuanced and interesting differences that exist across forest, range, and farm landowners. For example, while absentee forest owners in the studies reviewed were typically found to be "passive" managers, rangeland owners may be actively engaged (or hire others to manage on their behalf); however, their management on occasion has not been conducive to broader landscape-related functions and benefits (e.g. lack of invasive species management that require cross-boundary cooperation, attention to wildlife populations that conflicts with neighboring owners' values). This suggests that absentee forest and range landowners may need different resources that appropriately encourage active management (i.e. resources that align forest management with absentee landowners' values and educational opportunities for rangeland owners that dispel misconceptions). In addition, while the studies of absentee forest and range landowners suggested their similarities regarding non-production goals, farmland owners are likely different given the production-oriented goals for some absentee landowners of farmland that appear optional in forest and rangeland ownership.

UAES project findings thus far also show absentee landowners vary in terms of what influences their decision making on the land, and can be classified as either (1) solely interested in recreation, (2) interested in both recreation and conservation or (3) no major influences on their decision making. These groups have also been shown to vary in terms of what natural resource agencies they use for conservation outreach information, with only those not having any major influence on their decision making utilizing NRCS and Extension, with the first two groups having a negative relationship with both of these agencies in terms of information usage.

Water Wise Landscape Education

According to the U.S. Environmental Protection Agency, 30-60% of urban fresh water is used in the landscape. Fifty percent of applied water is lost due to run off and evaporation associated with inefficient irrigation systems. The Water Conservation District and the UCES assists Utah residents through the education of water conservation principles in the landscape. These efforts are accomplished using a variety of education media and tools including public workshops, web-based content, newspaper, radio, television, demonstration gardens, and incentive programs. The Utah State University Extension Water Check Program focuses on the application efficiency of landscape irrigation systems and components by identifying and measuring irrigation flaws and inefficiencies. On average, Utahans participating in the Water Check Program save 25,750 gallons of water annually, reducing the amount of water applied to landscapes by 8 percent. By using plants more adapted to Utah's desert climate as researched by UAES, water used in landscapes is drastically reduced and yards and gardens improved in both appearance and health. Utah, like much of the Intermountain West, is an urban state and turfgrass is the largest component of most urban landscapes. USU is working to develop grasses and mixtures of grasses for these landscapes can remain green and offer a safe surface for recreation while saving up to 50% of the water

currently needed for turfgrass areas. For a 5000 sq. ft. lawn this equates to a savings of almost 39,000 gallons per year. For the traditionally used species, management tailored to the Intermountain West will reduce the amount of pesticides applied, up to an estimated 30%, as well as 10-25% in water savings.

A UAES study showed plant canopy cover-rather than plant material water use categorization was the controlling factor in woody plant and perennial water use. This suggests categorizing landscape water use based on plant type, as suggested by the EPA (EPA Water Sense, 2009) appears to have no merit. Consequently, landscape managers may achieve meaningful water savings by simply adjusting landscape-planting densities. In the meantime, adjusting the percentages of landscaped area devoted to woody plants, turf and perennials may provide another method for conserving water in landscapes under well-watered conditions.

UAES reported techniques for optimizing water management are helping others as they develop strategies for best using water throughout the world. UAES research in urban water consumption by landscapes has resulted in a method allows the identification of high-end users, allowing municipalities to target these users for leaks and/or sprinkler checks and education, improving the overall efficiency of water use and delaying or avoiding the need for large new investments in water transmission structures.

Evaluations concerning 60% of the water Salt Lake City Corporation (SLCC), delivers to 400,000 daytime users, indicates it is of legally adequate quality, and SLCC does not need to change management.

Wildlife Conservation and Management Outreach Education

There can be substantial economic and social benefits associated with wildlife-related recreation. Much of the high quality wildlife-related recreation is associated with privately-owned lands. In the U.S., 2.1 million farmers and ranchers control more than 60 percent of the land base. As such, public wildlife inhabits, and is dependent upon, the habitat resources found on private land. Most stakeholders have little economic incentive to manage their land for wildlife. Although public and private wildlife management agencies and organizations have implemented programs to encourage landowners and other stakeholders to manage for wildlife and/or allow public hunting or recreational access, lack of coordination between management agencies and stakeholder concerns about damage caused by wildlife and wildlife users have reduced overall program effectiveness. To address these issues in Utah UCES facilitated the establishment of the Cooperative Wildlife Management Program Unit (CWMU) and a business association to address the needs of participants. The Association consists of over 200 farm and ranch operations encompassing over 2.0 million acres of private rangeland in Utah. The Association has saved Utah landowners over \$4.5 million. Annually, the CWMU program generates over \$20 million in new revenue for Utah landowners and provides free access to over 4,000 Utah hunters to high quality big game hunting opportunities.

Natural Resource Management

The current unprecedented outbreak of the native mountain pine beetle covers over 9 million acres in the western U.S. A UAES project developed a linear approximation technique based on techniques used in macroeconomics. They created a model of mountain pine beetle spread over a heterogeneous forest of up to 200 different forest managers. Forest managers choose harvest levels to balance timber and non-timber services from the forest and look across the forest to adjust harvest activity in anticipation of a spreading outbreak. Results of this theoretical model show timber harvesting can lessen the severity of a mountain pine beetle outbreak. The spatially explicit model indicates this decreased severity is accompanied by a more rapid spread of beetles across the forest. As a result, forest managers are presented with a tradeoff between outbreak severity and coverage. This insight will prove useful for public forest management which has traditionally responded to insect outbreaks with increased harvesting.

In US forage systems these non-native weeds induce over \$1 billion in lost revenue and management costs annually and weeds in cultivated areas induce over \$20 billion annually. UAES researchers developed a technique was designed to decrease positive interactions between non-native weedy plants and soil organisms and at the same time decrease negative interactions between native and forage species and soil organisms. Specifically, by adding activated carbon (AC) to soils, we have found

we can limit plant-microbe communication, decrease weed growth and increase native forage plant growth in the greenhouse and in sites in central Washington State. We found that high concentrations of AC (1 kg m⁻²) were required to increase germination of desirable vs. invasive species in plots. We also found that in both year one and year three following treatment, high concentrations of AC increased the ratio of desirable species vs. invasives in plots. It seems that by the third year, AC in the high concentrations plots increased the percent cover of desirable species, in particular. Together, results suggest that activated carbon (AC) needs to be at high concentrations (1 kg m⁻²) to increase native species growth and reduce invasives. In addition, AC effects can take years to have a measurable effect, and will not be measurable when there is little to no native plant establishment. Our greenhouse results suggest that native species have a greater response to AC treatments than non-native species. In addition, the results suggest that AC effects are largely a result of AC causing changes in plant-microbe communication rather changes in allelopathy. Results from this research place the original, very successful, results into a broader context and highlight the importance of plant-microbe communication to plant growth and competition.

RENEWABLE ENERGY

Alternative Energy Production

There is a lot of fluctuation in energy prices and a lot of interest in alternative fuels including wind, geothermal, methanol, biofuels, and ethanol type products. UAES research and UCES provides opportunities for farmers to look at raising other types of crops might be used as alternate fuels. There are companies interested in having farmers in Beaver County get involved in wind production, geothermal raising grasses to use in fuel production and the development of woody biomass for energy. UCES works with producers to help them determine if these alternative products will help them make more money for their operations.

The Induced Bed Reactor (IBR) anaerobic digester has been installed in the United States, China, Canada and India. UAES research showed anaerobic digestion can be a source of additional income for a family farm including sale of renewable energy and treated bio-solids from manure produced and has an advantage over many current anaerobic digesters because no energy input was needed in IBR's for mixing. The IBR can operate at moderate temperatures and temperatures high enough to kill pathogens. This means the IBR is appropriate for treating solids found in municipal waste where pathogen kill is important. Energy in the form of biogas which is similar to natural gas can be made from food processing waste, grocery waste, bakery waste, byproducts from soft cheese and yogurt manufacture. It is more efficient at treating agricultural and municipal waste than commonly used complete mix anaerobic digesters. The IBR can be effectively used to produce renewable hydrogen from food waste using dark fermentation.

One UAES project examines the physical and economic feasibility of 5% biomass co-firing in the coal-fired power plants of Utah. Transportation models are used to find out the physical feasibility of 5% biomass co-firing, as well as locate the supply zone for each power plant would minimize the transportation cost. Additional cost required for 5% biomass co-firing and the economic benefits associated with biomass co-firing are calculated to be \$34.84 million. Previous studies on CO₂ emission reduction from biomass co-firing are used to compute the economic benefit from selling carbon credits in the carbon trading market. Based on 2010 emission record in Utah, 5% biomass co-firing brings the annual economic benefit of \$11.37~\$34.10 million assuming \$16/ton of CO₂ in the emission trading market. A price of less than \$16/ton of CO₂ in the trading market would not yield a positive benefit/cost ratio.

UAES research was used to find the relationship between particulate matter (PM) emission and the human health damage. The regression results show decreases in 1% of PM emission improves the human health (in U.S.) by 0.65%~0.67% in value.

CHILDHOOD OBESITY, NUTRITION, AND COMMUNITY SUSTAINABILITY

Food Sense

Food Sense is Utah's Supplemental Nutrition Assistant Program - Education (SNAP-Ed). In Fiscal Year 2013 the program reached over 11,295 adult participants and 26,115 youth participants. Participants provide information on their personal demographics, their intent to change behavior after participating classes and their behavior change (after a series of lessons). Through self-reported post/pre behavior questionnaires, SNAP-Ed low-income individuals show increased intent to plan their food budget, plan for specific meals before shopping, prepare and stick to a shopping list, follow food safety practices by properly cooking, chilling, and separating food items, and properly cleaning food preparation surfaces. Participants also intend to exercise, make healthy food choices, eat breakfast, add vegetables, fruits, and dairy to their diets, choose whole grains, lean protein, healthy fats, and reduce salt intake in accordance with the 2010 Dietary Guidelines for Americans.

Manufacturing Extension Program

This program was developed to assist Utah's small manufacturers to learn and acquire new technologies and processes to help them become more competitive. The manufacturing sector plays a major role in Utah's economy. Small and medium sized manufacturers confront major problems in responding to increasing global competition. These problems encompass a broad range of issues, only some of which relate directly to technology. Inadequate resources - people, money, expertise, information, and insufficient time are reasons many small industrial firms are not improving their manufacturing performance. In Utah 63 of 69 companies reported impacts including a total bottom line impact of \$64,126,051 and a total investment impact of \$133,556,751. There were 4,929 jobs created or retained through the efforts of MEP.

Forage Marketing and Dairy Relocation Program

Dairies have relocated to Utah from the 'Bring the Cows to the Feed' program are 20.7% of Utah's dairy industry. Since the early 1990's, 11 dairies have 'moo-ved' to Utah as a direct result of this Extension program. They produce about 339.6 million lbs. of milk valued at \$61.6 million annually. These dairies hold an estimated 17,000 cows valued at approximately \$25,500,000. They have provided hundreds of millions of dollars in 'direct' economic impact and ongoing 'indirect' activity and created 1,700 jobs and \$40.2 million annual payroll.

Afterschool Programs and Education Research

UAES economics research is designed to help policy makers better understand the implications of using value-added models to estimate teacher quality effects. It shows commonly used statistical models of teacher quality may be biased because students are not randomly assigned to classrooms. There is strong evidence student assignment to classrooms is likely based on characteristics which are normally unobserved. The results of this research show value-added (and similar) statistical models should be used cautiously. If students are assigned to classes based on characteristics are unobserved or difficult to control for, as suggested by this research, statistical inferences regarding teacher quality, class size effects, and other important educational metrics may be unreliable or misleading. This research can therefore help improve education outcomes at the school and district level.

Building and Maintaining Healthy Relationships

UCES implemented the Utah Marriage Celebration providing research based information to individuals and couples. Information to promote family well-being was disseminated through presentations, e-mail, phone calls, publications or other written materials as requested. In addition 31 stepfamily and remarriage education classes were offered in 2013. The adults who attended the classes demonstrated statistically significant increases in knowledge and skills related to healthy relationships. Participants also experienced statistically significant increases in relationship stability and satisfaction. Overall, participants reported remarriage and stepfamily education classes were very helpful. In the qualitative interviews, participants reported various benefits for their couple relationship, family relationships, and with their children.

Community Development

UCES works with local leaders to develop a diversified economic base that will help provide a sustainable community and let residents know what resources are available to them. UAES research on natural gas vehicles is directly applicable to the planning decisions of state departments of transportation. This research finds the proportion of the passenger vehicle fleet is likely to adopt CNG vehicles is small even if technology improvements allow for very low conversion costs or manufacturer vehicle price differentials. We also find even at current prices, a non-negligible proportion of the vehicle fleet is predicted to adopt CNG. CNG vehicles make sense for consumers who drive many miles and are willing to live with the inconveniences associated with CNG vehicles. Our research suggests CNG is most likely to be cost effective for high mileage, low MPG vehicles like service truck, buses, and deliver vehicles. Moreover, these vehicles are also less likely to be negatively affected by the inconvenience of more frequent refueling.

Research supported in part by the UAES has now provided preliminary evidence demonstrating particulate pollution poses a significant public health risk, as indicated by PM-related changes in respiratory parameters in healthy individuals. Results of this project will have relevance to the potential impacts of PM pollution on the health of millions of people. Since our data indicates CVPM strongly induces the release of C-reactive protein, an important clinical indicator of impending or recent cardiovascular insult, this putative biomarker may be adopted as a useful "red flag" signaling exposure to CVPM and similar PM pose serious adverse health effects.

UAES research has contributed understanding for the factors shape migration flows to Intermountain West and the dynamics of employer-based investments in this region. Contrary to previous research, factors beyond amenity richness, such as growing economic investments, expansion of service sector industries, and county diversity motivated migration to the region while tax incentives, access to low wage skilled labor, and county diversity motivated employer investment in and relocation to the region. Contrary to expectations, race shapes migration to this region in important ways. While education is the primary factor driving migration generally, destination choice is shaped by the interaction between race, social networks and employment context. As a result, whites from the Rust Belt are much more likely to migrate west while blacks are more likely to migrate south. This research contributes greater understanding of factors shape recruitment and hiring practices among employers in the region. This knowledge will inform policy makers, employers and community agents on cultural, structural and demographic factors are re-shaping the region.

The Intermountain West is the fastest growing region in the United States. Planners and land use policy experts in the region frequently assume 'smart growth'-like programs are required to protect farmland and farming businesses from pressures associated with population growth and urban sprawl. These policies are almost all designed to promote development in clustered, higher density locations - ideally located close to urban areas. Having better evidence smart growth policies have demonstrated benefits for local farmers can be important to shifting local discussions about property rights vs. public benefits. UAES results found more clustered patterns of rural housing development are indeed linked to reduced rates of farmland loss and more robust gains in sales of farm products. Specifically, greater density of 'patches' of development in rural areas was significantly associated with lower rates of loss of farm numbers and farmland and cropland acres. Moreover, every 10% increase in the percent of a county's population growth located outside of urban boundaries was linked to a 2% drop in farm sales.

This provides important evidence efforts to utilize local land use ordinances to shape the location, density, and clustering of rural residential housing can have a measurable benefit for the farm sector.

Finance

Extension is an integral part of many programs designed especially for low and moderate income families. Programs include Volunteer Income Tax Assistance and the Earned Income Tax Credit; Utah Saves; Home Buyer Education and Individual Development Accounts as well as additional development of the PowerPay debt management and financial education website. The Smart Money Moves/ IDA Program in Cache County had a total of 194 IDA accounts for the matched-savings program. Since the program's beginning in Cache County, there have been 15 homebuyers who had IDA matched-savings to help them

purchase their first home bringing in a total of over \$2,000,000 to the Cache County economy. In addition, nearly \$200,000 dollars has been sent to USU to help cover tuition for IDA savers. In the third quarter of 2012 alone, there were three small businesses started up in Cache County as a result of the IDA program. UAES research results show more frequent parent-child discussions about personal finances increases the likelihood of respondents planning their spending and having written financial goals. Practicing recommended financial management behaviors and a low level of anxiety are related to regular saving. Low to moderate income consumers who save regularly are more likely to have life insurance. Economic factors affecting the likelihood of having a saving account include age and using recommended financial practices. Education, gross income, and net worth increase the likelihood of having both a savings account and an investment account. Low to moderate income consumers who use more information sources to make financial decisions are more likely to save.

During the 2013 tax season, taxpayers in six rural counties received Volunteer Income Tax Assistance via the Virtual VITA delivery model and the support of their local Extension office. In total the filers received \$233,800 in federal and state refunds including about \$130,000 in Earned Income Tax Credits (EITC). The EITC is the largest anti-poverty program in the country. It is estimated the taxpayers saved \$32,000 in tax preparation fees. Partly due to training that USU extension has done for the IRS and other interested parties the concept has expanded on a national level. During the 2013 tax season about 22,000 returns were completed following the Virtual VITA model developed in Utah. They came from about 120 sites in 22 states. If the benefits are similar to those seen in Utah it would mean that volunteers at these other locations helped qualifying taxpayers receive more than \$33 million in refunds and save about \$4.6 million in preparation costs.

Business, Entrepreneurship, and Rural Economic Development

The Extension Entrepreneurship and Business Development Initiative - County Team was trained and certified in NxLevel Entrepreneurship and Cashing in on Business, Home Based Business and E-Commerce Curricula. The Best Practice Team planned, organized, and facilitated county-wide economic development conferences in Uintah, Box Elder and Davis Counties as well as state-wide Diversified and Urban Agriculture Conference held in Salt Lake County. Small Business Development Center offices at Logan, Tooele, Brigham City, Vernal, Price and Blanding provided long term one-on-one counseling to 1048 clients. An additional 956 short term clients were assisted and 1158 participants received training in 56 programs. Topics included business planning marketing analysis, financial management, and managing human resources and business financing strategies. Through UAES and UCES efforts 225 jobs were created, 96 existing jobs were retained and there were 90 new business start-ups. Clients reported \$2.5 million in increased sales and \$6.3 million in total capital formation. UCES continued ongoing support of National eXtension Entrepreneurs and Their Communities COP Team and assisted with FAQs and Information Briefs for the website. UCES also assisted on national USDA Rural Development "Stronger Economies Together" curriculum design team, trained participants at national and regional training programs, and continued the Extension Sustainable Living Initiative by launching a website with 18 participating extension faculty.

Nutrition

The health and well-being of American families are influenced by the ability to consume a nutritionally adequate diet. Understanding how the body recognizes and responds to nutrients is critically important information and has implications for dietary selection, the control of food intake and numerous nutrition-related disorders. UAES researchers conducted experiments to elucidate the pathways that are involved in the recognition of nutrients, including fat, carbohydrate and salt. Overindulgence in any of these nutrients has been shown to have deleterious health outcomes - thus, it is important these receptive pathways are characterized in order to have better, empirically-based strategies to help curb the overindulgence of specific nutrients from both food design and pharmaceutical approaches. Researchers made several seminal findings related to how fats, sweets, and salts are recognized by the gustatory system which has added to the overall understanding of nutrient receptors and the pathways that contribute to their recognition. This data may help in the development of approaches may systematically

be involved in the reduction of food intake and help in the battle against the epidemic of obesity. The work performed suggests strongly these chemosensory pathways are important contributors to the control of food intake. Overindulgence in specific nutrients leads to a decrease responsiveness of these pathways which, in turn, further leads to increases in subsequent intake in order to receive the same pleasure from eating. The outcome of this research is consistent with the recommendations a well-balanced diet limits intake of fats and carbohydrates will maintain normal functioning in chemosensory pathways devoted to the control of food intake.

UAES research has unveiled important questions in regards to obesity, inflammation and iron regulation that further research could help answer. Despite a growing public perception that dietary omega-6 fatty acids are proinflammatory there is little data to support this assertion. Thus we created diets with different levels of fatty acids to explicitly test this assertion. As of now, our results do not support the idea that the EFA content of dietary fat does affect systemic inflammation.

Family Well Being

The strength of a society lies in the strength of its families. With the pressures of today many families are struggling--grandparents raising grandkids, single moms, balancing work and family, caregiving for aging parents, financial pressures, etc. all seem to be on the rise. An understanding of the social, cognitive, emotional, and physical development of individuals and families is imperative to the function of these families over the life cycle. Thirty-one stepfamily and remarriage education classes were offered in 2013 serving over 1,000 people. The adults who attended the classes demonstrated statistically significant increases in knowledge and skills related to healthy relationships. Overall, participants reported that remarriage and stepfamily education classes were very helpful. In the qualitative interviews, participants reported various benefits for their couple relationship, family relationships, and with their children.

Youth and Families with Promise

Juvenile criminal activity continues to be a problem in Utah. Utah's Youth and Families with Promise (YFP) program focuses on this issue through multiple interventions target at-risk youth and their families. This program started with 14 youth and 20 mentors. It has grown into a national program positively impacting over 3000 youth and their families each year.

During 2013 data from the Baby Steps project was used by the Utah Association for the Education of Young Children as evidence against a Utah Child Care Licensing proposal to increase child to teacher ratios and group sizes in Utah child care centers. Increased ratios and larger group sizes have repeatedly been shown to damage the quality of child care, especially for infants and toddlers as evidenced by the results to date of this project. The proposal to increase child to teacher ratios and groups sizes was successfully defeated in large part because of the data compiled and presented from this project.

Researchers were able to report to the Office of Child Care that rural child care providers appear to define quality child care much differently than urban providers. Many rural providers appear unwilling to comply with the State's quality initiatives because they dislike involvement with government programs. Additionally, rural parents more so than urban parents, reported feeling time-stressed and were unwilling to participate in any after-work child care activities such as parent-teacher conferences or parties at the child care center. These activities are considered elements of quality child care, but rural parents are not in favor of them.

FOOD SAFETY

Food Safety Manager Certification Program

Many rural and Utah food managers do not have ready access to training and certification for managers of retail and food service operations. Manager Certification is mandatory in Utah. USU provides online, DVD, and textbook learning together with online testing for food safety managers in all counties. This Food Safety Manager training provides the core food safety information used to help retail and foodservice venues produce safe foods for their consumers.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	110.0	0.0	65.0	0.0
Actual	89.6	0.0	53.9	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- External University Panel
- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Merit Review Process - Extension Plan: The cooperative extension service merit review process will involve a review by the University of Wyoming, University of Arizona, and the University of New Mexico extension services. These institutions will review the program components suggested in each program area utilizing extension faculty qualified as specialists with significant program experience in the area being reviewed. In turn, Utah State University Cooperative Extension Service will review the work from these three institutions.

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 scientists as requested by the principal investigator (PI). Prior to submission to the experiment station, the PI's department head also reviews and signs off on the proposal. Once the proposal reaches the station, two additional scientific peer reviews are obtained from subject matter experts, either from other on-campus faculty (if the expertise exists) or off-campus faculty (if on-campus expertise does not exist). The reviews are returned to the experiment station and the PI's are subsequently asked to respond to issues raised by these reviewers. The PI must then modify her/his proposal to address the issues raised by the "outside" reviewers before resubmitting it to the experiment station for funding consideration. The practice of sending reviews off-campus to qualified subject matter experts has increased over the past five years.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public

Brief explanation.

The media sources are frequently used by Utah counties to encourage county residents to participate in public meetings and listening sessions. Use of the local newspaper and radio through public service announcements and paid advertisements are the two primary techniques applied in media use. Counties targeted traditional stakeholders through letter/poster invitations to participate in public meetings and listening sessions. Such announcements are often placed in public places, on bulletin boards, and other locales frequented by non-traditional audiences. Non-traditional stakeholder groups were also invited to participate in public meetings and listening sessions. Inviting individual stakeholder and non-traditional stakeholder individuals to participate in public meetings and listening sessions is also a significant means for engaging them in discussions. Surveys serve as another means for contacting stakeholders. For the experiment station, research scientists, often with an extension appointment, work with extension leaders to ensure that ample stakeholder participation is achieved. Even faculty with primary research appointments and strong industry affiliations often provide a unique perspective about different audiences that should be cultivated or developed.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Open Listening Sessions
- Use Surveys

Brief explanation.

The Utah Agricultural Experiment Station uses many of the same advisory groups used by Extension that meet as needed to provide critical input from the public and private sectors. Listening groups with key and inclusive constituents are also utilized. Utah Extension utilizes advisory committees as the primary means of identifying stakeholder individuals and groups to collect program input. Principle council and advisory groups utilized included such groups as teen councils, horse and livestock councils, Workforce Services, Interagency Coalitions, community religious leaders, United Way, Utah Saves Advisory Boards, Utah Fair Boards, Utah Farm Bureau and Farmers Union, afterschool coalitions and previous recipients of Extension programs have been utilized. Counties used focus groups and open listening sessions as means to identify groups and individual stakeholders. Needs assessments and surveys provided another primary means of identifying individuals and groups though who input was collected.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals

- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

The input received from stakeholders was utilized most to redirect Experiment Station and Extension programs, to gather information on emerging issues, and to set priorities as a unified Extension and Experiment Station organization. With an ever growing metro population along the Wasatch Front in Utah this input has been valuable in redirecting Extension and Experiment Station program emphasis areas to reflect the needs of metropolitan populations. To a lesser extent, input was applied to Extension programs in redirecting applied research programs, in the hiring of staff and in the action plans of the county. These inputs frequently inform Extension through influencing recruitment and hiring practices and inform Extension on the types of research that stakeholders perceive as critical to their need. The Experiment station uses stakeholder input provided by Extension and advisory groups' input to make changes in its research programs. As evidenced by existing and past hiring patterns, the Experiment Station has been changing program emphasis as open positions allow and/or through newly funded positions. With those funded positions go operating and graduate student funds.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

The input received from stakeholders was utilized most to redirect Experiment Station and Extension programs, to gather information on emerging issues, and to set priorities as a unified Extension and Experiment Station organization. With an ever growing metro population along the Wasatch Front in Utah this input has been valuable in redirecting Extension and Experiment Station program emphasis areas to reflect the needs of metropolitan populations. To a lesser extent input was applied to Extension programs in redirecting research programs, in the hiring of staff and in the action plans of the county. These inputs frequently inform Extension through influencing recruitment and hiring practices and inform Extension on the types of research that stakeholders perceive as critical to their need. The Experiment station uses stakeholder input provided by Extension and advisory groups' input to make changes in the research program. As evidenced by existing and past hiring patterns, the Experiment Station has been changing program emphasis as open positions allow and/or through newly funded positions. With those funded positions go operating and graduate student funds.

Brief Explanation of what you learned from your Stakeholders

Most stakeholders are tied to specific program areas although they are interested in all programs offered through USU Extension and the Experiment Station. Areas dealing with home horticulture and organic gardening for food production are important to the general public. Agricultural sustainability including marketing, weed control, crop management and animal health issues are important to agricultural producers and these areas are supported by both the Experiment Station and Extension. Economics of various new technologies or production techniques are important research topics for the Experiment Station. Basic home making skills including food preservation/preparation, food safety, nutrition and sewing are important to home makers and are supported extensively by Extension and the Experiment Station. Families and individuals also want food and finance programs, which require both Extension and Experiment Station input. Youth leadership development and continuation of traditional 4-H programs such as livestock, horses, sewing, cooking, and others are important and stakeholders want to make sure these programs stay alive and viable and are supported primarily through Extension. Most users of USU soil testing service value the service and want it to continue. The Experiment Station is involved in a host of research issues relating to natural resources and the environment including climate change, public lands, water resources, urbanization of productive farmland, etc. The public makes little, if any, distinction between Extension and the Experiment Station and likes USU to be available to help with a wide range of issues.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1532359	0	2114170	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1532360	0	4039084	0
Actual Matching	1532360	0	4048613	0
Actual All Other	0	0	13871514	0
Total Actual Expended	3064720	0	21959211	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Climate Change and Natural Resource Use
3	Sustainable Energy
4	Childhood Obesity, Nutrition and Community
5	Food Safety

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
123	Management and Sustainability of Forest Resources	4%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		15%	
202	Plant Genetic Resources	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		5%	
205	Plant Management Systems	47%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		2%	
213	Weeds Affecting Plants	0%		5%	
215	Biological Control of Pests Affecting Plants	0%		8%	
216	Integrated Pest Management Systems	10%		2%	
301	Reproductive Performance of Animals	0%		15%	
302	Nutrient Utilization in Animals	0%		2%	
304	Animal Genome	0%		18%	
307	Animal Management Systems	32%		5%	
603	Market Economics	2%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	44.0	0.0	22.0	0.0
Actual Paid Professional	30.3	0.0	13.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
518137	0	1204924	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
518137	0	1208152	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	1034917	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Conduct research experiments with livestock and plants and plant material.
2. Publish studies and make presentations related to plant propagation and livestock reproduction and actual plant and livestock production.
3. Conduct workshops and meetings to educate local, state, and regional stakeholders concerning progress in producing livestock and plants that are economically viable and environmentally friendly.
4. Provide new methods of livestock pest control and disease prevention.
5. Release new plant varieties relative to this program area under plant variety protection (PVP) status.
6. Expand use of Integrated Pest Management (IPM).
7. Provide pest diagnostic assistance and management information to county agents, state and federal partners, commercial agriculture and horticulture producers, and the general public through the Utah Plant Pest Diagnostic Laboratory.
8. Coordinate efforts with other states and the Western Region Pest Management Center (WRPMC).
9. Enhance the USU Master and 4-H Junior Master Gardener Programs.
10. Utilize multiple demonstrations/applied research plots to manage weeds in agronomic crops with results reported at field days, workshops, or annual meetings.
11. Conduct research experiments and develop theories that can be used to enhance plant and animal productive efficiencies through the use of genomics.
12. Publish studies related to these areas of concern.
13. Conduct workshops and meetings for other scientists involved in this area of research.
14. Develop applications for the research on plant and animal genomics to directly benefit producers, youths, and other scientists.
15. Conduct market tests to determine the price premium associated with alternative production and marketing programs.
16. Build models to quantify the impacts associated with international trade.
17. Develop risk reduction models for agricultural producers.
18. Analyze firm-level decisions to identify specific changes that might be made on individual farms and ranches that would enhance net returns.
19. Provide outreach to agriculture businesses, small manufacturers, and entrepreneurs to provide educational training and in-depth information on: small business management, home-based businesses, main street community programs, business retention and expansion, rural and heritage tourism, rural and economic development activities, E-commerce programs, community entrepreneurship, marketing (market feasibility, research, customer relations/service, pricing), finances (recordkeeping, raising capital, growing/expanding financial issues), business plans for potential business owners, patents/trademarks/copyrights, insurance, zoning, and legal requirements, identification of business

opportunities, and youth entrepreneurship programs.

2. Brief description of the target audience

The target audience for this work would be other scientists, agricultural producers, landscapers, general public, home owners, green industry officials, professional landscape managers, turfgrass sod producers, local and regional livestock (primarily beef, dairy and equine) producers, small acreage owners, veterinarians, USDA, other private businesses, and government entities that conduct work in this area.

3. How was eXtension used?

USU is part of the national, world-wide impact eXtension Community of Practice (COP). The MapASyst Community of Practice (CoP) consists of geospatial extension programs from 15 states collaborating as the National Geospatial Technology Extension Network (NGTEN) (<http://www.geospatialextension.org>). These states include Ohio, North Dakota, Rhode Island, New Hampshire, Texas, Alabama, Missouri, Virginia, Louisiana, Arizona, Connecticut, Utah, Mississippi, Nebraska, and Oklahoma. The mission of NGTEN is to provide education and decision support on the practical use of earth systems science and technology to users and communities for solving problems and help meet the growing demands for a spatially literate workforce. This network facilitates geospatial technology and educational expertise among the CoP involving applications of geographic information systems (GIS), global positioning systems (GPS), satellite and aerial imagery and localized geographic information data and resources. NGTEN is an effort to foster communication, collaboration, and resource sharing among participating states and to encourage ties to research and development efforts in academia, industry, and federal agencies. NGTEN is essentially what eXtension calls a CoP- an informal network that helps share ideas, leverage successful educational programs and geospatial applications, and ultimately identify the 'best of the best' for implementation locally. The 15 Geospatial Extension Specialists (GES) will provide the initial leadership and management, and content expertise to Map@Syst.

The NGTEN members provide content expertise over 20 areas of interest. A few of these interest areas include community development, public health, precision agriculture, range management, coastal management, homeland security, disaster management, disease management, wildlife, natural resources, 4-H and youth development, and land use. The CoP boasts a comprehensive collaboration of people to draw from for content development. Some of these include universities (ie, researchers, Extension educators, instructors), community colleges, K-12, Sea Grant, Space Grant, non-profits, industry, and other local, state and federal government agencies.

There is a link to eXtension's "Ask an Expert" feature from the USU Extension webpage.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	95023	318562	39106	131102

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2013
 Actual: 3

Patents listed

Polejaeva, I., Wang, Z., Hu, S., Ranjan, R., Thomas, A., Davies, C., White, K. "Animal model and method, a transgenic goat expressing cardiac fibrosis and associated pathologies." (Application: July 25, 2013). 1100
 Takemoto, J. Y., Chen, D. (2013). Biliverdin from Non-Animal Source, U.S. Patent 8,455,222,B2. U.S. Patent and Trademark Office. 1131
 Zhou, A., Fernandez, R. E. "Gapped duplex approach to label-free DNA mismatch detection." 1063

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	127	127

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele who gain knowledge about improved human, plant, and animal management systems.
2	Number of clientele who implement improved human, plant, and animal management systems.

Outcome #1

1. Outcome Measures

Number of clientele who gain knowledge about improved human, plant, and animal management systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	43588

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farmers and ranchers facing limitations due to illness, injury, or disability often find it difficult to remain in agriculture. This program provides education, and technical assistance on modifications and assistive technology devices to help them remain in agriculture.

What has been done

AgrAbility of Utah is currently assisting a total of 60 clients and their families that are facing limitations due to injury, illness, or disability. Through on-site farm and home assessments, AgrAbility of Utah develops individualized plans that help producers and their families facing a disability remain in agriculture. These plans often involve working with other agencies/organizations (e.g., Vocational Rehabilitation) to help them obtain funding for needed assistive technology.

Results

Over \$200,000 was obtained through Vocational Rehabilitation for needed assistive technology and modifications helping our clients remain in agriculture. To date, AgrAbility of Utah, has helped over 220 agriculturalists and their family members remain in agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
307	Animal Management Systems
603	Market Economics

Outcome #2

1. Outcome Measures

Number of clientele who implement improved human, plant, and animal management systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	15729

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Efficient production of field crops and forages is essential to maintaining the economic viability of Utah's agricultural operations. Each year, Utah farmers and ranchers produce commodities that generate nearly \$1.5 billion in income, with crop sales accounting for approximately 26% of this value(NASS 2010.) Advances in science and technology have enabled growers to increase the productivity and/or efficiency of their farming operations.

What has been done

The Utah State University Extension Agronomy Program is a state-wide effort to assist farmers

and ranchers with crop production practices. Programs focus on the science associated with the management of alfalfa, corn, small grains, pasture, and alternative crops. County Extension Agents provide local agronomy assistance throughout Utah. At the state-wide level Extension Specialists provide technical support for agronomy, economics, entomology, irrigation, plant pathology, soils, weeds, and related topics.

Results

On average Utah farmers that use USU Extension agronomy programs report increased yield of 7.4% for small grains, corn and hay (grass and alfalfa). In Box Elder, Cache, Iron, and Sevier Counties crop school participants had a \$5.8 million value added due to their yield increases.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
307	Animal Management Systems
603	Market Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Every one of the above checked factors have had a negative impact on this program area!

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Many of the programs offered through Extension have participant self- evaluations where results are used to document impacts. Evaluations in 2013 of some extension programs falling under the Global Food Security and Hunger included the USU Risk Management Education for Agriculture program, workshops on assessing use of alternative low-water crops, the Western Sustainable Agriculture Research and Education (SARE) program, Master Gardener courses, Utah Beef Field Day, Arizona Strip Range Workshop and Tour, and USU Food and Agricultural Marketing program.

These are self administered questionnaires given at the time of the program. In some evaluations there are also six month follow-up questionnaires.

Key Items of Evaluation

USU Extension helped setup and hold the 2013 Hay and Forage Symposium in St. George The event was attended by approximately 300 producers. Evaluations showed 99% of participants intend to use the information they learned on their farm or ranch. Ninety-nine percent reported the information will improve their profitability. Much of the information presented in the symposium was developed by UAES researchers.

USU Extension also set up the Utah Arizona Invasive Weed update workshop. Ninety- three participants from Utah, Nevada and Arizona were educated about new and invasive weeds now and on the horizon. Evaluations showed the workshop ranked excellent in relevance of topics, presenter's knowledge of the subject and overall quality of the workshop. Once again, the basis for the week workshop was developed through UAES research.

IMB 3910 was held May 9 and 10 in Logan. There were 26 attendees (maximum we can accommodate). This was USU's 16th workshop which is held approx. each year. Written evaluations for the course have all been in the outstanding to above average category. Producers are better able to provide a product suited for the wholesale and retail trade after taking this workshop. This workshop has been one of USU's most successful Extension event as it combines the classroom with demonstration and hands-on training. Beef producers are able to leave this workshop having gained a tremendous amount of information that is directly relevant to their farms and ranches. Approximately 275 participants have taken the workshop coming from Utah, Wyoming, Idaho, Montana, Colorado and Nevada. Evaluations indicated that participant understanding in all 15 areas/subjects taught increased significantly from before the workshop to after. Self-assessed understanding in all 15 areas increased significantly ($p < .01$).

All of the farmers participating in the Farm/Ranch Estate and Planning Workshop incorporated some of the workshop materials into their business/operation.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change and Natural Resource Use

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	6%		10%	
112	Watershed Protection and Management	8%		10%	
121	Management of Range Resources	9%		5%	
123	Management and Sustainability of Forest Resources	4%		3%	
132	Weather and Climate	0%		15%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		20%	
205	Plant Management Systems	42%		15%	
213	Weeds Affecting Plants	1%		5%	
307	Animal Management Systems	29%		10%	
605	Natural Resource and Environmental Economics	1%		7%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	12.0	0.0	24.0	0.0
Actual Paid Professional	11.7	0.0	12.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
200520	0	483118	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
200520	0	484118	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	4210307	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Continue to facilitate and assist the establishment and success of local Conservation Resource Management (CRM) groups, for more local control of decisions on natural resources.
2. Educate the public with respect to the principle causes of air pollution and their role in prevention.
3. Partner with others to enable agriculture producers to meet EPA requirements.
4. Establish herbicide demonstration/research plots to evaluate the efficacy of these products under local conditions.
5. Conduct projects consultations, and workshops focusing on the role of outdoor recreation and natural resource-based tourism in relation to community development.
6. Partner with others in education and use of resources to rehabilitate the sagebrush steppe environment.
7. Educate and partner to enable the recovery of the sage grouse, pygmy rabbit and others to avoid listing as endangered species.
8. Determine management options that slow or stop the cycle of cheatgrass and fire on previously burned areas through range rehabilitation, seeding programs and nontraditional approaches to grazing management.
9. Educate producers and agency personnel on the need for continued range evaluation, monitoring, and management improvements and the role of grazing management in sustainable resource management.
10. Educate the public on responsible use and the value of multiple uses on rangelands.
11. Illustrate the need for management and control of pinion-juniper forests to restore watershed, wildlife habitat and forage values on rangelands.
12. Educate the public regarding various options with respect to adapting to global climate change
13. Provide information to landowners and users on grazing management of grazeable lands.
14. Partner with and educate the general public, livestock producers and agency personnel on the identification and methods of control of the specific noxious and invasive species.
15. Conduct experiments and develop theories that can be used to enhance water, soil, wildlife, and for various agronomic and urban areas.
16. Publish studies relating to this program area.
17. Provide educational training, problem solving, and in-depth applied information to: facilitate rehabilitation of degraded watersheds, protect and manage watersheds, conserving, managing and enhancing efficient water use, derive efficient irrigation strategies and technologies, implement water-wise landscaping practices, evaluate and promote plants that require less water and are drought tolerant, preserve and enhance water quality, enhance quality, capture, and use of storm-water and gray-water, identify areas of current or potential soil loss or reduced soil fertility and partner with other agencies to reduce and control these problems, educate producers on the important interactions of soil and irrigation,

provide information on soil nutrient deficiencies and cost effective soil quality and fertility improvements, continue demonstration projects - salinity, soil types, non-traditional soil fertility amendments, fertilizer formulation efficacy, organic matter use and management.

2. Brief description of the target audience

The target audience includes the general public, users of various environments (agricultural producers, extractive industry representatives, environmentalists, green industry professionals, etc.), small acreage owners, private forest owners, extension agriculture and horticulture agents, federal and state water and soil management agencies, and other academics and resource managers.

3. How was eXtension used?

There is a link to eXtension's "Ask an Expert" feature from the USU Extension webpage .

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9063	122582	5062	68467

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	76	76

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele who gain knowledge about improved human, plant, and animal management systems that relate to climate change and/or natural resource use.
2	Number of clientele who implement improved human, plant, and animal management systems as related to climate change and/or natural resource use.

Outcome #1

1. Outcome Measures

Number of clientele who gain knowledge about improved human, plant, and animal management systems that relate to climate change and/or natural resource use.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5137

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increased understanding of soil fertility and salinity will help farmers to efficiently use commercial fertilizers and manure resources to improve crop production, maximize profits and minimize nutrient pollution. Few farmers test soils for nutrient needs. Most use a mix of nutrients designed for the average field.

What has been done

An extension agent encouraged soil testing and helped participants interpret the research based recommendations. Eighteen farmers participated, testing 57 fields totaling 2,762 acres.

Results

Farmers saved \$36.49 per acre on average by soil testing and not purchasing unneeded nutrients for a total savings of \$100,793. By not applying an average of 71 lbs of unneeded nutrients per acre, 99 tons of nutrients were kept out of the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate
201	Plant Genome, Genetics, and Genetic Mechanisms

205	Plant Management Systems
213	Weeds Affecting Plants
307	Animal Management Systems
605	Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

Number of clientele who implement improved human, plant, and animal management systems as related to climate change and/or natural resource use.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2075

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

At home Utahans use nearly two-thirds of their water irrigating lawns and landscapes. Water officials know that at least 30% of that water is being wasted.

What has been done

The Utah State University Extension Water Check Program is a Wasatch-Front based effort to assist homeowners, commercial property managers, and institutions with efficient landscape irrigation management. The program, developed through UAES research, focuses on the application efficiency of landscape irrigation systems and components by identifying and measuring irrigation flaws and inefficiencies.

Results

On average, Utahans participating in the Water Check Program save 25,750 gallons of water annually, reducing the amount of water applied to landscapes by 8 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management

121	Management of Range Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
213	Weeds Affecting Plants
307	Animal Management Systems
605	Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Every one of the above checked factors have had a negative impact on this program area! We are only now beginning to recover from the economic downturn in the economy over the last half-dozen years.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Many of the programs offered through Extension have participant self evaluations where results are used to document impacts. Evaluations of some extension programs falling under the Climate Change and Natural Resource Use include workshops on assessing use of alternative low-water crops, the Western Sustainable Agriculture Research and Education (SARE) program, and Master Gardener courses. These are self administered questionnaires given at the time of the program. In some evaluations there are also six month follow-up questionnaires.

Key Items of Evaluation

There were 246 high school students participating in Stream Side Science activities in 2013. Full assessments of Stream Side Science and of USU's one day aquatic macroinvertebrate field days for kids found that these programs both increase knowledge about water science and concern about protecting water quality. A more nuanced understanding of aquatic environments, even among 4th graders was found. The study of 4th graders (Kinder thesis, manuscript in prep) also demonstrated that the impacts from a single 1 hour event (if it is a high quality event) are retained for as long as 10 months.

From follow up surveys of teachers who take our trainings, we know that ~ 40% will use these activities in their classrooms for 1 or 2 years at a minimum. This translates into thousands of students using Stream Side Science activities each year.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
206	Basic Plant Biology	0%		25%	
402	Engineering Systems and Equipment	55%		35%	
403	Waste Disposal, Recycling, and Reuse	45%		40%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	1.4	0.0
Actual Paid Professional	0.2	0.0	0.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3932	0	41867	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
3932	0	41867	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	183218	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Conduct research into alternative biofuels and methods of production that are well-suited for the Intermountain West.
2. Publish in peer-reviewed journals and other professional outlets.
3. Take the research that is done and adapt that research so useful practical strategies might be followed in producer biofuels to the extent that it can be shown to be beneficial in terms of benefits and costs.

2. Brief description of the target audience

For experiment station faculty their target audiences are geared primarily towards extension specialists, county agents, and other scientists; the extension specialists' audiences include peers, county agents, federal and state organizations, producer groups, state and local government, and the general public. County agents work cooperatively with federal, state, and local governments, citizen groups, and the public to address sustainable energy issues in their areas.

3. How was eXtension used?

There is a link to eXtension's "Ask an Expert" feature from the USU Extension webpage.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	69	413	5	30

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	5	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele gaining sustainable energy knowledge
2	Number of clientele who implement sustainable energy practices

Outcome #1

1. Outcome Measures

Number of clientele gaining sustainable energy knowledge

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of clientele who implement sustainable energy practices

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Every one of the above checked factors have had a negative impact on this program area!
The economy has only recently started to improve.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Many of the programs offered through Extension have participant self evaluations where results are used to document impacts.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity, Nutrition and Community

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	9%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		35%	
703	Nutrition Education and Behavior	11%		5%	
724	Healthy Lifestyle	2%		5%	
801	Individual and Family Resource Management	13%		10%	
802	Human Development and Family Well-Being	6%		5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		25%	
806	Youth Development	59%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	56.0	0.0	11.5	0.0
Actual Paid Professional	44.8	0.0	6.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
765496	0	195005	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
765496	0	195322	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	1452051	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Conduct research with respect to human nutrition, family finances, bankruptcy, and community development.
2. Publish studies and make presentations related to individuals, family finances, and community well-being.
3. Conduct workshops and meetings, deliver activities, develop new curricula, write newsletters and news releases and post Internet fact sheets.
4. Provide training in a variety of mediums-face-to-face, satellite, group discussions, demonstrations, conferences and workshops, via DVDs, CDs, fact sheets, newsletters, and other media.
5. Include the following materials or media sources in training sessions: Take Charge of Your Money, Power Pay and Power Saves, Utah Saves Education and Outreach, Individual Development Account, First Time Homebuyer Assistance, Financial Education for Bankruptcy Filers (USU is certified by the Department of Justice to offer debtor education classes), Living Well on Less, Money Sense for Your Children, and Earned Income Credit assistance.
6. Utilize different teaching methods of The Utah Food Stamp Nutrition Education including individual, group classes, DVD video series, and an on-line course. FSNE Nutrition Education Assistants will provide other nutrition education opportunities to FSNE participants
7. Use the "Give Your Body the Best" curriculum developed in 2005 by USU to teach individuals or groups of low income persons regarding chronic diseases; on food allergies, intolerance, and poisoning; and lessons on getting to know foods and enjoy them.
8. Increase the capacity among other extension personnel to participate in or lead community self-assessments (SWOT analyses, asset mapping, search conferencing, surveys, etc.) that lay the groundwork for subsequent project activities.
9. Conduct research experiments and/or develop theories that can be used to explain (a) causes for public land conflicts and potential solutions, (b) solutions to the urban expansion into rural areas and open space, and (c) conditions for continued rural community economic viability.
10. Publish studies and make presentations related to these areas of concern.
11. Conduct workshops and meetings to educate local, state, and regional stakeholders concerning these issues.
12. Deliver educational and informational services through various media.
13. Develop educational resources related to rural economic viability for community leaders and other stakeholders
14. Provide for local training in principles developed that are related to this area of study.
15. Conduct design activities (for a park, a Main Street revitalization, etc.) that will typically yield a design of variable specificity (some might be conceptual drawings, others might be more extensive).
16. Provide consultations regarding land use planning policies and their implications on growth.

2. Brief description of the target audience

The target group is the general population of Utah (including youth), with a special emphasis on Native Americans, Latinos, African Americans, Asians/Pacific Islanders, and low income families with children at or below poverty levels, food stamp program eligible individuals, and individuals facing bankruptcy. A subgroup of the audience targets is pregnant teens and teen mothers.

Elected officials, appointed officials, general population (including youth), and at-large community opinion leaders and influential people are targeted for community development.

3. How was eXtension used?

Regional and National Extension Initiatives including Western Rural Development Center Small Business Management Resources; eXtension Entrepreneurs and their Communities providing on-line business assistance to entrepreneurs and communities throughout the country; and USDA Rural Development sponsored national initiative "Stronger Economies Together" now including 36 participating states.

There is a link to eXtension's "Ask an Expert" feature from the USU Extension webpage.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	154059	875396	302039	1716249

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	42	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele who gain knowledge about nutrition education and behavior.
2	Number of clientele who implement practices of nutrition education and behavior.
3	Number of clientele who gain knowledge about individual and family resource management.
4	Number of clientele who implement individual and family resource management.
5	Number of clients who implement Science, Technology, Engineering, and Math (STEM) skills with business.

Outcome #1

1. Outcome Measures

Number of clientele who gain knowledge about nutrition education and behavior.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	18401

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research shows that many diseases and other health problems have much to do with what we eat, and could possibly be prevented by change in eating and other health habits. Child obesity is on the rise, which will only bring more health problems in the future. Many individuals know of the need to eat more healthfully, but have not translated that need into simple tasks to make it happen. Informing about ways to eat more healthfully to prevent obesity and other diseases, and ways to prepare quick and nutritious meals will empower individuals to make healthier choices.

What has been done

Food Sense (SNAP-Ed) serves individuals who are either food insecure or at risk for food insecurity. In 2013, the Food Sense (SNAP-Ed) program directly educated over 11,295 adults and 26,115 youth in Utah and was present in all 29 counties across the state. In addition, the Food Sense (SNAP-Ed) program indirectly educated another 369,688 Utahans through county fairs, health fairs, posters, websites, blogs, and more. This was all done as a result of the committed support from USDA's Food and Nutrition Services (FNS), Utah's Department of Workforce Services (DWS), and Utah State University. Group classes for adults and youth are the core of the Food Sense (SNAP-Ed) program in Utah. These classes address the specific needs of our participants and provide nutrition education as outlined in the current USDA Dietary Guidelines and MyPlate.

Results

In 2013, the Utah State University Food Sense (SNAP-Ed) program, known nationally as the Supplemental Nutrition Assistance Program (SNAP-Ed) assisted thousands of Utah families in making healthy food choices on a limited budget.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #2

1. Outcome Measures

Number of clientele who implement practices of nutrition education and behavior.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	10377

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to a 2012 USDA report, 14.6% of Utahans were "food insecure", indicating that they worried about where their next meal would come from. A study by Lisboa Associates reported that less than half of low-income households use foods that provide an ample supply of important nutrients. Another study pointed out that over two thirds of Food Stamp program households have health related problems related to sodium consumption, cholesterol intake, high sugar, and being overweight.

What has been done

The Utah State University Supplemental Nutrition Assistance Program -Education (SNAP-ed) teaches low-income audiences, specifically targeting those on the Supplemental Nutrition Assistance Program (SNAP). Lessons focused on the current dietary guidelines and experiential learning activities reinforced nutrition concepts and taught needed skills to eat healthy on a limited

budget.

Results

Food Sense class surveys showed that 78% of participants found that the lessons were useful (31% "extremely", 47% "very"); 78% felt the presentations were effective (37% "extremely", 41% "very"); 80% indicated the quality of the presentations was very good (42% "extremely", 38% "very"); and 76% indicated they gained knowledge through participation (33% "extremely", 42% "very").

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #3

1. Outcome Measures

Number of clientele who gain knowledge about individual and family resource management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	8540

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The manufacturing sector plays a major role in Utah's economy. Small and medium sized manufacturers confront major problems in responding to increasing global competition. These problems encompass a broad range of issues, only some of which relate directly to technology. Inadequate resources ? people, money, expertise, information, and insufficient time are reasons that many small industrial firms are not improving their manufacturing performance.

What has been done

Priorities for this program will come from a strategic focus on Utah's small manufacturers and on Utah's supply chain linkages. Priority to service delivery will be given to those objectives that best conform to the mission of the Manufacturing Extension Program, which is; "To raise the competitiveness, performance, and profitability of Utah's manufacturers".

Results

The following are Impacts for 2013: Number of Companies reporting Impacts = 63 of 69, Total Bottom-line Impact = \$64,126,051, Total Investment Impact = \$133,556,751, Customer Satisfaction Score = 8.91/10.00, Jobs Created or Retained = 4929

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #4

1. Outcome Measures

Number of clientele who implement individual and family resource management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1356

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many entrepreneurs and new business owners lack the knowledge, experience and technical management skills to survive the difficult and competitive process of starting and maintaining a new business venture. This is especially true of rural businesses and entrepreneurs where the decline in traditional agriculture and natural resource based income has led to increased rates of poverty and fewer opportunities for non-farm jobs in rural areas.

What has been done

Small Business Development Center (SBDC) offices in Logan, Brigham City, Tooele, Vernal, Price and Blanding provided long term one-on-one counseling to 1048 largely rural clients, an additional 956 clients assisted and 1158 participants in 56 training programs on topics including business planning, marketing analysis, financial management, managing human resources and business financing strategies.

Results

These activities resulted in 225 jobs created and 96 jobs retained or saved, 90 new business starts, \$2.5 million in increased sales and \$6.3 million in total capital formation reported.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #5

1. Outcome Measures

Number of clients who implement Science, Technology, Engineering, and Math (STEM) skills with business.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	303

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Computer Science (not computer literacy) underlies most innovation today, yet the majority of U.S. schools require only that students use computers. Computer science teaches students design, logical reasoning, and problem solving. Currently, there will be 1 million more computing jobs than students over the next 10 years (adding up to \$500 billion in salaries). In addition, more than 50% of all projected math and science occupations are in computing occupations. But unfortunately, less than 3% of college students graduate with a computer science degree.

What has been done

Code Camp is a networking competition where software development and business minds come together and form teams to launch a product in 24 hours. From 2012-13, the camp raised over \$13,700 in sponsorships from 25 local businesses that brought together 303 participants, comprising 56 teams. Every team completed judged projects in 24 hours, of which 13 mobile and web apps went straight to market.

Results

Since 2010, Southern Utah Code Camp has increased value-added revenues to Washington County, improved business relationships, increased collaboration, and connected businesses with human talent. 48 college students have been hired by local businesses, 17 programmers have found higher paying jobs, and 4 start-ups have launched with combined revenues surpassing \$200,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Every one of the above checked factors have had a negative impact on this program area! The economy has slowly improved over the last one to two years in a large share of the increase has been in the area of technology.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Many of the programs offered through Extension have participant self-evaluations where results are used to document impacts. Evaluations in 2013 of some extension programs falling under the Childhood Obesity, Nutrition, and Community included Food Sense (SNAP-Ed) nutrition, Couples and Money Workshops, Relationship Workshops, Utah Prepare Fair, farm-chef-fork programs, and 4-Hit (Information Technology).

Key Items of Evaluation

Of the members in 4-HiT coding clubs, 96 percent of youth surveyed in this program have indicated a significant increase in their code writing and problem solving abilities. Another 146 youth age 9-14 and 17 adults reported increased knowledge in the subjects of robotics, programming, engineering, physics, and design. Further, through organizing 4-H County Contests, 6 youth age 15-16 specified their public speaking skills and confidence in explaining technical jargon had been enhanced. Overall, through surveys USU found significantly increased levels of confidence, technical skill, and attitude in 44 of the most active adult volunteers and youth age 8-14 by offering over 260 robotics, programming and maker activities.

Surveys show that after taking Food Sense classes there was a:

- 4% increase in the number of families who usually had enough food to last the month.
- 8% increase in the number of families who always had enough food to last the month.
- 13% increase in the number of people who used a menu plan to plan their meals
- 7% increase in number of people who ate breakfast
- 11% increase in number who ate 2 1/2 cups of veggies per day
- 13% increase in number who ate 2 cups of fruit per day
- 68% of participants said classes were extremely high quality.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
303	Genetic Improvement of Animals	2%		0%	
311	Animal Diseases	0%		10%	
501	New and Improved Food Processing Technologies	0%		10%	
502	New and Improved Food Products	0%		10%	
504	Home and Commercial Food Service	43%		0%	
701	Nutrient Composition of Food	0%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		10%	
704	Nutrition and Hunger in the Population	0%		40%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	55%		0%	
Total		100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	12.6	0.0
Actual Paid Professional	2.6	0.0	2.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
44275	0	2114170	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
44275	0	2119154	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	6991021	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Conduct experiments and develop theories that can be used to develop a safer food supply from production, through processing, and to the final consumer.
2. Conduct experiments and develop theories that can be used to develop new food products or improve existing food products.
3. Publish studies and make presentations related to these two areas of concern.
4. Extend research to Utah residents, family consumer scientist agents, small and medium sized food processors, restaurant food safety managers to provide educational training and in-depth information on: safe food handling practices, safe food preservation and storage practices, certification to food safety managers, safe food handling practices for processors, and 4-H nutrition and health safety curricula and programs.

2. Brief description of the target audience

The target audience will include food processors, agricultural producers, general consumers (both within and without Utah), family consumer science agents, at risk groups and their families, and other scientists.

3. How was eXtension used?

There is a link to eXtension from the USU Extension website.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6969	13381	6688	12841

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	20	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele who gain knowledge about home and commercial food service.
2	Number of clientele who implement home and commercial food service practices.

Outcome #1

1. Outcome Measures

Number of clientele who gain knowledge about home and commercial food service.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	10097

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 1998, the Utah legislature passed a bill requiring all food service operations in Utah to have a certified food safety manager. There is an ongoing need for education and certification and recertification exams. Most consumers believe that food borne illnesses are caused by commercial food operations. Just the opposite is true. The majority of food safety problems are related to personal food handling practices at home.

What has been done

The USU Extension offices served as a liaison for the Food Safety Manager Certification program. The offices answered questioned for customers, connected them with the Food Safety web site, and proctored exams for food service managers.

Results

In one county 93% of food safety managers passed the certification exam.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
311	Animal Diseases
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

504	Home and Commercial Food Service
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
704	Nutrition and Hunger in the Population
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Number of clientele who implement home and commercial food service practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6016

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bacteria and other air particles can grow on food if not preserved accurately. These particles can grow into food-borne illnesses that can spoil food, inflict illness in individuals who eat the food, or even cause death in severe cases.

What has been done

To inform home food preservers about these risks and how to properly preserve food classes were taught throughout the community. In Cache County a total of 392 pressure gauges were tested in 2013. Of these, 143 tested to be accurate. A total of 249 gauges required slight adjustments in order to pressure correctly. A total of 13 gauges were significantly malfunctioning and required replacement.

Results

This service possibly prevented botulism for these consumers and their families.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
311	Animal Diseases
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
504	Home and Commercial Food Service
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
704	Nutrition and Hunger in the Population
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Every one of the above checked factors have had a negative impact on this program area! The economy has shown some improvement over the last year or two.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Many of the programs offered through Extension have self-evaluations where results are used to document impacts. Evaluations in 2013 of some extension programs falling under Food Safety included food preservation, food storage, and food safety.

Some of the projects funded by the UAES have been able to identify significant economic impacts. These typically involve some type of benefit/cost analysis.

Key Items of Evaluation

Thirty-two educational classes, workshops, booths, and camps teaching nutrition, health and well-being, food preservation, food safety and food storage were delivered to

1,741 adults and youth who learned to better meet their nutritional needs, maintain good health and use proper food safety practices.

To bring the important message of how hand washing can prevent the spread of infection, the handwashing website www.soaperhero.org was further promoted. Traffic on the site continues to be regular. Since 2010, educators from 20 states and 5 countries have utilized the materials. Hand washing education was taught in several preschools and elementary school classes. Awareness of the importance of hand washing has been improved.