2017 Utah State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Utah State University Extension and Utah Agricultural Experiment Station conducted work in five planned focus areas: Global Food Security and Hunger; Climate Change and Natural Resource Use; Sustainable Energy; Childhood Obesity, Nutrition, and Community; and Food Safety.

GLOBAL FOOD SECURITY AND HUNGER

Horticulture

Research Impact: J. Reeve is working on improving soil quality and sustainable organic production in Utah farming systems. Results from an organic and integrated peach project showed that weeds, not lack of fertility, are the primary restraint on tree growth when establishing organic peach trees. However, planting birdsfoot trefoil in the alleyways as opposed to grass reduced the need for expensive weed management in the establishment of organic peaches. Economic and market analysis indicated that organic peach production was more profitable than both conventional and integrated management due to highly stable prices. Conventional peach production had the greatest potential for profit when peach prices where high, however, the risk was greatest due to a highly volatile market.

Success Story: USU Extension provided the subject matter, demonstrated and taught various horticulture topics for 24 internet videos. Footage was produced, edited and posted on YouTube and Vimeo. Viewers accessed these 24 videos 907,174 times from 2011-2017. Of those accesses, 113,623 occurred in 2017. The video on Killing Stumps has been accessed 694,232 times, of which 50,430 occurred in 2017. This is the most accessed video on the USU Extension Channel. Other include significant videos include: Pruning Young Peach Trees accessed 106,260 times, of which 31,068 occurred in 2017; Pruning Apples vs. Peach Trees accessed 44,406 times, of which 8,220 occurred in 2017; and Planting Poplars access 18,862 times, of which 6,308 occurred in 2017.

Success Story: Evaluation of several years of records show that most home owners have applied excessive amounts of phosphorus to their soils while farmers in the valley have soils that are deficient in phosphorus and potassium. In 2017, 16 homeowners took and submitted 22 soil samples for analysis. 63.6% of samples had excessive P (>30 mg/kg), 22.7% had low P (<20 mg/kg) and 4.5% had low K (<150 mg/kg. Homeowners testing soils know how to interpret results, how to properly amend their soils, and how much fertilizer and other nutrients to apply to maintain landscapes, grow high yield vegetable, and protect water quality.

Success Story: Increased understanding of soil fertility and salinity helps farmers to efficiently use commercial fertilizers and manure resources to improve crop production, maximize profits and minimize nutrient pollution. USU Extension encouraged soil testing and helped participants interpret the research based recommendations. Farmers saved $24.66 per acre on average by soil testing and not purchasing unneeded nutrients for a total savings of $33,490. By not applying an average of 50 pounds of unneeded nutrients per acre, 34 tons of unnecessary nutrients were kept out of the environment.

Success Stories: Noxious weeds pose a great threat to agriculture, wildlife, bio-diversity, and other natural resources in Juab County. As a member of the Squarrose Knapweed Cooperative Weed Management Area (CWMA) and the Juab County Weed Program, Juab County Extension received six weed control grants totaling $218,000. During the year, 6,800 acres were monitored treated with herbicides. As a result of the weed control grants and cooperation of the CWMA, the program resulted in a $51,000.00 savings to the producers. Extension assisted with the Utah Squarrose Knapweed field day.

Fifty-one participants increased their knowledge in controlling this weed. I conducted workshops where 48 producers increased their knowledge and skills in the areas of pesticide safety, weed control, alfalfa hay, and small grains. I presented information to 50 participants at the area Ag Expo that increased their understanding in soil testing, irrigation, crop management, and Ag related materials available through USU.

Juab County Extension conducts a public weed awareness program. This year, 337 individuals increased their knowledge in the areas of weed control, pesticide safety and use. This represents nearly 15% of all the households in the county. During this year's program, $15,120 was saved by program participants and 168 acres of weeds have been sprayed.

Success Story: Mountain States Oilseeds contracts 20,000 acres of safflower annually from Northern Utah and Southern Idaho growers. USU Extension research has identified newer safflower varieties that are higher in production, whiter in color and have a higher oil content. Ninety-eight percent of their contracted safflower is S-333 which USU Extension identified in earlier research as one of these better producing varieties. These higher yields equate to about 520,000 additional pounds of safflower valued at $31,200. We received a $8,200 grant from the Idaho Oilseed Commission to assist in evaluating pre- and post applied herbicides for weed control in dormant safflower which we have identified as a better management practice over spring seeded safflower.

Crops

Research Impact: G. Cardon is studying soil productivity management issues in Utah and the Western US. Data indicates that much greater nitrogen credit can be given for a previous alfalfa crop to the subsequent production of silage corn in the first year of rotation and even in the second year of rotation. This result is very significant in that it is clearly possible to reduce the N requirement for first and second year corn after alfalfa up to 200 units of N per acre (based on typical grower practice and USU recommendation levels) without yield reduction. This is projected to potentially save Utah corn growers up to $6-$12 million annually (depending on the percentage of alfalfa ground in rotation).

Research Impact: J. Norton is studying the functional and molecular diversity in nitrogen (N) cycle enzymes under contrasting agricultural management systems. Improved understanding of N cycling in agroecosystems is essential for increasing N use efficiency and sustainable food production. The researchers completed community characterization with metagenomics analyses from agricultural soils from both Utah and Georgia. These soils were sampled from under contrasting N management using ammonium fertilizers and organic N sources from steer and poultry manure composts. Results showed that agricultural N management affects microbial communities, enzyme activities and the diversity and abundance of the genes encoding nitrification and N mineralization.

Research Impact: D. Alston is studying the effects of weeds, alternate crops, and onion nutrition on onion thrips populations. Greenhouse studies were conducted to assess host plant suitability of common weeds and crops grown in the Utah onion farmscape. Enzyme linked immunosorbent assay (ELISA) tests for the presence of Iris yellow spot virus (IYSV), an economically important pathogen vectored by onion thrips, found low levels of incidence (1.1-2.6%) in common mallow, dandelion, field bindweed, flixweed, and prickly lettuce. IYSV was not detected in foxtail barley or shepherd's purse. These results indicate that thrips carrying the virus had fed on these weeds. It does not confirm that the virus is able to replicate in their tissues.

Research Impact: D. Hole is working on the breeding and evaluation of sustainable winter barley cultivars for feed and malting. The objective is to develop cultivars of winter barley with improved yield, test weight, straw strength, disease and insect resistances and other agronomic and quality characteristics for production in Utah with irrigated or non-irrigated conditions. Emphasis is on winter 2-row malting types aimed at craft beer targets and winter 6-row feed types. The project released a winter barley cultivar this year named UT10201. This entry (formerly UT10201-15) was the second highest yielding cultivar with an average yield of 199 bu/ac. Foundation seed was produced in cooperation with the Utah Crop Improvement Association. This is the first winter barley cultivar released by Utah State University.

Success Story: The Utah Cooperative Agricultural Pest Survey (CAPS) is part of a national pest detection program funded through agreements between USU, the Utah Department of Agriculture and Food, and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service. The

collaborative effort surveys for exotic pests identified as threats to U.S. agriculture and forest resources. For example, the brown marmorated stink bug is an invasive pest of fruits and vegetables first detected in the U.S. in 1996 and now threatens Utah agriculture since its detection in the state in 2012. Since 2015, the bug has been found in five counties along the Wasatch Front and has the potential to negatively impact approximately $33 million in harvested crops via increased yield loss and management costs. The CAPS program is the first line of defense in protecting Utah agriculture, valued at over $1.6 billion annually and covering nearly 12 million acres, and forests covering over 18 million acres. This is accomplished through invasive species prevention, early detection, rapid response, control, research, and education. Each year, outreach efforts reach an average of 1,000 growers and the public through presentations and workshops and 11,500 subscribers through the Utah Pests advisories and quarterly newsletter.

Success Story: The USU Integrated Pest Management program partnered with the Utah Climate Center to develop web-based tools to help farmers in Utah get timely access to site-specific crop management information. Named Utah TRAPs (Temperature Resource and Alerts for Pests), this collaboration produces real-time pest management information and weather conditions through a website, mobile app, and customizable alerts for over 70 locations in Utah and Idaho. These tools have helped a majority (93%) of the largest fruit growers in the state save thousands of dollars per acre in operating costs by optimizing pesticide applications, irrigation monitoring, and reduction in wind machine use for frost protection.

Success Story: Alfalfa is the largest cash crop in Utah, followed by small grains and corn. Several arthropod pests cause economic damage to these crops including alfalfa weevil, aphids, and spider mites. USU research efforts focus on the effects of insecticides on pests and predators in alfalfa and evaluation of pest-resistant plant varieties.

What was done: Utah citizens are reached through presentations on integrated pest management in seven county crop schools reaching over 400 farmers each year; hands-on pest diagnostic workshops at the Utah Hay Conference with over 250 attendees; and more than 700 pocket guides distributed and over 450 video fact sheet views on beneficial and pest insects of alfalfa.

Impact: The Extension Agronomy Program conducted surveys of Utah's small grain, corn, and hay producers. Utah farmers using these pest management and plant maintenance recommendations reported a 7.4% increase in crop yields.

Success Story: Utah Plant Pest Diagnostic lab (UPPDL)

From home gardeners to the pest management and agricultural industries, the UPPDL supports over $1.6 billion in industry every year with pest management expertise, diagnostics, and research information. Approximately 350 physical samples of plant and pest diseases processed per year, with over 14,000 samples processed since sample recording began in 1978. The UPPDL quarterly newsletter, Utah Pest News, has 6,600 local, state, regional, and national subscribers.

Success Story: In 2017 working with USU specialists USU Extension established a LEPA irrigation research project in one county. One span of a grower's pivot was fitted with LEPA nozzles. Soil moisture stations were installed under the LEPA nozzles and on an adjacent pivot span which acted as a control. Soil moisture and yield of alfalfa were measured. It was found that this project has the possibility of saving 20% of applied water and reducing power costs.

Success Story: Producers seek information from USU Extension on livestock rations and nutrition, hay testing and marketing. Summer annual hay crops are often grown in rotation with alfalfa to provide livestock forage. But these crops can accumulate toxic concentrations of nitrates which levels can cause abortions and death in livestock. Abundant hay supplies in 2017 depressed hay prices especially for feeder hay. Ten forage lots (6 producers) were tested for nitrates and 39 lots (9 producers) totaling 1298 tons were tested for hay quality. Of the forages tested for nitrates, 2 lots had very high nitrates which could have resulted in animal deaths if fed, 1 lot had marginal levels which could have caused abortions but could be used if mixed with other feeds and fed to non-pregnant animals. Producers were more successful in avoiding high nitrate forages than in the past. Producers marketed premium and supreme quality hay for higher prices and received $27,714 more in revenue. Producers saved an estimated $3,175 in fewer aborted calves from nitrate poisoning.

Success Story: Increased understanding of soil fertility and salinity helps farmers to efficiently use

commercial fertilizers and manure resources to improve crop production, maximize profits and minimize nutrient pollution. USU Extension encouraged soil testing and helped participants interpret the research based recommendations. Farmers saved $24.66 per acre on average by soil testing and not purchasing unneeded nutrients for a total savings of $33,490. By not applying an average of 50 pounds of unneeded nutrients per acre, 34 tons of unnecessary nutrients were kept out of the environment.

Success Story: In 2017, 121 producers attending the Box Elder County Crop School learned how to properly manage arthropods pest in alfalfa fields, which insecticide and herbicides work best for controlling insect pests in alfalfa and the importance of rotating pesticide to reduce pesticide resistance. They also learned about maintaining a productive stand of alfalfa hay, how to properly store hay prior to selling to hay brokers to keep the value of the product high. Producers rated the usefulness of the information received at the crop school at 4.82 out of 5.0 possible.

Issue: Threats to field crops include; unpredictable weather, water quantity, erratic hay prices, soil fertility, fertilizers practices, changing markets, insect and weed pest management and regulations, pests reducing yield and quality, etc. New varieties of alfalfa, small grains, safflower and corn need to be researched under Utah growing conditions. Also, cultural practices and weed control that improve production in existing fields need to be implemented to obtain maximum productivity.

What was done: The Pesticide Safety Education and Applicator Training workshop in Box Elder County trained private pesticide applicators on pesticide laws, pesticide safety, respirator fit and herbicide actions and how plants develop resistance, and weed identification and control in agricultural crops. Ninety-seven individuals were trained in pesticide safety and received 3 credit hours to assist in renewing their pesticide license in Utah and Idaho.

Beef

Research Impact: K. White and colleagues have been studying reprogramming events associated with somatic cell nuclear transfer. Analysis of histocompatibility complex class I (MHC) expression in developing somatic cell nuclear transfer bovine pregnancies was completed. These data indicate significant aberrant expression of genes that are critical for proper establishment and maintenance placental function throughout pregnancy, and clearly support the hypothesis that this is the primary cause of premature pregnancy loss in somatic cell nuclear transfer pregnancies. Several developmentally important genes that are aberrantly expressed during early preimplantation development have also been identified. These aberrantly expressed genes may be causative of the pregnancy failure and poor post-natal survival observed in some somatic cell nuclear transfer (SCNT) outcomes. Finally, preliminary data evaluating the impact of microRNA on gene expression have been collected. The results indicate that: the total number of miRNA reads are higher in 8-cell embryos; microRNA's known to play roles in pluripotency and maternal transcript degradation are significantly up-regulated - these may play a role in epigenetic programming and pluripotency during the maternal to zygotic transition (MZT) period of development; expression of miR-196 was significantly greater in 8-cell embryos - this targets NOBOX, a transcription factor that regulates the expression of zygotic transcripts during early MZT8; microRNA members of the miR-302 family were very abundant in 8-cell embryos - essential for the acquisition of pluripotency in generation of induced pluripotent stem cells (iPSCs); abundance and dynamic expression of miRNA suggests a direct role in the regulation of gene expression through this stage of development. Together, these data are beginning to help answer important questions about the developmental competence of SCNT embryos.

Success Story: Beef cattle production is still the major form of agriculture in San Juan County as well as the Four Corners Area. Most beef operations have their mother cow herds on open range 365 days a year. This means that the cows are only handled one or two times a year, and many of the cows are not seen during the between times because of the vastness of areas where they live. A critical issue for most ranches is the care and handling of heifers who will be calving for the first time. In May USU Extension began the synchronization process for almost 250 head of cattle owned by 7 different beef producers. The cost per cow of synchronization and artificial insemination is $88.59 vs 64.32 for natural mating. If you calculate the pay weight of the calves from natural mating you come up with $970 per calf. $991.36 (AI) - $970 (NM) = $21.36 more for the calves from the synch/AI program. However, none of the calculations consider the added income from improving the genetics of the herd over generations or the reduced costs

of feeding heifers due to a shortened calving season.
Success Story: Seventy-six percent of the Cowman's Reproduction Workshop (CRW) participants indicated they would make management changes because of the knowledge gained at the workshop and 43% reported seeing improvements in reproduction performance with another 43% indicating possible improvement in reproduction performance.
Success Story: Producers seek information from USU Extension on livestock rations and nutrition, hay testing and marketing. Summer annual hay crops are often grown in rotation with alfalfa to provide livestock forage. But these crops can accumulate toxic concentrations of nitrates which levels can cause abortions and death in livestock. Ten forage lots (6 producers) were tested for nitrates and 39 lots (9 producers) totaling 1298 tons were tested for hay quality. Of the forages tested for nitrates, 2 lots had very high nitrates which could have resulted in animal deaths if fed, 1 lot had marginal levels which could have caused abortions but could be used if mixed with other feeds and fed to non-pregnant animals. Producers were more successful in avoiding high nitrate forages than in the past. Producers marketed premium and supreme quality hay for higher prices and received $27,714 more in revenue. Producers saved an estimated $3,175 in fewer aborted calves from nitrate poisoning.
Dairy
Research Impact: Z. Wang has been studying the effect of antibody-free calf bovine serum (AF-CBS) on the growth of an rCHO cell line and its productivity of alkaline phosphatase. This project demonstrated that AF-CBS is superior to calf bovine serum (CBS) and is comparable or better than fetal bovine serum (FBS) in promoting cell growth, viability and recombinant protein production. In economic terms AF-CBS would be more desirable than FBS for industrial applications and scientific research, because AF-CBS can be produced from calves while FBS is produced from fetuses. Furthermore, because large volumes of AF-CBS can be produced each time, it would also reduce the commonly found batch to batch variations in FBS. Taken together, this investigation has paved the way for more in-depth testing of this novel AF-CBS product to establish it as the "next generation" serum to replace CBS and FBS. This study has significant implications both for the pharmaceutical industry and for academic research where serum is routinely used.
Success Story: The USU Extension Dairy Specialist and his team have done statewide surveillance projects of bulk tank milk from most dairy farms in Utah. As an outgrowth of the follow up and outreach program regarding bulk tank milk statewide surveillance results, including visits and farm-specific programs for farms testing positive for mycoplasma, Johne's disease, and/or BVD, Utah had a state mean Somatic Cell Count in all bulk tank milk of 160,000/ml during 2017. This is lower than most other states and decreasing faster than national average. This provided $2.2 million added annual revenue, $14,800 per farm, and reflects continued improvement in milk quality.
Sheep
Research Impact: N. Cockett and her collaborators are building the Sheep Genomes Database. This database currently contains whole genome sequences from 935 sheep from 21 countries and 69 breeds and aligned to Oar v3.1. Analysis of 250 of the sequences revealed over 80 million SNPs and indels with high confidence using two variant-calling platforms. Data in the database is publicly available via European Variation Archive (EVA), which delivers key advantages concerning public access of genome information, data storage and variant accessioning. Variants are available as raw (unfiltered) or filtered following application of a comprehensive QC protocol.
CLIMATE CHANGE AND NATURAL RESOURCE USE
Research Impact: P. Adler is testing models for forecasting climate change impacts on rangeland plant communities. Use of long-term datasets and statistical and mathematical models to analyze population dynamics showed that while intraspecific (within species) interactions are strong and limiting, interspecific (between species) interactions were surprisingly weak. As a result, these dominant species have little impact on each other's abundances; their populations are mostly regulated by the intraspecific density dependence. A consequence of this result is that indirect effects of climate change, mediated by species interactions, are weak and single species models perform adequately. Experimental data indicated that the population-level model was no worse than the demographic model, and actually outperformed it in some cases. Furthermore, an analysis of long-term monitoring data from across the Intermountain West

showed that sagebrush cover responds positively to warm years in cold locations, and negatively to warming at hot locations. All-together, our findings have demonstrated the potential of using cheap, population-level data to model single-species responses to climate variation.

Research Impact: K. Beard is determining how increasing precipitation intensity will impact rangelands in Utah. In seasonally snow-covered regions reduced precipitation also reduces snow cover, which can increase soil frost depth, decrease minimum soil temperatures and increase soil freeze-thaw cycles. In addition to the effects of reduced precipitation on plants via drought, freezing damage to overwintering plants at or below the soil surface could further affect plant productivity and relative species abundances during the growing season. The effects of both reduced rainfall (via rain-out shelters) and decreased snow cover (via snow removal) were examined at 13 sites globally as part of the International Drought Experiment (IDE), a coordinated distributed experiment. Across all sites, there was a significant correlation between the snow removal effect on minimum soil temperature and the effect on subsequent plant biomass. Across sites, there was no significant correlation between the rain-out shelter effect on soil moisture and the effect on plant biomass. Overall, our results reveal that reduced snowfall, when it decreases minimum soil temperatures, can explain a substantial component of the total effect of reduced precipitation on plant productivity.

Research Impact: L. Hipps is investigating decadal scale Patterns in climate and connections to water use by plants. Research about the of drought-wet cycles in the western US has connected ocean-atmosphere connections and drought in California. Evidence was found of historical droughts not related to the El Nino-Southern Oscillation (ENSO), which was the current paradigm. Results indicate the Pacific North American (PNA) and North Pacific Oscillation (NPO), although not directly causing drought in California, do modulate the spatial drought pattern. In addition, research was conducted to document coherent or cyclical patterns of summer temperature in northern Utah. By using phase space analyses, it was found that the summer temperatures have wandered around an attractor until about 1985, when suddenly began to orbit a new attractor, which is warmer. Current efforts are to connect these findings with calculated changes in evapotranspiration (ET) by irrigated plants.

Research Impact: J. Endter-Wada has been designing policies and promoting practices to meet agricultural, urban and environmental water needs in the Intermountain West. Water use and social analyses examined agricultural adaptations to drought and climate change in the Bear River, Weber and Provo River Basins. The analysis focused on infrastructure upgrades, new water metering and communication technologies, and proposed water banking strategies. Research conducted in collaboration with the Weber Basin Water Conservancy District (WBWCD) regarding meter implementation on pressurized secondary irrigation systems showed that information feedback on water used in comparison to water needed to maintain landscapes provided people with an informational incentive to conserve water. Significant amounts of landscape water were conserved in the year following meter installation. WBWCD decided to start a phased retrofit of their retail secondary irrigation connections (17,000+) and implemented a policy requiring that all new connections within their service area be metered. Over the past 5 years (2012-2016), WBWCD has documented that, on average, metered connections (n=4,990) use 34% less water annually (0.61 acre-feet per connection) than un-metered locations (0.92 acre-feet per connection). WaterMAPS™ analysis of urban landscape water use efficiency in WBWCD, Jordan Valley Water Conservancy District, and Salt Lake City showed that urban landscape water use is generally two to three times, on average, of what is needed to maintain landscapes in healthy conditions. Providing site specific information to water customers on their capacity to conserve enhanced their conservation savings.

Success Story: Utah State University Extension water outreach efforts continue to meet the needs of citizens in every corner of the state. Home to internationally recognized experts on water issues, USU is solving water challenges ranging from agricultural water management to ecosystem services to urban water use efficiency and conservation. Further, as the western United States continues to suffer through unprecedented drought conditions, USU's state-of-the-art research and programming efforts are being recognized for their effectiveness and success in meeting the needs of a very diverse group of water users and stakeholders. An uncertain water future requires a thorough understanding of this precious resource, and USU Extension continues to meet the challenge by leading the way toward a sustainable water future.

Success Story: In 2010, USU Extension partnered with several Utah organizations to bring the Qualified Water Efficient Landscaper (QWEL) program to Utah. The program was adapted to Utah's climate by USU professionals, with training provided by USU. QWEL provides approximately 20 hours of education that is focused on water-efficient principles including irrigation system and landscape design with proper plant selection for the climate. Landscape professionals then use their training to help Utahans reduce landscape water demand.

Success Story: Utah's AgWeather Network (AgWxNet) is a collection of 30 automated weather stations, providing real-time weather data to a variety of public users, such as the agriculture community, the Utah Division of Water Resources, the legal community, and the insurance industry. Tailored for those users, particularly interested in water management, the network sensors provide real-time estimates of water usage to aid municipalities, farmers, ranchers, and others.

Success Story: Helping Utahans steward precious water is a top priority of USU's Extension efforts across the state. Two numbers are fundamental to this effort - how much water comes in and how much water goes out. Together these form a critical piece of the water management puzzle. As a result, USU Extension has partnered with the Utah Climate Center for access to the most accurate and up-to-date environmental measures. The Utah Climate Center maintains a network of approximately 120 environmental monitoring stations. These include 47 stations dedicated to soil moisture monitoring, 22 stations dedicated to fruit orchard conditions, 16 stations dedicated to long-term climate monitoring, and 33 stations dedicated to a variety of other research activities. The Utah Climate Center also manages a group of citizen scientists who provide daily precipitation reports from their homes across the state. These efforts don't stop with how much water we've had in the past, or have today; Extension's partnership with the Utah Climate Center is expanding to include longer-term projections that will aid or clientele in preparing for the water landscape ahead. This includes efforts to better understand the global climate cycles that give rise to Utah's highly variable climate, as well as the underlying climate trends in which these cycles are embedded. A warming atmosphere means changing weather patterns, more wintertime precipitation falling as rain instead of snow, and an evolution of the climate cycles themselves.

Success Story: Because of limited water and irrigation in Tooele County, grazing is the principle agricultural pursuit; as such weed control and grazing management are extremely important. USU Extension is working with Jon Fenske of the Army Corp of Engineers in Davis, California to improve modeling techniques for monitoring ground water contamination in the Tooele Valley. Because of our limited water resources in the valley this is an extremely critical issue. To date no agricultural or culinary water has been affected however local agricultural wells are influencing the movement of the contaminated ground water. USU Extension's help in gaining access to local farmers and farms with critical information has been instrumental in improving groundwater prediction models for this long term important project.

SUSTAINABLE ENERGY

Utah has become one of the leading states in the nation for Extension sustainability outreach because of collaborative engagement by numerous stakeholders. The USU Extension Sustainability website has been visited by 94 countries and 96 cities and towns in Utah, with more than 20,000 page views since its launch in October 2012. The sustainability fact sheets have seen 1,923 downloads in just two years. The experimental social media campaign we launched to help inspire and educate the public about environmental sustain- ability has experienced involvement of several thousand people. As an example, the Facebook page has a following of more than 1,000, with posts regularly reaching over1,500 people. USU Extension Sustainability's Twitter page has over 500 followers, Pinterest has more than 1,500 pins with 350 followers and the blog has achieved over 6,000 views.

CHILDHOOD OBESITY, NUTRITION, AND COMMUNITY SUSTAINABILITY

Childhood Obesity

Research Impact: H. Wengreen has been developing the FIT Game program: a game-based approach obesity prevention in children. The FIT Game narrative was further adapted to target the behavior of physical activity. The FIT characters in the narrative of the game modeled being physically active along with eating vegetables throughout the narrative. Information from a focus group was used to inform development of newsletters targeted at providing information to parents to support their effort of helping children to eat more vegetables at home. Two additional schools (Bridger and Woodruff Elementary

schools) were recruited to participate in the 4-school experimental trial (n= approximately 600 children). In addition, a one grade pilot study was implemented in a 6th grade classroom at Providence elementary to further assess if the FIT Game method could be used to target other healthy behaviors, such as physical activity. In 2017 a training manual was created to document the steps needed to take the measurements on the amount of fruits and vegetables served during lunch each day. This measurement is critical to the implementation of the game. This manual will be shared with school personnel if the FIT Game is implemented by schools without the help of USU researchers.

Success Story: 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. During 2017 in Utah 51 of 58 companies reported bottom line impacts approaching $8M.

Success Story: Financial insecurity poses a wide range of problems for households. For example, the lack of savings contributes to generational poverty, high levels of consumer debt to marital dissatisfaction and unfamiliarity with tax codes can keep household from claiming the benefits available to them. To help consumers mitigate financial insecurity USU Extension engages consumers in three distinct ways. The first is to maintain and improve the PowerPay debt elimination website while working to enhance the availability of the software such as with the PowerPay app. The second is to teach the required financial training course of the Utah Individual Development Account Network. This program helps qualifying ow income households become eligible for matched savings grants. Finally, USU Extension is part of the Earn It. Keep It. Save It. coalition of Utah that delivers the Volunteer Income Tax Assistance program with the Internal Revenue Service in this state. USU Extension oversees the sites using the Virtual VITA concept that USU Extension initiated and the IRS has since adopted and promoted. During 2017 the PowerPay website totaled 97,000 users conducting nearly 172,000 sessions.

Impact: Extrapolating from a previous Rutgers's University study it is estimated that the creators of self-directed debt elimination plans on the website saved $4,219,000 in interest costs this year.

The PowerPay app was downloaded 7338 times, an increase of 137% over 2016. Again, using extrapolations from data generated at Rutgers, the app users saved another $1,651,000.

From the IDA courses, 12 low income people qualified for matching grants collectively worth $54,000. The program was suspended after one series because supportive federal funding was discontinued.

Taxpayers filing the 180 returns through the Virtual VITA system I coordinated this year received refunds totaling $231,376 (including more than $74,500 in Earned Income Credit, the largest support program in the nation for working low income households) and saved just under $42,000 in tax return preparation costs. While there were 1.5% fewer returns prepared, taxpayer refunds were up 19.2% and Earned Income credit benefits soared more than 37%. These numbers demonstrate that we are reaching the households targeted by the VITA program.

We also asked taxpayers about non-financial impacts. More than 84% felt much more confident about their return accuracy compared to self-prepared returns. Furthermore 99% reported a better understanding of the factors influencing their refunds.

Also in 2017 the IRS launched a new tracking system which included an effort to determine the number of returns prepared using some form of the Virtual VITA process initiated in Utah. IRS officials report that some 400,000 to 550,000 returns were prepared this way, representing 14%-19% of all VITA returns.

Finance

Research Impact: L. Delgadillo has been evaluating a solution focused financial coaching program for low income citizens of Utah. In general, this pilot study presents specific constructs for outcome evaluation regarding their use in coaching research and in developing effective financial coaching interventions. The take away for practitioners is that in coaching interventions we do not measure single events (if someone opened a checking or a saving account). We are more interested in measuring the processes of self-learning (e.g. how the opening of a saving account helps you in feeling more financially confident), and

measuring the working alliance between the coach and the coaching client. Self- learning develops by promoting self-reflection, and by helping individuals understand how their cognitive and emotional reactions interfere with their self-efficacy. The working alliance measures the ability of the client and coach to work together on a collaborative relationship. Lastly, the pilot program also accomplished its secondary objective, which was to advance training in financial coaching to undergraduate students and family finance practitioners.

Youth Development

Success Story: Extension is planning and carrying out STEM activities for youth where they engineer and program autonomous robots, write code to create their own apps and video games. Youth are gaining the skills and abilities that are absolutely needed for their future careers through their 4-H experiences. These skills are drastically changing their circumstances because of the high demand for a STEM workforce in Utah.

What was done: FIRST® LEGO® League Regional Qualifier - 366 youth and 72 adult volunteers used their computer programming skills to construct and program autonomous robots to solve open-ended problems. Based on pre/post surveys youth can speak publicly about technical subjects and adults guide and organize youth as 4-H club leaders. This event has grown to become the largest robotics competition in the state of Utah. 4-HiT Robotics, Coding, and Maker Clubs - 270 youth can demonstrate STEM abilities in their 4-H projects (e.g. building electronics, soldering, programming Arduino micro-controllers) and are excited to pursue a degree and career in STEM related fields Code Camp - 212 youth can write software for video games and build mobile applications. They can also explain the variety of career opportunities in computer programming and explain why skills and experience in this field is in such high demand (based on pre/post surveys and interviews).

Success Story: USU Extension offers a variety of programs statewide that provide individuals with resources to enhance their relationships. Educational opportunities include such things as marriage relationship conferences, date nights, healthy relationships classes, divorce education, and underage drinking prevention programs. The relationships we have with others impact our personal health, professional effectiveness, and quality of life. Unhealthy relationships impact not only individuals, children, and families, but the effects extend to the workplace and society in general. One report estimates that divorce and unwed childbearing costs taxpayers in Utah $276 million every year. Healthy Relationships Utah, a Utah State University Extension initiative, has a long history of successful programs and partnerships. The initiative supports an array of services as part of an overall strategy to promote healthier relationships in Utah. Through grants provided by Utah Department of Workforce Services (DWS) and the U.S. Department of Health and Human Services, Healthy Relationships Utah is able to provide free, research-based relationship education courses in communities, jails, high schools, and at many DWS facilities throughout the state.

Research Impact: K. Bradford has been studying ways to strengthen couples' relationships. This research has resulted in the development of eight computer modules that can be used to help couples improve their relationships. The modules include: (1) Overview/becoming a better spouse, (2) Communication, (3) Intimacy and sexuality, and (4) Time and conflict management. The modules are available electronically for access in rural areas.

Success Story: As a resource to the increasing number of blended families, USU offers remarriage and stepfamily education. In collaboration with community-based agencies, classes are offered in various locations in Utah at no cost to married and non-married couples with stepchildren. Parents' ages range from 18 to 80, with an average age of 36. Each year, approximately 500 couples participate. Children between the ages of 6 and 17 attend with their parents. Participants receive six sessions of the Smart Steps: Embrace the Journey curriculum in English or Spanish. Adults and children meet separately, then combine for a family activity. Skills such as communication, conflict management, and step parenting are taught. Participants complete an evaluation about their level of knowledge or skill before (Time 1), after the class (Time 2), and one month later (Time 3). Results from the evaluations indicate stepfamily education is effective, that relationship quality is enhanced through program participation, and that positive program effects are sustained and continue after the classes. Individuals reported increased agreement with their partner on key relational issues: finances, dealing with family/relatives, dealing with ex-spouses/partners,

and parenting.

FOOD SAFETY

Extension provides reliable information for Utah families interested in home food preservation and storage. Canning and food storage classes attracted1,836 participants last year. More than 533 pressure canner gauges were checked for safety, a service that is available in many county Extension offices. In addition, 63 volunteers were trained as Master Food Preservers.

Success Story: Bacteria, yeasts and molds can grow in home-canned foods if not preserved properly, according to USDA food safety recommendations. In addition, low-acid foods are at risk for clostridium botulinum which can grow into the food-borne illness botulism.

What was done: Food preservation education is taught through the Master Food Preservation Course to prevent food-borne illness, to protect the time and money investment that families put into preserving food, to help preserve food and eliminate food waste, and to promote food safety. Evaluations of the Master Food Preserver Series measure both knowledge gain and intent to change food safety behaviors.

Impact: Knowledge gained included where to look for safe canning resources changed from 57% above average or excellent knowledge to 100%. The change in knowledge of necessity of adjusting processing times/pounds of pressure for altitude went from 43% above average and excellent to 86%; liquid poured into a jar of fruit should always be hot 13% to 88% above average and excellent; most vegetables need to be blanched prior to dehydrating 17% to 100% above average and excellent; vent pressure canner for 10 minutes prior to building pressure 14% to 100% above average and excellent; add acid to tomato products 14% to 100% above average and excellent; and the need to process all jam and jelly products went from 43% to 100% above average and excellent.

Success Story: 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. With the tradition and culture in Utah, many people preserve food in the home, and use old family recipes that have not been approved by the USDA and are potentially unsafe. Many Utahans have a large supply of stored nutritious food that may never be used mostly due to lack of knowledge of how to incorporate it into day-to-day meals. The solution to these problems include educating individuals on how to better improve their own and their family's safety in preserving food in the home as well as ways to use food storage ingredients. Pressure canner gauges are tested to insure canned goods are processed accurately. Five hundred and thirty-three canning lid pressure gauges were tested in Extension offices in 2017. This service possibly prevented botulism for these consumers and their families.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	110.0	0.0	53.9	0.0
Actual	87.0	0.0	104.7	0.0

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- Combined External and Internal University Panel

- Expert Peer Review

2. Brief Explanation

Agricultural Experiment Station: The scientific peer-reviewed process within the agricultural experiment station involves two steps. Prior to submission to the experiment station, the PI's department head reviews and signs off on the proposal. Once the proposal reaches the station, two 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). If there is a conflict between these two reviews, an additional peer review is sought. These anonymous external reviews are returned to the experiment station and the PI's are asked to respond to issues raised by these reviewers. The PI then modifies 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 is used approximately 10%-15% of the time.
Utah Cooperative Extension Service: The cooperative extension service merit review process involves 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.

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.

Media sources are frequently used by Utah counties to encourage county residents to participate in public meetings and listening sessions. Use of local newspaper and radio resources through public service announcements and paid advertisements are the two primary techniques applied in media use. Counties target 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 traditional audiences. Nontraditional stakeholder groups are also specifically invited to participate in public meetings and listening sessions through various public and private invitations. Inviting individual stakeholder and non-traditional stakeholder individuals to participate in public meetings and listening sessions is also a significant means of engaging them in discussions. Surveys serve as another means for contacting stakeholders, traditional and nontraditional. 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. Advisory groups, both at the county and university levels, are utilized in obtaining stakeholder input.

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 used many of the same advisory groups used by Extension that meet as needed to provide critical input from public and private sectors. Listening groups with key constituents were also utilized. Utah Extension utilized advisory committees as the primary means of identifying stakeholder individuals and groups to collect program input. Council and advisory groups utilized groups, such as teen councils, horse and livestock councils, Workforce Services, Inter-agency Coalitions, community religious leaders, United Way, Utah State Advisory Boards, Utah Fair Boards, Utah Farm Bureau and Farmers Union Boards, after-school coalitions and previous recipients of Extension programs were also utilized. Counties used focus groups and open listening sessions as means to identify group and individual stakeholders. Needs assessments and surveys provided another primary means of identifying individuals and groups.

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.

Input received from stakeholders has been utilized 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. These inputs frequently inform Extension by influencing recruitment and hiring practices and the informing Extension on the types of applied research stakeholders perceive as critical to their need. The Experiment Station uses stakeholder input provided by Extension and advisory groups to change 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. Operating and

graduate student funds go with those newly funded faculty positions.

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 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. These inputs informed Extension through influencing recruitment and hiring practices and on the types of research that stakeholders perceive as critical to their need. The Experiment station used stakeholder input provided by Extension and advisory groups' input to make changes in the research program through alternative funding measures and new faculty hiring. 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 still tied to specific program areas although they are interested in all programs offered through USU Extension and the Experiment Station. Information related to 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. Production and marketing issues are still critical to agricultural producers and require both Extension and the Experiment Station resources. The economics of various new technologies or production techniques continue to be important research topics for the Experiment Station and Extension. 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, to a lesser extent, the Experiment Station. Families and individuals are in need of food and finance programming which require both Extension and Experiment Station input. Youth leadership development and continuation of traditional 4-H programs such as livestock, horse, 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 and climate information value these services and want them to continue. The Experiment Station is involved in a host of research issues related to natural resources and the environment including climate change, public lands, water resources, urbanization of productive farmland, etc. -- all areas of critical importance to the citizens of the state of Utah. We have discovered that 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. Individual members of the public are always concerned as to why their important issues are not the highest

priority with Extension and the Experiment Station, not realizing that there are inadequate resources to support all needed help. As a system, we understand that we cannot be all things to all people.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1756754	0	2327753	0
Actual Matching	1756754	0	12268068	0
Actual All Other	0	0	5693277	0
Total Actual Expended	3513508	0	20289098	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

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
102	Soil, Plant, Water, Nutrient Relationships	0%		6%	
202	Plant Genetic Resources	0%		3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		5%	
205	Plant Management Systems	55%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		8%	
213	Weeds Affecting Plants	6%		0%	
215	Biological Control of Pests Affecting Plants	0%		2%	
216	Integrated Pest Management Systems	9%		2%	
301	Reproductive Performance of Animals	0%		10%	
302	Nutrient Utilization in Animals	0%		3%	
303	Genetic Improvement of Animals	0%		2%	
304	Animal Genome	0%		7%	
305	Animal Physiological Processes	0%		2%	
307	Animal Management Systems	26%		3%	
311	Animal Diseases	0%		5%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%		2%	
603	Market Economics	0%		6%	
902	Administration of Projects and Programs	0%		8%	
903	Communication, Education, and Information Delivery	0%		3%	
990	Unclassified	0%		16%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	23.0	0.0	23.0	0.0
Actual Paid	20.0	0.0	55.6	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**
393963	0	1188981	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
393963	0	6372724	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	5007366	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 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 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, 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?

As part of the eXtension Animal Manure Management Community of Practice, Rhonda Miller, helped provide a web resource that is used by people throughout the nation. Through this websource and the 'Ask an Expert' section, people can find answers to their questions regarding livestock waste management and small farm management. Practices are adopted that minimize environmental impacts. The Animal Manure Management group hosted a third Waste to Worth conference in Raleigh, NC in April 2017. The conference was attended by ag professionals, educators, and producers.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	54109	328639	298530	1813170

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	116	116

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
2017	32353

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Producers seek information from USU Extension on livestock rations and nutrition, hay testing and marketing. Summer annual hay crops are often grown in rotation with alfalfa to provide livestock forage. But these crops can accumulate toxic concentrations of nitrates which levels can cause abortions and death in livestock. Abundant hay supplies in 2017 depressed hay prices especially for feeder hay.

What has been done
Ten forage lots (6 producers) were tested for nitrates and 39 lots (9 producers) totaling 1298 tons were tested for hay quality. Of the forages tested for nitrates, 2 lots had very high nitrates which could have resulted in animal deaths if fed, 1 lot had marginal levels which could have caused abortions but could be used if mixed with other feeds and fed to non-pregnant animals.

Results
Producers were more successful in avoiding high nitrate forages than in the past. Producers marketed premium and supreme quality hay for higher prices and received $27,714 more in revenue. Producers saved an estimated $3,175 in fewer aborted calves from nitrate poisoning.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
2017	12601

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increased understanding of soil fertility and salinity helps farmers to efficiently use commercial fertilizers and manure resources to improve crop production, maximize profits and minimize nutrient pollution.

What has been done
USU Extension encouraged soil testing and helped participants interpret the research based recommendations.

Results

Farmers saved $24.66 per acre on average by soil testing and not purchasing unneeded nutrients for a total savings of $33,490. By not applying an average of 50 pounds of unneeded nutrients per acre, 34 tons of unnecessary nutrients were kept out of the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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
101	Appraisal of Soil Resources	0%		4%	
102	Soil, Plant, Water, Nutrient Relationships	3%		14%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		3%	
111	Conservation and Efficient Use of Water	0%		12%	
112	Watershed Protection and Management	21%		1%	
121	Management of Range Resources	14%		12%	
123	Management and Sustainability of Forest Resources	3%		8%	
131	Alternative Uses of Land	0%		2%	
132	Weather and Climate	0%		9%	
133	Pollution Prevention and Mitigation	0%		3%	
134	Outdoor Recreation	0%		3%	
135	Aquatic and Terrestrial Wildlife	24%		1%	
136	Conservation of Biological Diversity	0%		6%	
205	Plant Management Systems	14%		4%	
206	Basic Plant Biology	0%		1%	
213	Weeds Affecting Plants	7%		1%	
306	Environmental Stress in Animals	0%		3%	
307	Animal Management Systems	0%		3%	
605	Natural Resource and Environmental Economics	14%		7%	
723	Hazards to Human Health and Safety	0%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	12.0	0.0	19.1	0.0
Actual Paid	12.8	0.0	33.2	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**
257282	0	577735	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
257282	0	4232845	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	333907	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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15166	379765	9911	248177

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	77	77

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
2017	13747

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Utah has experienced moderate to extreme drought trends for over 12 years. Fifty three percent of Utah?s potable water is used to irrigate landscapes and Utah residents with automatic irrigation systems over water by 70%. With Utah?s population growth at 1.64%, ranking the fourth fasted growing state in the nation, water conservation is a big concern. Greater educational outreach is needed in order to help residents become more conscious about their landscape water use.

What has been done
Extension provided soil moisture meters as a simple tool for educating homeowners about proper irrigation practices without knowing their specific site conditions. For many participants, using the soil moisture meter allowed them to see that they were actually watering more than necessary.

Results
Out of those participants who reduced landscape water use, 23% of the participants watered 2 less days per week, 28% watered one less day per week, and 48% reduced watering sporadically. Master Gardener participants used soil moisture meters to collect in-depth data that will lead to regional watering guidelines based on plant type, irrigation type, soil type, and sun exposure.

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
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
2017	60476

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The United States Environmental Protection Agency (EPA) and the Utah Department of Environmental Quality Division of Water Quality (DWQ) have developed E. coli standards for water bodies in Utah. Preliminary water samples resulted in some positive tests for E. coli in the Fremont River in Wayne County, Utah. Because of these positive samples, the Fremont River was added to the EPA 303d list of impaired water bodies for E. coli. A listing on the 303d list automatically triggers the development of a Total Maximum Daily Load document for the water body by DWQ.

What has been done
Extension was identified as an objective third party capable of providing consistent and accurate E. coli sampling and testing on ten sites on the Fremont River.

Results
The data resulting from the testing is being used to provide access to federal funding and provide safe water for recreational users.

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
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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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
402	Engineering Systems and Equipment	67%		0%	
403	Waste Disposal, Recycling, and Reuse	33%		0%	
502	New and Improved Food Products	0%		50%	
511	New and Improved Non-Food Products and Processes	0%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	0.5	0.0
Actual Paid	0.5	0.0	0.0	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**
10050	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
10050	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	884	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 primarily directed 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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. Outcome Measures

Number of clientele who implement sustainable energy practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

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

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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
305	Animal Physiological Processes	0%		3%	
501	New and Improved Food Processing Technologies	0%		6%	
604	Marketing and Distribution Practices	0%		3%	
607	Consumer Economics	0%		3%	
608	Community Resource Planning and Development	5%		8%	
702	Requirements and Function of Nutrients and Other Food Components	10%		22%	
703	Nutrition Education and Behavior	0%		6%	
723	Hazards to Human Health and Safety	0%		3%	
724	Healthy Lifestyle	4%		6%	
801	Individual and Family Resource Management	16%		3%	
802	Human Development and Family Well-Being	8%		5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	3%		11%	
805	Community Institutions and Social Services	0%		5%	
806	Youth Development	54%		11%	
903	Communication, Education, and Information Delivery	0%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	0.0	7.8	0.0

Actual Paid	51.0	0.0	10.4	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**
1025108	0	358757	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1025108	0	1362325	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	260930	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?

Extension Educator Paul Hill, developed developed the Fellows Program to provide a rich forum for innovation, creation, experimenting, and adopting practices that ultimately advance CES education and engage a wider range of lifelong learners. The Fellows immersed themselves in yearlong professional development where they had opportunities to apply skills addressing emerging needs. Hill also advanced the Innovation Lab to identify emerging technologies and to identify, incubate and scale up successful innovations leveraged for use by CES professionals. The lab is facilitated by members of the existing EdTechLN and various Innovation Partners including eXtension Fellows, Innovation Fund grant recipients, and user community leaders and members. Hill identified emerging learning opportunities using the EdTechLN, Network Literacy community, 1890 institution liaisons, and the Impact Collaborative. In addition, professional development and co-learning opportunities for underrepresented and nontraditional populations were created. A network of 311 members from every state (and even Australia) was built that actively engaged over social media to provide specific support in helping all Extension professionals use technology in concert with their program outreach goals.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	121908	1714790	278986	3924290

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	15	15

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.

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
2017	7380

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
High obesity rates, rising health care costs, numerous chronic diseases and increasing stress levels negatively affect personal and family health and wellness. Individuals and families need local educational programs to assist them in forming healthy habits and living an active lifestyle.

What has been done
Healthy Habits, A Way of Life, Health and Wellness Challenge was offered in Beaver County. Both youth and adults participated in this five month program to help increase healthy behaviors, exercise, nutrition, mental health, etc. Health assessments were completed at the beginning and at the conclusion of this program to give participants baseline clinical testing and to see progress and improvements made.

Results
Healthy Habits participants improved their wellness in several areas, better nutrition, more activity, lower stress levels, increased water consumption, weight loss, and partner choices.

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
2017	1581

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 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.

What has been done
The Food $ense Nutrition Program, whose primary audience is low-income individuals receiving SNAP benefits or other public assistance, informs participants about ways to eat more healthfully to prevent obesity and other diseases, and ways to prepare quick and nutritious meals to empower individuals to make healthier choices.

Results
Participants who attended Food $ense Nutrition Education classes and completed the program?s survey reported an increase in knowledge and likelihood to adopt the key indicator measures set by the state Utah State University Extension Food $ense Nutrition Education Program office.

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
2017	11034

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Americans carry more unsecured debt than ever before and lack of basic financial literacy is often cited as one of the key reasons. Utah residents file for bankruptcy more often than citizens nationwide and need education and assistance to improve family financial stability.

What has been done
In order to help consumers mitigate financial insecurity USU Extension engaged consumers in three distinct ways. The first was to maintain and improve the PowerPay debt elimination website while working to enhance the availability of the software such as with the PowerPay app. The second was to teach the required financial training course of the Utah Individual Development

Account Network. This program helps qualifying low income households become eligible for matched savings grants. Finally, USU Extension is part of the Earn It. Keep It. Save It. coalition of Utah that delivers the Volunteer Income Tax Assistance program with the Internal Revenue Service in Utah. USU Extension oversees the sites using the Virtual VITA concept that USU Extension initiated and the IRS has since adopted and promoted.
"

Results
During 2017 the PowerPay website totaled 97,000 users conducting nearly 172,000 sessions. Extrapolating from a previous Rutgers?s University study it is estimated that the creators of self-directed debt elimination plans on the website saved $4,219,000 in interest costs this year. The PowerPay app was downloaded 7338 times, an increase of 137% over 2016. Again using extrapolations from data generated at Rutgers, the app users saved another $1,651,000.

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

2017 3053

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In recent years, Utah has ranked among the highest in the number of bankruptcies and mortgage foreclosures. Cache County families are no exception to this trend. Due to high credit card debt, unemployment, larger homes and cars, and the desire to keep one parent at home with the children, families are experiencing much difficulty in making end meet. Cache County residents are in need of educational opportunities that focus on money saving tips and financial management topics.

What has been done

Utah Saves, the Individual Development Account Program, Smart Money Moves, and other finance programs were offered in Cache County to assist with reversing this disturbing trend. Finance programming for the Latino Community was also be offered using curriculum developed in our county.

Results

Of the financial management participants 90% reported the ability to pull, read, understand, and fix credit reports, 89% reported having a financial plan for budgeting, and/or saving, 87% reported an increased sense of confidence in dealing with their finances, and 92% reported less stress when dealing with their finances.

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

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

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
311	Animal Diseases	0%		13%	
501	New and Improved Food Processing Technologies	0%		37%	
502	New and Improved Food Products	0%		13%	
504	Home and Commercial Food Service	60%		0%	
602	Business Management, Finance, and Taxation	0%		12%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	40%		25%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	3.5	0.0
Actual Paid	3.5	0.0	4.7	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**
70351	0	202280	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
70351	0	300174	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	90190	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?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8299	86729	7611	79539

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	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 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
2017	11458

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Bacteria, yeasts and molds can grow in home-canned foods if not preserved properly, according to USDA food safety recommendations. In addition, low-acid foods are at risk for clostridium botulinum which can grow into the food-borne illness botulism.

What has been done
Food preservation education is taught through the Master Food Preservation Course in order to prevent food-borne illness, to protect the time and money investment that families put into preserving food, to help preserve food and eliminate food waste, and to promote food safety.

Results
Evaluations of the Master Food Preserver Series measure both knowledge gain and intent to change food safety behaviors. Knowledge gained included where to look for safe canning resources changed from 57% above average or excellent knowledge to 100%. The change in knowledge of necessity of adjusting processing times/pounds of pressure for altitude went from 43% above average and excellent to 86%; liquid poured into a jar of fruit should always be hot 13% to 88% above average and excellent; most vegetables need to be blanched prior to dehydrating 17% to 100% above average and excellent; vent pressure canner for 10 minutes prior to building pressure 14% to 100% above average and excellent; add acid to tomato products 14% to 100% above average and excellent; and the need to process all jam and jelly products went from 43% to 100% above average and excellent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
504	Home and Commercial Food Service
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
2017	8587

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. With the tradition and culture in Utah, many people preserve food in the home, and use old family recipes that have not been approved by the USDA and are potentially unsafe. The solution to these problems include educating individuals on how to better improve their own and their family's safety in preserving food in the home as well as ways to use food storage ingredients. Pressure canner gauges are tested to insure canned goods are processed accurately.

What has been done

Five hundred and thirty-three canning lid pressure gauges were tested in Extension offices in 2017.

Results

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

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
504	Home and Commercial Food Service
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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.