# 2016 Kansas State University Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

K-State Research and Extension's (KSRE) statewide presence lends itself to collaborative efforts with organizations, private business and industry, local groups, state and federal organizations, and colleagues in other states. Great examples of such collaboration can be seen through the work of our Centers and Institutes. In addition to traditional one-on-one methods of communication, our faculty and staff use technology to deliver research-based programs to clients across the state and beyond, including web-based smart phone applications that help our audiences to have the information needed to make management decisions. In 2015, over 47,000 public presentations of all forms were provided as a means of delivering innovation, discovery, and knowledge on critical issues. Quality faculty draw businesses and funding to K-State and to Kansas. Several high-profile projects are under way in the Biosecurity Research Institute, and infrastructure development for the National Bio and Agro-Defense Facility is in progress.

We continually evaluate our programs to ensure we are making the best use of our resources and reaching out to Kansas' citizens. We have many more tools because of technology, but the purpose has not changed to serve the wants, desires, needs, and dreams of Kansas' citizens. We have established valuable partnerships around the state, the nation, and the world. We accomplish our goals when we have positive impact on individuals, but our ultimate goal is achieved when we also provide social impact. We view new discoveries and engaging people we serve as benefiting both individuals and society.

Published, peer-reviewed studies containing estimates of return on research and development investment that are specific for Kansas have shown a long-term benefit-cost ratio of 33.6:1 for agricultural research and outreach education, yielding a 10.2 percent average annual return to productivity that can be directly correlated with a long term benefit of $5.5 billion to the state of Kansas.

The demographics of Kansas continue to change. KSRE is successfully reaching out to both underserved and traditional audiences through new venues. To increase multicultural competency and sensitivity among our workforce, the College of Agriculture/KSRE Diversity Programs Office provides quarterly Navigating Difference training for new Extension professionals. This program brings systemic change and diversity to the KSRE team and provides cultural competency awareness and skills that they can practically apply in their day to day work.

An emerging and growing effort within K-State Research and Extension is the Multicultural Undergraduate and Graduate Summer Research Fellowship program. This program specifically targets under-represented populations of students to establish networking relationships back to their respective home institutions, as well as K-State faculty. Although the undergraduate institutions of these students have not exclusively been from 1890 Land Grants, those institutions have heavily dominated the applicant pool to date. The K-State Research and Extension fellow program places these students in a laboratory or field setting with a K-State Research and Extension scientist to work on a focused set of research goals that can be accomplished in the eight-week program. This program has a specific goal of growing the minority populations of students within graduate programs in the College of Agriculture and across other partner Colleges represented within K-State Research and Extension.

Hispanic youth and their families are actively participating in 4-H in Southwest Kansas. They are discovering the value of 4-H as an organization that empowers young people to learn new skills, build their confidence and grow into capable, responsible adults. The purpose of the project is to engage Hispanic youth and their families, primarily in Southwest Kansas, in safe and active learning experiences that are grounded in positive youth development. The project is helping to establish new clubs in which the youth fully participate in 4-H and engage in relevant and age appropriate programming in science, health, citizenship, and leadership development. In addition, support and guidance is being provided to parents in helping their children set and achieve their goals and aspirations for the future. A new specialist position was added in the Department of 4-H Youth Development with a focus on reaching new youth and adult audiences.

Kansas 4-H has a long tradition of training leaders for the future. The Citizenship in Action program encourages teenagers to learn more about how government functions and how to actively participate in the legislative process. Also, the 4-H SET program focuses on preparing more youth who are proficient in science, engineering, and technology. Youth are learning skills in such areas as global positioning systems and computer interface. Ninety-five percent of youth in 4-H have reported being comfortable with making their own decisions, and ninety-one percent have a plan for reaching their goals.

Climate change and its influences on management decisions for agricultural systems in Kansas is a collaborative research initiative with partners like Wichita State University, University of Kansas, and the overall Global Research Alliance on Agricultural Greenhouse Gases. A project is underway to develop educational programs on climate-related information to rural Kansans.

FTEs have been adjusted with reduced numbers in extension positions. This occurs through elimination of positions through vacancies and realignment of specializations through formation of districts. Over the past decade, faculty positions supported through state and federal appropriations have declined by approximately 10% forcing our system to focus its priorities. At this time, 45 counties have formed 16 districts.

Sugarcane aphid, a new, serious pest affecting sorghum, erupted in at least 36 Kansas counties in 2015. Research demonstrates that if this pest is left uncontrolled, the aphid will cause 10 to 60 percent yield loss. Six targeted regional workshops in intense sorghum production areas were conducted to help farmers scout and manage the pest by focusing on best management practices to maximize efficacy in insecticide use. The affected area represents 50 percent of sorghum production for the state. Through learning at these workshops, management decisions likely reduced crop damage and subsequent yield loss resulting in a public benefit value estimated at $38 million in grain sorghum production in this one year. Continuing in 2016, sorghum hybrids are now being identified with some natural resistance to the aphid, and this has become a component of the Extension educational programming to reduce the impact of this new pest. The value of federal capacity funding for the purpose of integrated pest management cannot be overstated in this example.

Herbicide-resistant sorghum technology will help with in-season grass control in sorghum; nitrogen fertilizer management research allows producers to reduce nitrogen use while maintaining yields; improved stalk quality will support the weight of higher yields; greater cold tolerance would allow sorghum producers to plant earlier and use longer season hybrids than they currently grow and increase yields. Research efforts through K-State's Great Plains Sorghum Improvement and Utilization Center help increase sorghum acreage in Kansas so producers can make better use of water and other valuable resources now and in the future.

We are effectively using our statewide network of offices to share research-based information related to the environment, families, communities, and production agriculture. We used input from external and

internal groups to develop a strategic plan for K-State Research and Extension to begin addressing five grand challenges: global food systems, water, health, developing tomorrow's leaders, and community vitality. These challenges directly or indirectly affect all Kansans and we are not going to solve these challenges alone. By developing partnerships within Kansas, across the United States, and internationally, we are educating and working with the next generation of students, scientists, and extension educators.

The new ideas and knowledge developed through research and shared by extension will be used to solve the five grand challenges. This plan will provide direction and closely align with the university's plan to be a Top 50 research institution by 2025.

Environmental stewardship remains a critical focus. In one example of our engaged work, poultry litter imported into Southeast Kansas from Arkansas, Missouri and Oklahoma has the potential to reduce the fertilizer costs of crops and forage. Through K-State Research and Extension research-based educational programs, Southeast Kansas producers are increasingly viewing poultry litter as a favorable soil amendment for supplying phosphorus, potassium, micronutrients and organic matter. Utilizing poultry litter through research-verified management practices, Kansas farmers can accrue an annual savings of $2 million in farm nutrient input costs.

Congruently, Kansas citizens voiced concerns about potential environmental impacts (i.e. odor and water quality) from the utilization of poultry litter. A partnership between Kansas Farm Bureau, Kansas Department of Health and Environment, Kansas Department of Agriculture, Kansas Department of Commerce, USDA Natural Resources Conservation Service and K-State Research and Extension formed to identify best management practices for the storage and utilization of poultry litter to protect the air and water quality of Kansas. From 2013 - 2015, 10 demonstration-learning sites on improved temporary storage for environmental benefit were developed for farmer education.

K-State Research and Extension professionals worked to develop the tools and educational focus in support of low commodity prices and loss of profitability in agricultural pursuits for farmers, ranchers, landowners, and agricultural business leaders. These educational programs and training efforts were begun in 2016, and will continue for the next 2 to 3 years. Evaluation of the impacts will be evident in 2018 and 2019.

**Total Actual Amount of professional FTEs/SYs for this State**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| Plan | 385.0 | 0.0 | 266.0 | 0.0 |
| Actual | 383.0 | 0.0 | 286.0 | 0.0 |

## II. Merit Review Process

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

- Internal University Panel
- Combined External and Internal University Panel

- Expert Peer Review

**2. Brief Explanation**

All new and renewing K-State Research and Extension Action Plans/Projects undergo a review process coordinated locally at the department or unit level, with input, as needed or requested from the experiment station grants and contracts office. Department heads and unit leaders are given latitude to employ strategies for evaluation of new plans and projects for their scientific merit and their relevance to programmatic focus. Guidance is provided to unit heads and unit leaders regarding the process by which review may take place. Most employ on-campus reviewers; some use a combination of on and off-campus expert reviews; and a few choose to utilize completely external off-campus review. Usually, at least two model review outlines were made available for review of new and continuing projects. Department heads and unit leaders could utilize these review templates as written or add/modify elements of the review to fit unique nuances specific to their respective discipline or to accommodate special input from stakeholders. When reviews are complete, the Department Head or Unit Leader meets with the applicant(s) to discuss the reviews and identify necessary revisions. A final revised version of the proposal is reviewed by the Associate Director for Research and/or Extension, and approved as appropriate for final review by National Program Leaders at USDA/NIFA. This process ensures that action plans adequately and appropriately address issues that make a positive difference in the lives of stakeholders. On a regular basis, as projects are conducted, investigators and team leaders meet with stakeholders from all sectors to validate the goals, objectives, and on-course progress of the program. This process does not change from year to year.

## III. Stakeholder Input

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

- Survey of traditional stakeholder groups
- Survey of selected individuals from the general public
- Other (Survey of underserved, minority groups)

**Brief explanation.**

K-State Research and Extension is rich with advisory panels, teams, councils, and committees through every discipline of research and extension work. In Kansas, local Cooperative Extension is organized with elected Program Development Committees (PDCs). Individuals throughout the community are targeted to seek election for their experience and interest broadly in needs and issues of agriculture, family, youth, and community. Six individuals are elected to each of the four committees in all counties across the state. This equates to roughly 2500 private citizens taking an active role as stakeholders in setting priorities for extension programming at the local level. Each year, the individuals involved in leadership activities of these local councils are invited to a one-day training and dialog event at four locations across Kansas. This all day meeting includes updates on their roles and responsibilities as stakeholders for the extension program.

In 2009, a system-wide survey was conducted to focus on issues of agreed importance for which K-State Research and Extension must focus. Stakeholders from all 105 counties in Kansas provided feedback and input into the prioritization process. The survey consisted of a series of seven strategic opportunities and several statements within each opportunity to describe the work plan focus. Stakeholders provided feedback on those statements as to their relative importance to Kansas. That process has resulted in areas of emphasis for our on-going research and extension plans. Every academic discipline and our outstate research and extension centers also operate with advisory groups. Those advisory groups are recruited through defined criteria to see that a broad set of interests and backgrounds are represented. Typically, advisories meet with administration and

faculty once or twice annually to review progress on key initiatives and to gather input on future directions and priorities for the discipline or the center. No changes in 2016.

**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 Surveys

**Brief explanation.**

Following are three examples of processes used to select advisories. First, the Director of K-State Research and Extension and Dean of the College of Agriculture has an advisory that is carefully selected through a nomination process. The individuals invited to serve are selected based upon the target audience represented, gender, race, ethnicity, and leadership. This group meets three times annually to review programs and provide advice to the Dean and Director on key initiatives to strengthen the programs in research, extension, and teaching. A second example is with the State Extension Advisory Council. This group is elected through their leadership on local Extension Boards. Individuals are approached and encouraged to accept nomination to the process. Then their peers go through an election process to identify the representatives they wish to serve on this advisory. This advisory meets twice annually with the Extension director and the administrative team to identify priorities and opportunities to fulfill the mission. Additionally, the Associate Director for Research actively participates on stakeholder boards with direct contact to commodity groups within the state. For example, the Associate Director participates in the Kansas Wheat Alliance and the Kansas Wheat Research Foundation boards. This connection provides guidance to researchers developing varieties and studying problems key to Kansas' wheat production.

The Southwest Kansas Research and Extension Center (SWREC) located in Garden City, Kansas holds a meeting annually with their research advisory committee. The SWREC Advisory Committee is made up of one producer from each county in the Southwest Extension Area (essentially the SW quarter of Kansas) for a total of 24 members. This group is selected by their county extension committees. They serve 3 year terms which can be renewed as long as they are interested. This means one-third of the committee is up for reappointment each year. Besides the core committee, the following are invited to participate: each county agent; three commercial crop consultants; and any members of the corn, wheat, sorghum, soybean or sunflower commissions who reside within the southwest extension area.

The SWREC Advisory Committee meets one day annually, usually the first Thursday in January. In general, the morning session consists of brief presentations by station scientists, while the late morning and afternoon sessions consists of a series of breakout sessions where attendees can interact with station scientists in a small group session to ask questions and share production challenges. The day concludes with attendees using a voting process to identify the highest priority targets for research. Without exception, the advisory attendees and station scientists reach consensus around ongoing production challenges. This process helps ensure that work at this branch station appropriately serves its local clientele.

In our family programming areas, Program Development Committee (PDC) members were asked to identify people to survey that reflected the demographics of their communities, based on age, gender, race/ethnicity and income. They were asked to identify people that were not familiar with Extension as well as those who were. Each PDC member was asked to deliver a survey to six individuals. Those surveyed were asked to rate on a 1 to 5 scale the need for selected topics within

their community. Completed surveys were received from more than 2,000 people and the results are being used locally and at the state level to prioritize work for the next few years.

We provide all of our Extension agents and local Executive Boards with a web-based training tool on techniques for recruiting new Board and PDC members to ensure diversity of interests and experiences with new members.

**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 individuals
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

**Brief explanation.**

Stakeholder input is a continuous process across the breadth of programming for research and extension educational programs in an effective grass-roots organization like K-State Research and Extension. Stakeholder input happens through local, regional, state, multi-state, and national input processes. The stakeholder input process is a comprehensive effort to seek focus on critical issues and problems needing research and answers that fit well within our defined mission priorities. This input continues throughout planning, project implementation, and program delivery. Specifically, face-to-face meetings that include strategic planning, small group process, and reporting back to the recipient institution are commonly used. Nominal group processes are employed to assure hearing of all voices. With the State Extension Advisory Council, that group is given the task to seek input from others outside of the face-to-face meeting, and to bring that knowledge and experience to the meetings through their sharing of such input. In seeking specific input, we have employed telephone random survey processes to help us understand how well we market our information, education, and programs as an organization. This information goes into a strategic market planning process to help us to reach a broader clientele, especially minority and under-served audiences. We have stakeholder groups who focus on our non-traditional audiences and programming. Specifically, the Kansas Center for Sustainable Agriculture and Alternative Crops operates with an advisory council for the expressed purpose of providing input on projects and ideas across both research and extension. This group assists in identifying opportunities for directing seed grant funds to research and extension faculty to better reach nontraditional needs and audiences. The breadth of advisory groups giving input and sharing needs and ideas range from the traditional Dean's advisory council to advisories working through every academic department and research/extension center to every local Extension office. Within program areas, we have advisors made up of stakeholders in areas of family nutrition, meat science, food science, crop commodity groups, livestock commodity groups, agricultural bankers, and the list goes on. We estimate that at any given time K-State Research and Extension has formal relationships with more than 200 advisory stakeholder groups who provide continuous input and feedback on research and extension initiatives, priorities, and direction. No new processes were employed in 2016.

**3. A statement of how the input will be considered**

- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Action Plans

- To Set Priorities

**Brief explanation.**

One example of how input shapes our research and extension programs is exemplified in our wheat breeding program. We maintain wheat variety development on both our main campus and at our Agriculture Research Center in Hays. Both of our faculty breeders have close contact and relationships with the Kansas Wheat Commission, the Kansas Association of Wheat Growers, seedsmen, milling and baking companies, etc. They continually receive input as to the direction of their breeding programs and the breeders listen and adjust accordingly. Moreover, wheat breeders continually are forward looking for the next disease or other challenge and seeking to genetic solutions to those unending challenges.

Budget priorities are established through input on creating or redirecting funds to a new position or program direction based in part upon discussions with stakeholder groups as we identify priorities they have that match with our funding opportunities. For example, grape and wine industry developments are small in Kansas. Yet, through discussions with that interest group, we have placed resources in a multi-state initiative to bring greater expertise and problem solving to the grape producers and wine makers in Kansas. In 2005, a strategic planning process for the Cooperative Extension mission of K-State Research and Extension was completed. The 34-member task force that worked to complete this process was carefully constructed to involve a balance of key leadership among our broad stakeholders and personnel within our faculty and agent ranks. The purpose of the strategic planning was to identify key principles that must be given attention to assure the future to a relevant, sustainable, quality Extension Service in Kansas. The process included three facilitated all day meetings and interim reports posted on our website to solicit further external input. Focus was given to organizational structure and staffing, resource development, systems of education and information dissemination, and constituent development and marketing. The task force identified a series of recommendations. In 2006, the strategic planning recommendations were distributed widely within and outside the organization and planning and implementation processes developed to address key issues. Some of those issues include strengthening professional development, increasing program depth and focus of our local extension programs, moving forward on multi-county models of program delivery, multistate programming initiatives, and enhanced training for stakeholders in the advocacy process.

In 2007, that strategic planning process resulted in targeting $275,000 annually over three years toward enhanced professional development for our faculty in becoming more effective Extension professionals. A redesign of our employee resource website was undertaken to make it easier for our faculty and staff to organize and plan for their personal professional development. We targeted hires of Extension faculty who are multi-lingual and able to interact more directly with our Latino families. We organized a new Center for Engagement to bring the broader resources of the campus to the issues and needs of the people of Kansas. We streamlined our hiring process to refill positions in a shorter time frame while at the same time maintaining our high standards of affirmative action process. We brought faculty together to address critical emerging issues in energy, bio-security, immigration, rural development, and our aging populations in rural Kansas.

While significant budget reductions have resulted in loss of faculty and staff positions, we continue to use the priorities set forth in that strategic plan to provide guidance on communication, professional development, and structural reorganization to meet those goals, along with budget realities. No changes in 2016.

**Brief Explanation of what you learned from your Stakeholders**

Industry trends, entrepreneurial interests, gaps in knowledge and understanding, problems and pitfalls in adaptations of knowledge and technology, lack of information within a given commodity production or processing system are all common learning experiences for faculty and administration in our listening relationship with key stakeholders. In times of budgetary strain, stakeholders continue to emphasize the importance of local presence, attention to the long-term issues and problems of Kansas, and finding ways to improve our efficiency without sacrificing the effectiveness. The result has been in deeper discussions and development of multi-county Extension units, greater use of technology to deliver training, updates, and public education. We are dramatically increasing the use of computer-based educational delivery, while still finding ways to maintain the desires of interaction and connectedness to our clientele. An example has been in our listening to the interests and needs of the grape and wine producers in Kansas. While research and extension within Kansas State University does not have an investment of human resource to address the knowledge and technology needs of the grape producers, we have listened to their interests and needs and we are currently working out an agreement among Kansas State University, the University of Missouri, Kansas Department of Agriculture, and Kansas Department of Commerce to bring educational programs and support to that industry through a joint agreement where the University of Missouri has that expertise. We have similar discussions ongoing with the fruit growers and industry interests. No changes in 2016.

## IV. Expenditure Summary

| 1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS) | | | |
|---|---|---|---|
| Extension | | Research | |
| Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| 5650682 | 0 | 4374641 | 0 |

| 2. Totaled Actual dollars from Planned Programs Inputs | | | | |
|---|---|---|---|---|
| | Extension | | Research | |
| | Smith-Lever 3b & 3c | 1890 Extension | Hatch | Evans-Allen |
| Actual Formula | 3123041 | 0 | 4014835 | 0 |
| Actual Matching | 14151160 | 0 | 34405874 | 0 |
| Actual All Other | 20975418 | 0 | 7520561 | 0 |
| Total Actual Expended | 38249619 | 0 | 45941270 | 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 |
|---|---|---|---|---|---|
| 201 | Plant Genome, Genetics, and Genetic Mechanisms | 5% | | 10% | |
| 205 | Plant Management Systems | 28% | | 14% | |
| 216 | Integrated Pest Management Systems | 5% | | 10% | |
| 307 | Animal Management Systems | 36% | | 19% | |
| 311 | Animal Diseases | 0% | | 24% | |
| 501 | New and Improved Food Processing Technologies | 2% | | 2% | |
| 502 | New and Improved Food Products | 0% | | 1% | |
| 511 | New and Improved Non-Food Products and Processes | 2% | | 1% | |
| 601 | Economics of Agricultural Production and Farm Management | 19% | | 14% | |
| 603 | Market Economics | 1% | | 0% | |
| 606 | International Trade and Development | 0% | | 5% | |
| 703 | Nutrition Education and Behavior | 1% | | 0% | |
| 704 | Nutrition and Hunger in the Population | 1% | | 0% | |
| | **Total** | 100% | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| **Plan** | 89.0 | 0.0 | 129.0 | 0.0 |
| **Actual Paid** | 146.0 | 0.0 | 128.0 | 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** |
| 1454778 | 0 | 1796936 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 6564970 | 0 | 15398450 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 5240400 | 0 | 3365838 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

Sustain Profitable Agricultural Production Systems

- Develop animal and crop production systems that thrive in the variable conditions of the Great Plains.
- Develop horticulture, forestry, and alternative green enterprises that thrive in the variable conditions of the Great Plains.
- Advance new and improved systems of agricultural production to meet the need of producers and consumers.
- Enhance the value of agricultural products.

Ensure an Abundant Food Supply for All

- Improve access to high quality foods, especially for consumers with limited resources.
- Increase food variety and value by developing new and enhanced food products.

### 2. Brief description of the target audience

- Farm and ranch managers
- Agricultural producers and agribusinesses throughout the food industry supply chain with emphasis on producers who want to help themselves
- People who influence producers and producer decisions, including educators (veterinarians, media, industry organizations, packers/purchasers)
- Government agencies/ regulators
- The lending industry
- Policy makers

### 3. How was eXtension used?

The eXtension program was utilized in many program areas as a resource for producers. This was especially important for sheep and goat producers as the specialist position in this area was vacant in 2016. This informational resource will continue to be important for many livestock producers and specialists to access information.

## V(E). Planned Program (Outputs)

### 1. Standard output measures

| 2016 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 211304 | 0 | 3500 | 0 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2016 |
| Actual: | 13 |

**Patents listed**

A Genetic System for Promoting Recombination and Gene Transfer in Wheat; Increase Milk Filtration Efficiency by Injecting Micro/nano Bubbles; Small Molecule Therapeutics Inhibitors Against Coronaviruses Including MERS-CoV; Olefin Self-metathesis Enables Plant Oil-based Materials from Tender to Robust; Effective Delivery of Nucleic Acids Complexed with Branched Amphipathic Peptide Capsules; Modification of Endogenous Plant Proteins to Increase Thermostability via Advance Breeding Technologies; Novel Small Molecule Inhibitors of Complement C5 Activation; Use of Micro- and Nano-Bubbles in Milk and Milk Processing; KS11HW39-5-4 Joe; Yogurt Slices; Cloned A wheat FHB1 Gene Controlling Wheat Susceptibility to Fusarium Head Blight and Developed FHB1 Diagnostic Markers for Marker-assisted Breeding; A Full-length cDNA Infectious Clone of Seneca Valley Virus (SVV); Monocyte Derived Mesenchymal Cells with Osteogenic, Chondrogenic, and Adipogenic Potential.

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2016 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 13 | 78 | 91 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of individuals participating in programs

| Year | Actual |
|---|---|
| 2016 | 10862 |

**Output #2**

**Output Measure**

- Number of new/improved varieties, inbreds, germplasm developed and released

| Year | Actual |
|---|---|
| 2016 | 3 |

**Output #3**

**Output Measure**

- Number of educational events (e.g., meetings, demonstrations, field days, press releases, and distributed publications) delivered

| Year | Actual |
|---|---|
| 2016 | 394 |

**Output #4**

**Output Measure**

- Number of producers engaged in one-on-one consultations through Kansas Farm Management Association or Farm Analyst programs

| Year | Actual |
|---|---|
| 2016 | 2762 |

**Output #5**

**Output Measure**

- Number of presentations at national and international conferences

| Year | Actual |
|---|---|
| 2016 | 120 |

**Output #6**

**Output Measure**

- Number of research papers cited above a threshold (10)--indicative of high impact

| Year | Actual |
|---|---|
| 2016 | 1182 |

**Output #7**

**Output Measure**

- Number of research grants received in excess of $50,000.

| Year | Actual |
|---|---|
| 2016 | 23 |

**Output #8**

**Output Measure**

- Number of hours reported annually by Master Gardener volunteers

| Year | Actual |
|---|---|
| 2016 | 118472 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Livestock producers demonstrate best management practices (BMPs) in regard to management and production, including genetic selection, reproduction, nutrition, health, animal care and well-being, livestock safety and quality, environmental management, and optimal marketing strategies (Measured by number of producers adopting BMPs) |
| 2 | Kansas farmers and ranchers increase awareness of financial performance (based on number members reported by farm management association) |
| 3 | Kansas farmers experience higher yields, more stable yields and/or a higher value of their crop as a result of plant breeders development of new varieties or germplasm (Measured by number of acres planted to KAES-developed materials or materials derived from KSU varieties, inbreds, or germplasm) |
| 4 | Cow/calf producers lower cow feed supplement costs through use of BRaNDS software to make informed, cost-effective purchase decisions (measured by number of participating producers) |
| 5 | Improved sustainability of Kansas farms and ranches through membership in the Kansas Farm Management Association program and through assistance received through the K-State Farm Analyst program (Measured by number of members and number receiving assistance through KFMA and Farm Analyst program) |
| 6 | Public value communicated by Master Gardener volunteers (measured by number of hours and activities reported annually) |
| 7 | Increase food variety and value by developing new and enhanced food products (Measured by number of new products developed) |
| 8 | Improve access to high quality food, especially for consumers with limited resources (measured by improvement in food budgeting) |
| 9 | Producers will gain a better understanding of the issues affecting grain markets and how to deal with the market risk (measured by the number reached). |

## Outcome #1

### 1. Outcome Measures

Livestock producers demonstrate best management practices (BMPs) in regard to management and production, including genetic selection, reproduction, nutrition, health, animal care and well-being, livestock safety and quality, environmental management, and optimal marketing strategies (Measured by number of producers adopting BMPs)

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2016 | 4000 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Kansas livestock producers faced challenges in profitability in 2016 with lower beef, pork and milk prices. While market prices were lower, many feed input costs also declined to lessen the financial impact of lower revenue. Thus livestock producers of all sectors must continue to improve production efficiency to help meet global food demand in an economically and environmentally sustainable fashion.

Also, to produce meat and milk effectively, producers had to prepare for the Veterinary Feed Directive which resulted in numerous label use changes of common antibiotics used for herd health. This area was a major focus for producers seeking information on how to continue to maintain herd health and efficiency.

**What has been done**
Livestock extension/outreach programming primarily focused on optimizing feed cost, pasture management, reproduction strategies, and animal health. These messages were delivered through multiple sources such as extension publications, newsletters, popular press articles, one-on-one consultations, and public meetings.

Programs on the Veterinary Feed Directive, calving management schools, heifer development and feed resource management were delivered across Kansas. Evaluations were used to collect information at public meetings and a follow-up evaluation tool asking about specific changes made by producers. Built www.KSUantibiotics.org to educate on antibiotic resistance and conducted numerous evaluations to identify antibiotic replacements.

Specific efforts for dairy and swine operations in areas of production record use and interpretation, evaluating input cost, animal housing, employee management/training, and improved antibiotic usage programs were completed.

**Results**
Beef, swine and dairy producers were provided with basic information about Veterinary Feed Directives and given an opportunity to ask questions about implementing this regulation in their unique operations. Statewide, this included 30 meetings (1,741 attendees), 39 newspaper articles, 38 radio and TV spots, 29 newsletter articles and 29 social media releases. Producers gained respect for proper and judicious use of antibiotics. Survey data from a subset of meeting attendees indicated that as a result of attending educational sessions, 88% increased their understanding of the regulations associated with the Veterinary Feed Directive.

Implementation of new sodium recommendations for starter pigs, updated ingredient economics and mitigation strategies for disease introduction to improve productivity on Kansas swine farms was completed.

A new Extension program to benchmark key performance indicators of dairy herds was launched. Using this tool (www.drinkdairy.com), producers can rank their herd(s) with others in the following areas: reproduction, production, and postpartum cow health. Currently, the program is benchmarking 26 herds from KS, NE and OK, accounting for a total of 107,000 dairy cows. Approximately 70% of dairy cows from KS are enrolled in this program.

Note: Outcome #4 is being reported with this outcome in this and future years.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 307 | Animal Management Systems |
| 601 | Economics of Agricultural Production and Farm Management |

**Outcome #2**

**1. Outcome Measures**

Kansas farmers and ranchers increase awareness of financial performance (based on number members reported by farm management association)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 2080 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The state of the economy, along with volatile commodity and input prices, make business planning in agriculture increasingly difficult and raises the stakes of each decision a producer must make. Having good information on which to base decisions is critical for producers to remain profitable and sustainable for the future. Education, training and assistance in keeping good records and in the appropriate methods to analyze and use those records will provide the needed knowledge to make informed decisions.

**What has been done**
The goal of the KFMA program is to provide each member with farm business and family financial information for improved farm business organization and decision making so that Kansas farms can minimize risk while they increase sustainability and profitability. Making the information available publicly can help to accomplish the same for many involved in agriculture in Kansas and around the country in addition to the KFMA membership. Activities in 2016 included: 7,300 face to face meetings with 2,645 producers; 56 presentations to 1,300 individuals; 2,304 farm business analyses; 2,637 individual crop and livestock enterprise analyses; 4 radio interviews; numerous newsletter and newspaper articles; presentation to over 200 students in classes at KSU and Fort Hays State University; a large number of hits to the KFMA Newsletter on website; and over 117 cash flow analyses with Finpack.

**Results**
Through one-on-one consultations, 2,645 Kansas producers have increased awareness of their current financial position and their financial performance during the past year. Of these producers 2,304 have the opportunity to benchmark their performance against other farms in their region; farms of similar type; as well as the most economically profitable farms. This allows producers to identify strengths and weaknesses in their operation and to take action to build on the strengths, and address any weaknesses, vastly increasing the operation's sustainability and profitability for the future. Through enterprise analysis these operations have also identified enterprises that are the most profitable and they clearly understand their cost of production for each enterprise allowing them the opportunity to make informed marketing decisions when selling their products. Additionally, at least 117 producers in poor financial condition, or with family conflict, gained an improved understanding of how to address their situation in a sustainable manner.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 601 | Economics of Agricultural Production and Farm Management |

## Outcome #3

### 1. Outcome Measures

Kansas farmers experience higher yields, more stable yields and/or a higher value of their crop as a result of plant breeders development of new varieties or germplasm (Measured by number of acres planted to KAES-developed materials or materials derived from KSU varieties, inbreds, or germplasm)

### 2. Associated Institution Types

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 3544500 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Wheat is arguably the most economically important crop in Kansas with nearly 8.5 million acres planted annually. The Kansas Agricultural Experiment Station (KAES) develops new varieties and releases improved germplasm of wheat, soybeans, grain sorghum and canola. New varieties can benefit Kansas farmers directly and new germplasm gives other breeders, and ultimately farmers the advantage of KAES research.

For example, K-State Research and Extension, in collaboration with local farmers, establish wheat variety demonstration plots throughout Kansas. The results help producers make important wheat variety decisions. After two pre-plant wheat meetings, 98% of the attending wheat growers reported using the wheat demonstration plot information to make wheat variety selection decisions.

KAES is also developing enhanced high throughput technology to rapidly identify soybean genotypes which have the desired disease resistance, yield potential, drought resistance or heat stress characteristics. This technology can improve the speed and accuracy of identifying superior breeding material and permit the selection of traits that have never been evaluated on a side by side basis.

**What has been done**
KAES developed varieties were planted on 16.8% of Kansas wheat acres in 2016. Everest, a KAES-developed variety led the state in acreage for the fourth consecutive year. Another 14.2% of the acres were planted to varieties with a KAES-developed line as a major contributor to the pedigree. Varietal blends were also planted on 10.7% of the acres. Most of these blends would have contained a KAES-developed variety. Three new hard red winter wheats were released in 2016 (Larry, Zenda and Tatanka).

Field evaluation for soybeans have produced robust data sets evaluating remote sensing applications in soybean breeding.

**Results**
KAES programs continue to serve producers of Kansas and neighboring states by the development of varieties that are productive and protect yield against biotic and abiotic stresses. These efforts contributed to a record 57.0 bu/ac yield for wheat in Kansas in 2016.

Soybean research has found that special reflectance data can provide information on the relative

performance of yield, maturity and resistance to Soybean Sudden Death Syndrome in soybean varieties. This effort is supporting the development of high-throughput evaluation systems as a means to improve genetic gain.

**4. Associated Knowledge Areas**

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

**Outcome #4**

**1. Outcome Measures**

Cow/calf producers lower cow feed supplement costs through use of BRaNDS software to make informed, cost-effective purchase decisions (measured by number of participating producers)

Not Reporting on this Outcome Measure

**Outcome #5**

**1. Outcome Measures**

Improved sustainability of Kansas farms and ranches through membership in the Kansas Farm Management Association program and through assistance received through the K-State Farm Analyst program (Measured by number of members and number receiving assistance through KFMA and Farm Analyst program)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 2762 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The state of the economy, along with volatile commodity and input prices, make business planning in agriculture increasingly difficult and raises the stakes of each decision a producer must make. Having good information on which to base decisions is critical for producers to remain profitable and sustainable for the future. Education, training and assistance in keeping good records and in the appropriate methods to analyze and use those records will provide the needed knowledge to make informed decisions.

**What has been done**
This improved sustainability was achieved through providing producers reliable and accurate information on which to base decisions, along with the necessary education, tools, training and assistance in keeping good records and the appropriate methods to analyze and use those records to acquire the needed knowledge to make the best decisions possible in each situation.

**Results**
Through one-on-one consultations, 2,762 Kansas producers have improved sustainability for the future due to their involvement with the KFMA and Farm Analyst programs during the past year. Of these producers, 2,304 had the opportunity to benchmark their performance against other farms in their region; farms of similar type; as well as the most economically profitable farms. This allows producers to identify strengths and weakness in their operation and to take action to build on the strengths, and address the weaknesses, vastly increasing the operation's sustainability and profitability for the future. Through enterprise analysis these operations have also identified those enterprises that are the most profitable and they clearly understand their cost of production for each enterprise allowing them the opportunity to make informed marketing decisions when selling their products. This greatly increases the sustainability of each of these operations. Additionally, at least 117 producers in poor financial condition, or with family conflict, gained an improved understanding of how to address their situation in a sustainable manner.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 601 | Economics of Agricultural Production and Farm Management |

**Outcome #6**

**1. Outcome Measures**

Public value communicated by Master Gardener volunteers (measured by number of hours and activities reported annually)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 118472 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Extension Master Gardeners are a vital part of K-State Research and Extension. Donating time in return for horticultural training, Extension Master Gardeners help Extension agents meet the need for horticultural information in their communities. The Master Gardener program is designed to provide trained volunteers to help meet that need at minimal cost.

**What has been done**
The means of providing this information is diverse including horticultural "hotlines," demonstration gardens, working garden shows, public presentations and providing tours. Extension Master Gardeners require continual education in best management practices, conservation of natural resources, waste management, integrated pest management, and identification and selection of proper plant materials for healthy people, plants, and the environment.

**Results**
Extension Master Gardeners donated more than 99,000 hours with a value over $2.25 million in 2016. The level of enthusiasm and commitment not only impacts our volunteer projects but often results in our EMGs influencing family, friends and neighbors to use proven horticultural practices.

Homeowners sometimes over-fertilize and often misdiagnose problems in their landscape and garden resulting in overuse of unneeded or ineffective products. By providing timely, accurate information, our Master Gardeners influence our clientele to use less and more effective inputs resulting in better results and a savings of time and money. Using less fertilizers and pesticides also helps protect the environment.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 205 | Plant Management Systems |

## Outcome #7

### 1. Outcome Measures

Increase food variety and value by developing new and enhanced food products (Measured by number of new products developed)

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2016 | 1 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Existing Kansas companies and entrepreneurs have to keep an edge on the market by continuously developing new and innovative products.

**What has been done**
Technical and educational support has been provided in the areas of product development food labeling, food safety and regulatory compliance. Faculty and staff provided education in the following areas:
- Taught food processors concepts of "Food Safety Preventive Controls" to comply with the new Food Safety Modernization Act (FSMA)
- Certified 106 food processing personnel, FDA inspectors and students as "Process Control Qualified Individuals" (PCQI) as required by FSMA.
- Initiated a program to start re-issuing all labels for Kansas food processors in the new format required by regulations.
- Developed a solid yogurt product that is undergoing a patenting process with K-State's Research Foundation.
- As Process Authority, helped certify tens of canned Kansas food products to be legally produced and sold in the state and across state lines.

**Results**
A conservative estimate of the dollar value of the services provided to Kansas companies and entrepreneurs in 2016 is $0.5M based on industry standards for the cost of such services. Additionally, the value to students involved in these activities is tremendous as evidenced by the job offers they got last year based in big part on their experiences working with Kansas food processors, developing and analyzing foods.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 501 | New and Improved Food Processing Technologies |
| 502 | New and Improved Food Products |
| 603 | Market Economics |

## Outcome #8

### 1. Outcome Measures

Improve access to high quality food, especially for consumers with limited resources (measured by improvement in food budgeting)

### 2. Associated Institution Types

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 0 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Where a person lives affects how they live - you can't make healthy decisions if healthy options aren't available. Policy, systems and environmental changes make healthier choices an option for community members by looking at the policies, rules, common practices, community norms and environments that affect behavior.

**What has been done**
An Extension Family and Consumer Sciences Agent trained officers at the Juvenile Detention Center to work with youth at their facility to put in a vegetable garden.

**Results**
The youth at the Juvenile Detention Center raised tomatoes, cabbage, kale and peppers, and the produce was incorporated into meals and snacks at the facility as well as cooking activities for the youth.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 703 | Nutrition Education and Behavior |
| 704 | Nutrition and Hunger in the Population |

**Outcome #9**

**1. Outcome Measures**

Producers will gain a better understanding of the issues affecting grain markets and how to deal with the market risk (measured by the number reached).

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2016 | 1800 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The recent decline in grain prices due to large crops in 2015 and 2016 has caused widespread effects across the agricultural industry in Kansas. International effects include a strong dollar affecting exports, as well as good crops in South America and elsewhere. As a result, producers need information on grain marketing, basis, market outlook and farm policy in order to understand factors driving the market and tools available for dealing with the market risk, as well as managing the financial risk from low grain prices.

**What has been done**
In January, interactive maps were produced showing estimated payments for farmers who signed up participating crops in the Agriculture Risk Coverage program. These maps were updated monthly to allow producers and lenders to estimate how much they could receive from this program. Daily estimates of Loan Deficiency Payments were provided for wheat starting in July, when the wheat price fell below the loan rate. Monthly analysis of grain markets was posted on the AgManager.info website with weekly grain basis information through the basis tool and maps. Thirty-one crop insurance and marketing updates were held through the year and six Risk-Assessed Marketing workshops in the state with more than 160 participants using a case-farm simulation. More than 30 presentations on the grain market outlook were held throughout the state, including highly leveraged groups such as agricultural lenders and insurance agents. Research was conducted and made available on grain basis and transportation issues.

**Results**
An estimated 1,800 producers, lenders, insurance agents and agribusiness managers were educated through direct, in-person training about issues related to grain markets. Many more were helped through the information and materials available on the website. There were more than 11,000 visits to the grain-market outlook pages, more than 21,000 visits to the risk management and crop insurance page and more than 500 users of the crop basis tool each month. Users include lenders and insurance agents who take this information back to their clients, providing greater influence.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 601 | Economics of Agricultural Production and Farm Management |
| 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
- Other (Technological change)

### Brief Explanation

K-State Research and Extension has been transitioning to a new reporting system over the last several years. The number of direct contacts reported this year is substantially different than last year. The numbers reported this year and in the future reflect our on-going efforts to report accurate information.

## V(I). Planned Program (Evaluation Studies)

### Evaluation Results

We used pre-planned surveys that were developed in conjunction with the Office of Educational Innovation and Evaluation. The surveys were given at the end of each educational program to determine the knowledge gained by the participants. We also used case study approach to report results from individual producers.

### Key Items of Evaluation

## V(A). Planned Program (Summary)

**Program # 2**

**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 |
|---|---|---|---|---|---|
| 702 | Requirements and Function of Nutrients and Other Food Components | 15% | | 15% | |
| 703 | Nutrition Education and Behavior | 30% | | 20% | |
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources | 15% | | 15% | |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins | 30% | | 30% | |
| 723 | Hazards to Human Health and Safety | 0% | | 10% | |
| 724 | Healthy Lifestyle | 10% | | 0% | |
| 802 | Human Development and Family Well-Being | 0% | | 10% | |
| | **Total** | 100% | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| **Plan** | 55.0 | 0.0 | 39.0 | 0.0 |
| **Actual Paid** | 45.0 | 0.0 | 50.0 | 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** |
| 50841 | 0 | 701850 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 486591 | 0 | 6015000 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 4470192 | 0 | 1314800 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

• Develop new rapid methods for the surveillance, detection, isolation, and quantification of microbes and chemical residues in animals, plants, and food products
• Develop risk monitoring techniques to detect potential hazards in the distribution chain.
• Validate the efficacy of techniques in controlling and eliminating microbial and chemical hazards.
• Disseminate food safety and bio-security information through extension and research seminars, workshops, and resident and distance education programs, using a variety of media options and communication tools.
• Offer safe food production, handling, and sanitation education to groups involved in all levels of food production and service.
• Identify best management practices to prevent foodborne illness and to enhance the security of the food supply throughout the food chain.
• Develop technology to reduce the hazards and improve the quality of animal food products, which will complement the development of HACCP programs by USDA.
• Develop, complement, and maintain an aggressive technology transfer system that effectively communicates work about Food Safety to consumers, students, industry, government, and other scientific investigations.

### 2. Brief description of the target audience

• Growers and processors of agricultural commodities, commercial and non-commercial food service personnel, market and home gardeners, other food handlers, retail markets, consumers, and educators;
• Families and individuals of all ages living in Kansas, including populations with limited resources; low literacy skills; varying ethnicities; disabilities, diseases, or impairments; and documented or identifiable health disparities;
• Economic stakeholders, and policy and funding agencies;
• Health care, education, and nutrition professionals;
• K-State Research & Extension faculty and staff with responsibilities for food and/or nutrition;
• Government; and
• Consumer groups (i.e., STOP).

### 3. How was eXtension used?

eXtension was not used in this program.

## V(E). Planned Program (Outputs)

### 1. Standard output measures

| 2016 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 90957 | 0 | 89 | 0 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2016 |
| Actual: | 0 |

**Patents listed**

### 3. Publications (Standard General Output Measure)

**Number of Peer Reviewed Publications**

| 2016 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 0 | 0 | 0 |

## V(F). State Defined Outputs

**Output Target**

**Output #1**

**Output Measure**

- Number of rapid methods developed for the surveillance, detection, isolation, and quantification of microbes and chemical residues in animals, plants, and food products

| Year | Actual |
|---|---|
| 2016 | 0 |

**Output #2**

**Output Measure**

- Number of therapeutic, chemical, and physical treatments developed for animals and plants and their products to eliminate or reduce contamination with potential hazards

| Year | Actual |
|---|---|
| 2016 | 0 |

**Output #3**

**Output Measure**

- Number of ServSafe certification workshops

| Year | Actual |
|---|---|
| 2016 | 59 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Increase knowledge level and improve attitude of clientele in safe food production, handling, and sanitation programs; best management practices to prevent foodborne illness; and social, economic, and communications issues related to food safety and agricultural bio-security (Measured by number of participants increasing knowledge) |
| 2 | Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels (Measured by number of participants in food service manager certification class who successfully complete the exam) |
| 3 | Reduce incidence of foodborne illness (Measured by number of foodservice facilities with trained employees) |
| 4 | Increase number of viable technologies to improve food safety (Measured by number of viable technologies developed or modified for the detection and characterization of food supply contamination from foodborne threats) |
| 5 | Increase understanding of the ecology of threats to food safety from microbial and chemical sources (Measured by number of students enrolled in Food Safety and Defense graduate certification) |

## Outcome #1

### 1. Outcome Measures

Increase knowledge level and improve attitude of clientele in safe food production, handling, and sanitation programs; best management practices to prevent foodborne illness; and social, economic, and communications issues related to food safety and agricultural bio-security (Measured by number of participants increasing knowledge)

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2016 | 96 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Food processing, food service, retail and regulatory sectors all depend on food safety information to protect the clientele served. Research has resulted in that information being imparted specifically in the following ways.

**What has been done**
Secondary school teachers have been provided research based information to impart to their students.

**Results**
Over the past five years:
- 157 (29 this year) secondary school teachers have attended workshops designed to impart information including food production, processing, handling and sanitation practices that they then teach to their students.

- 250 externship students (an average of 50 per year)have been given food safety experiences and training by researchers.

- 74 (6 this year)interns spent 200-500 hours over 2-4 months receiving training from experienced researchers. Those interns (38) over the past 5 years (5 this year) have also participated in Frontier field trips that cover food safety practices.

- 16 interns are currently working on their internships.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

## Outcome #2

### 1. Outcome Measures

Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels (Measured by number of participants in food service manager certification class who successfully complete the exam)

### 2. Associated Institution Types

- 1862 Extension

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|
| 2016 | 420 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Food safety is an important public health priority. Foodborne illness is a common, costly -- yet preventable -- public health problem. The U.S. Centers for Disease Control and Prevention estimate that roughly one in six people in the U.S. (about 48 million) get sick, 128,000 are hospitalized and 3,000 die of foodborne illness each year. Most cases of foodborne illness can be prevented through proper hygiene practices, including hand washing and following proper food handling and preparation recommendations.

**What has been done**
K-State Research and Extension (KSRE) Family and Consumer Sciences (FCS) professionals in partnership with the Kansas Restaurant and Hospitality Association (KRHA) provided food safety training to foodservice outlets and community organizations in Kansas. The ServSafe® Food Safety Education program is a nationally recognized certification and training program. This program targets foodservice managers, entry-level food handlers, and community organizations who provide food to the public. In 2016, our efforts resulted in over 260 contact hours of food safety education. Whether instructing a restaurant owner, line cook or church dinner volunteer, educators provide training and tools focusing on risk factors known to be the most important when it comes to preventing foodborne illness.

**Results**
In 2016, ServSafe® Food SafetyManager Classes reached 579 foodservice workers statewide. These 24 classes resulted in 420 foodservice employees receiving ServSafe Food Protection Manager Certification.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |

**Outcome #3**

**1. Outcome Measures**

Reduce incidence of foodborne illness (Measured by number of foodservice facilities with trained employees)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 74 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Food safety is an important public health priority. Foodborne illness is a common, costly -- yet preventable -- public health problem. The U.S. Centers for Disease Control and Prevention estimate that roughly one in six people in the U.S. (about 48 million) get sick, 128,000 are hospitalized and 3,000 die of foodborne illness each year. Most cases of foodborne illness can be prevented through proper hygiene practices, including hand washing and following proper food handling and preparation recommendations.

**What has been done**
K-State Research and Extension (KSRE) Family and Consumer Sciences (FCS) professionals in partnership with the Kansas Restaurant and Hospitality Association (KRHA) provided food safety training to foodservice outlets and community organizations in Kansas.The ServSafe® Food Safety Education program is a nationally recognized certification and training program. This program targets foodservice managers, entry-level food handlers, and community organizations who provide food to the public. In 2016, our efforts resulted in over 260 contact hours of food safety education. Whether instructing a restaurant owner, line cook or church dinner volunteer,

educators provide training and tools focusing on risk factors known to be the most important when it comes to preventing foodborne illness.

**Results**
In 2016, 630 participants completed the ServSafe Food Handler class. Participants in 35 classes responding to a post session survey indicated that they had increased knowledge and skills of best food safety practices.

Over 91.5% of the participants in the ServSafe Food Handlers classes indicated they plan to use what they learned at work and/or at home. Participants reported they intend to wash their hands, check food temperatures and use food thermometers more often, and to be more cautious of cross contamination and food left out at room temperature.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

**Outcome #4**

**1. Outcome Measures**

Increase number of viable technologies to improve food safety (Measured by number of viable technologies developed or modified for the detection and characterization of food supply contamination from foodborne threats)

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 1 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
All parts of the food sector utilize the technologies designed to improve food safety.

**What has been done**
Over the past 5 years researchers have been focused primarily on E.coli. The collective research results have been integrated to provide new and improved detection, quantification, and

elimination technologies. Specifically, various USDA-approved food-grade interventions were evaluated to determine their effectiveness for reducing Shiga toxin-producing E. coli (STEC) on both pre-rigor and chilled beef carcasses. These inoculated carcass studies were conducted to mimic commercial operations by processing full beef sides through a standard three-stage Chad carcass wash cabinet and applying standard ambient water wash, followed by 180 degree F water and organic acid wash using typical sequences. Subsequently, fabricated beef subprimals were inoculated and treated with chemical wash interventions before and upon re-opening of vacuum packages to address risks associated with non-intact raw beef products.

**Results**
New and improved technologies continue to reduce the risk and incident of foodborne disease.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

**Outcome #5**

**1. Outcome Measures**

Increase understanding of the ecology of threats to food safety from microbial and chemical sources (Measured by number of students enrolled in Food Safety and Defense graduate certification)

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 12 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Food safety and defense is critical to consumer's confidence and well-being. Thus, research information is designed to update food safety and defense programs.

**What has been done**
Food Safety and Defense Graduate Certificate majors as well interns contribute to updating programs. Additionally, their careers provide significant future impacts.

**Results**
A total of 22 (12 this year) Food Safety and Defense Graduate Certificate majors have completed the program.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 711 | Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources |
| 712 | Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins |
| 723 | Hazards to Human Health and Safety |

## V(H). Planned Program (External Factors)

**External factors which affected outcomes**

- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

**Brief Explanation**

K-State Research and Extension has been transitioning to a new reporting system over the last several years. The number of direct contacts reported this year is substantially different than last year. The numbers reported this year and in the future reflect our on-going effort to report accurate information.

## V(I). Planned Program (Evaluation Studies)

**Evaluation Results**

**Short-Term:**
1. Program participants improve their attitudes toward, and awareness of, issues related to food safety.
2. Participating Extension agents, Master Food Volunteers, foodservice professionals and foodservice volunteers increase their knowledge and skills of safe food handling from production to consumption.
3. Public program participants increase their knowledge of and skills in safe food handling practices and home food preservation techniques.

Evaluation Questions:
• What awareness, knowledge, skills or change in attitudes did program participants gain regarding food safety and/or handwashing?

• What awareness, knowledge, skills or change in attitudes did program participants gain regarding home food preservation?

**Medium-Term:**
1. Participating Extension agents, Master Food Volunteers, foodservice professionals, farmer's market vendors, produce growers and foodservice volunteers demonstrate increased safe food handling practices (including handwashing) from production to consumption.
2. More venues serving food in Kansas have food-safety trained employees or volunteers.
3. Program participants demonstrate increased use of safe food handling practices and home food preservation techniques.

Evaluation Questions:
• Three to six months after a program, what changes do program participants report regarding safe food handling practices from production to consumption and in home food preservation?
• How many and what types of organizations and foodservice professionals or volunteers have completed food safety programs, the "food safety employee" level of a food safety course, and successfully completed the ServSafe exam?

**Long-Term:**
1. Fewer Kansans experience foodborne illness resulting in reduced health care costs.
2. Foodborne illnesses reported by the Kansas Department of Agriculture and KDHE Office of Epidemiology decrease.
3. Kansas Department of Agriculture foodservice code violations in various kinds of food service operations decrease.
4. Fewer incidences of foodborne illness from home food handling and preservation are reported.

Evaluation Questions:
• Have foodborne illnesses reported by the Kansas Department of Agriculture and KDHE Office of Epidemiology decreased?
• Have Kansas Department of Agriculture foodservice code violations in various kinds of food service operations decreased?
• Has the reported incidence of foodborne illness from home food handling and preservation decreased?

**Key Items of Evaluation**

## V(A). Planned Program (Summary)

**Program # 3**

**1. Name of the Planned Program**

Natural Resources and Environmental Management

☑ 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 | 12% | | 12% | |
| 104 | Protect Soil from Harmful Effects of Natural Elements | 13% | | 8% | |
| 111 | Conservation and Efficient Use of Water | 19% | | 15% | |
| 112 | Watershed Protection and Management | 10% | | 7% | |
| 121 | Management of Range Resources | 5% | | 7% | |
| 132 | Weather and Climate | 2% | | 7% | |
| 141 | Air Resource Protection and Management | 3% | | 5% | |
| 205 | Plant Management Systems | 8% | | 8% | |
| 511 | New and Improved Non-Food Products and Processes | 15% | | 12% | |
| 601 | Economics of Agricultural Production and Farm Management | 3% | | 3% | |
| 603 | Market Economics | 7% | | 3% | |
| 605 | Natural Resource and Environmental Economics | 3% | | 13% | |
| | **Total** | 100% | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| **Plan** | 50.0 | 0.0 | 65.0 | 0.0 |
| **Actual Paid** | 41.0 | 0.0 | 77.0 | 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** |
| 1023403 | 0 | 1080902 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 3458360 | 0 | 9263124 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 1445730 | 0 | 2024747 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

• Understand the sources, fate, and transport of important water contaminants (i.e., fecal coliform bacteria, nutrients, sediment, and pesticides [especially atrazine herbicide]), and develop and determine the environmental and economic effectiveness of best management practices for these potential contaminants.
• Quantify the environmental and economic effectiveness of best management practices for improving water quality at the watershed level.
• Disseminate science-based information through environmental education programs for both youth and adults, and deliver extension programs aimed at stakeholders that focuses on adoption of best management practices in targeted areas for water quality improvement.
• Develop and test new crop, livestock, bioenergy, and riparian forest systems that will reduce water use while optimizing productivity, environmental quality, and profitability, including water saving technologies for concentrated animal feeding operations (CAFOs) and industries that process agricultural commodities.
• Develop an information and education program for policy makers, producers, water professionals, and youth audiences with respect to the Ogallala Aquifer, including assessment of the potential impacts of climate change on this important water resource.
• Develop an understanding of air quality impacts of rangeland burning, including extent and timing of burn events, influence of fuel load on emissions, modeling the downwind transport of particulate matter, and developing a climatology of extreme events.
• Disseminate science-based information and transfer technologies to stakeholders, and implement youth education programs focused on air quality.
• Disseminate science-based information regarding the sustainability of biofuel production and processing.
• Develop new processes to modify agricultural-based materials into higher value products.
• Develop resources and pathways to increase climate literacy.
• Provide decision tools for adaptive best management practices that address the effects of climate change.

### 2. Brief description of the target audience

• Agricultural producers, youths, policymakers/regulators, crop and livestock consultants.
• Growing industry based on bioprocessing and bioconversion, including the existing ethanol and biofuels industry.

- International grain processors.
- Industrial products manufacturers: adhesives, composites, bio-based chemicals, solvents and lubricants.
- Entrepreneurs and investors seeking to enter this industry.
- Audiences whose production systems will be influenced by climate change, as well as those who consult or influence the decision-makers of these producers. Secondary audiences will be decision-makers and leaders responsible for preparing communities for change (e.g., state and local elected officials, environmental groups).

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2016 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| **Actual** | 64070 | 0 | 220 | 0 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2016 |
| Actual: | 0 |

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2016 | Extension | Research | Total |
|---|---|---|---|
| **Actual** | 11 | 15 | 26 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of educational programs delivered

| Year | Actual |
|---|---|
| 2016 | 468 |

**Output #2**

**Output Measure**

- Number participating in educational programs

| Year | Actual |
|---|---|
| 2016 | 12202 |

**Output #3**

**Output Measure**

- Number of refereed research publications

| Year | Actual |
|---|---|
| 2016 | 25 |

**Output #4**

**Output Measure**

- Number of presentations at national and international conferences

| Year | Actual |
|---|---|
| 2016 | 26 |

**Output #5**

**Output Measure**

- Number of workshops, web-based curricula, and field days/tours related to climate change

| Year | Actual |
|---|---|
| 2016 | 31 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Producers adopt BMPs that protect environmental quality (measured by number adopting BMPs) |
| 2 | Producers adopt BMPs for atrazine and soil erosion (measured by number of acres) |
| 3 | Measurable improvement in water quality (percent reduction atrazine) in Little Arkansas River Watershed |
| 4 | Improve utilization of biological raw materials as bioconversion substrates (measured by number of new processes developed). |
| 5 | Improved environmental conditions through sustainable biofuel production and utilization (measured by: gallons biofuel; gallons of cellulosic ethanol; gallons of biodiesel . . . produced in KS) |
| 6 | Improved environmental conditions through sustainable biofuel production and utilization (measured by: PPM OF CO2 in atmosphere; water quality; average temperature during year) |
| 7 | Agricultural/natural resource producers, and/or business representatives modify existing practices or technologies and/or adopt new practices to protect/enhance natural resources and/or enhance biodiversity (Measured by # documented) |
| 8 | Development of new knowledge and technologies (Measured by percentage of participants who increase knowledge of management practices under climate variability and change) |
| 9 | Improve climate mitigation strategies and their adoption (Measured by number of farms and landowners reducing carbon and energy footprints) |

**Outcome #1**

**1. Outcome Measures**

Producers adopt BMPs that protect environmental quality (measured by number adopting BMPs)

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 311 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The K-State Watershed Specialist program began in 2000, as a partnership with the Kansas Departments of Health and Environment and other agricultural groups. This partnership assigned specialists to high-priority watersheds. The specialists work closely with local Watershed Restoration and Protection Strategy (WRAPS) groups as service providers and coordinators to develop and implement plans to improve surface water quality and to meet state water quality standards.

**What has been done**
The Watershed Specialist team provided a broad array of educational services:
- participated in and/or facilitated 368 educational events reaching more than 8,000 Kansans. They delivered 79 presentations in addition to several news articles (4) and radio/tv interviews (4) reaching an immeasurable amount of people. Presentations included PowerPoint, posters, oral demonstrations, brochures and signage.

**Results**
The Watershed Specialist team provided technical assistance in the implementation of 311 BMPs. This includes 57 livestock BMPs, affecting nearly 4,000 animal units, 243 cropland BMPs affecting more than 41,300 acres and 11 streambank BMPs, affecting 3,740 linear feet of streambanks along Homer Creek and the Smoky Hill River.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |

| | |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 121 | Management of Range Resources |
| 141 | Air Resource Protection and Management |

**Outcome #2**

**1. Outcome Measures**

Producers adopt BMPs for atrazine and soil erosion (measured by number of acres)

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 20061 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The project goal is to assist farmers to voluntarily implement atrazine herbicide best management practices (BMPs) to meet surface water quality standards of 3 micrograms per liter, with no seasonal spikes. A decision was made to target specific sub-watersheds within the Little Arkansas Rive watershed in order to document water quality improvements.

**What has been done**
Four watersheds within the Little Arkansas River watershed were targeted for implementation of BMPs for atrazine herbicide. Atrazine runoff vulnerable fields outside of the four targeted watersheds were also made eligible for incentive payments. Corn and grain sorghum fields were targeted.

**Results**
Farmers committed to implementing atrazine BMPs on 20,061 acres of corn and grain sorghum.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |

| | |
|---|---|
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |
| 121 | Management of Range Resources |
| 141 | Air Resource Protection and Management |

**Outcome #3**

**1. Outcome Measures**

Measurable improvement in water quality (percent reduction atrazine) in Little Arkansas River Watershed

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 51 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The project goal is to assist farmers to voluntarily implement atrazine herbicide best management practices (BMPs) to meet surface water quality standards of 3 micrograms per liter, with no seasonal spikes. A decision was made to target specific sub-watersheds within the Little Arkansas River watershed in order to document water quality improvements.

**What has been done**
Four watersheds within the Little Arkansas watershed were targeted for implementation of BMPs for atrazine herbicide. Atrazine runoff vulnerable fields outside of the four targeted watershed were also made eligible for incentive payments.

**Results**
Implementation of atrazine BMPs resulted in 11,078 lbs a.i. (or 35%) less atrazine being applied in the targeted areas. After including all BMPs implemented and using KSU BMP effectiveness data, BMP implementation was predicted to reduce atrazine runoff by 51% on 20,061 acres and a total load reduction of 971 lbs.a.i. in targeted acres.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|

| | |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |
| 112 | Watershed Protection and Management |

**Outcome #4**

**1. Outcome Measures**

Improve utilization of biological raw materials as bioconversion substrates (measured by number of new processes developed).

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 2 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The U.S. consumes more than 140 billion gallons of transportation fuels annually. Due to finite reserves, non-uniform distribution, and volatile prices of fossil fuels, renewable fuels from biomass could make a significant contribution toward a more sustainable future. Recent legislation has called for this nation to annually produce 36 billion gallons of renewable fuel by 2022 to help offset impending concerns over climate change and energy security. Such targets have implications of national security, economic development, and sustainable practices for the future.

**What has been done**
Both fundamental and applied research has been conducted in the area of biofuel and biobased materials. Key projects include 1) sorghum biomass and sweet sorghum as a viable renewable resource for biofuels; 2) biobased materials from camelina meals; 3) full utilization of free sugars and starch in sweet sorghum through diffusion process; 4) biobased product development; 5) development of Near Infrared Spectroscopy (NIR) models for quick analysis of biomass composition and physical properties.

**Results**
Our mean results include: 1) multi-seeded (msd) mutants sorghums have a great potential as an excellent feedstock for bioethanol production with high grain yield, high starch content, and high fermentation efficiency; 2) conversion efficiency of sweet sorghum increased through a diffusion process; 3) biobased adhesives and films developed using camelina meal and proteins; 4) biobased product such as adhesives and resins from plant based oil and proteins; and 5) developed NIR methods for quick analysis of biomass composition and physical properties.

As research results, we published 14 peer reviewed papers, 2 book chapters, 2 patent disclosures and presented 10 meeting papers.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 511 | New and Improved Non-Food Products and Processes |

**Outcome #5**

**1. Outcome Measures**

Improved environmental conditions through sustainable biofuel production and utilization (measured by: gallons biofuel; gallons of cellulosic ethanol; gallons of biodiesel . . . produced in KS)

Not Reporting on this Outcome Measure

**Outcome #6**

**1. Outcome Measures**

Improved environmental conditions through sustainable biofuel production and utilization (measured by: PPM OF CO2 in atmosphere; water quality; average temperature during year)

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Agricultural/natural resource producers, and/or business representatives modify existing practices or technologies and/or adopt new practices to protect/enhance natural resources and/or enhance biodiversity (Measured by # documented)

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 0 |

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
Agricultural producers and woodland owners are concerned about many natural resource issues that affect their production and management.

**What has been done**
Numerous workshops and field days have been organized, including the subjects of prescribed burning, range management, deer and predator management, nuisance animal control and forestry. One of the biggest is the Kansas Natural Resources Conference (KNRC).

The 9th Annual KNRC focused on engaging landowners through effective communication with the theme "Conversations on Conservation." The conference is held in cooperation with natural resource professionals, students and managers representing more than six professional societies to discuss the advancements and research surrounding the field of natural resources.

Research projects, papers and posters on all natural resource topics were presented, including: Foresty, Wetlands, Fisheries, Wildlife, Range Management, Soil and Water.

**Results**
Nearly 2,000 adults and 220 youth participated in educational workshops and field days. The number of indirect contacts from all programs reached more than 28,000 adults and 300 youth. (These numbers do not include radio listeners of "Outbound Kansas" and "Tree Tales programs.)

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |

## Outcome #8

### 1. Outcome Measures

Development of new knowledge and technologies (Measured by percentage of participants who increase knowledge of management practices under climate variability and change)

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

| Year | Actual |
|---|---|

2016 75

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Producers in the Southern Great Plains face a wide range of climate issues that are constantly in flux and climate change is projected to increase this variability in the future. This is certainly important to both the beef cattle industry and row crop agriculture in the region.

**What has been done**
The Great Plains Grazing project has coordinated a Speed Science video series targeting a producer audience as well as a monthly webinar series in addition to other Extension activities.

**Results**
The monthly webinar series resulted in a total of 2,275 views, while the Speed Science video series resulted in 78 views. There were 461 subscribers added to the Great Plains Grazing mailing list in 2016 with an average open rate of 32.7%.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 102 | Soil, Plant, Water, Nutrient Relationships |
| 111 | Conservation and Efficient Use of Water |

**Outcome #9**

**1. Outcome Measures**

Improve climate mitigation strategies and their adoption (Measured by number of farms and landowners reducing carbon and energy footprints)

Not Reporting on this Outcome Measure

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Educational funding)

**Brief Explanation**

K-State Research and Extension is eliminating Outcomes 5-6 related to bioenergy developments as this is no longer a priority program. We do not have a faculty team

engaged in projects relating to those outcomes due to a decline in our faculty numbers and realignment of priorities.

K-State Research and Extension has been transitioning to a new reporting system over the last several years. The number of direct contacts reported this year is substantially different than last year. The numbers reported this year and in the future reflect our on-going efforts to report accurate information.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

**Short-Term (Knowledge)**
Target audiences will become aware of both existing and emerging natural resource issues. Participants will gain an understanding of:

- Improved knowledge of environmental concepts and Kansas natural resources
- Increased knowledge and skill development in the area of interpretation and leadership
- Why environmental issues are of interest or concern
- Who/what is impacted by these environmental issues
- Which research-based methods could be employed to address and ultimately resolve the issues

Audiences will increase their knowledge base regarding economically and environmentally sustainable practices that will prevent future problems. Stakeholders will recognize and appreciate the importance of their role in the process of collaboration and resolution of natural resource issues.
Indicators

- Have you tested your well water to determine it's suitability for intended uses?
- Have you developed a cropping plan in response to limited water supply?
- After participating in this program, I gained increased understanding about _____ .
- Increased outreach & service to the community in the area of natural resource management, conservation and environmental education.

**Medium-Term (Behavior)**
Stakeholders and participants will develop long-range strategic plans and implement best management practices as they relate to the sustainable management of grasslands, water, forestry, energy, wildlife, and air. Partnerships will be made among stakeholders to work collaboratively to alleviate and prevent environmental concerns throughout Kansas.
Indicators

- What BMPs, if any, do you plan to make based on what you have learned at this meeting?
- How has your management changed to address water quality and quantity issues?
- What changes, if any, have you implemented to reduce livestock impact on stream water quality?

**Long-Term (Change in Condition)**
Target audiences will benefit from measurable improvements in existing natural resource concerns and mitigation of emerging threats. Kansas citizenry will be environmentally

literate and will make sound decisions regarding natural resources. Participants and their associated interests will become economically viable and environmentally sustainable. KDHE water quality monitoring data will show measurable improvement, similar to what has been shown in Clarks Creek, Grouse-Silver Creek, and the Cheney reservoir. The water footprint for the production of crops and livestock, and the maintenance of home landscapes and gardens has been reduced.

Indicators

- How has your lawn management changed in response to water conservation concerns?
- How has your irrigation practices changed due to the availability of the 5 year flexible account?
- Which BMPs have you implemented?
- What economic impact (dollars saved or increased dollars earned) on a per head or per acre basis can you attribute to your participation in this program?
- Tax dollars saved by natural resources agencies due to volunteer service.

**Key Items of Evaluation**

## V(A). Planned Program (Summary)

**Program # 4**

**1. Name of the Planned Program**

Childhood Obesity: Healthy Eating and Physical Activity through the Lifespan

☑ 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 |
|---|---|---|---|---|---|
| 702 | Requirements and Function of Nutrients and Other Food Components | 5% | | 35% | |
| 703 | Nutrition Education and Behavior | 70% | | 55% | |
| 724 | Healthy Lifestyle | 20% | | 0% | |
| 802 | Human Development and Family Well-Being | 5% | | 10% | |
| | **Total** | 100% | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| **Plan** | 45.0 | 0.0 | 18.0 | 0.0 |
| **Actual Paid** | 43.0 | 0.0 | 13.0 | 0.0 |
| **Actual Volunteer** | 0.0 | 0.0 | 0.0 | 0.0 |

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

| Extension | | Research | |
|---|---|---|---|
| **Smith-Lever 3b & 3c** | **1890 Extension** | **Hatch** | **Evans-Allen** |
| 50841 | 0 | 182481 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 486591 | 0 | 1563900 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 4181046 | 0 | 341848 | 0 |

## V(D). Planned Program (Activity)

**1. Brief description of the Activity**

Educational programs about making healthy food choices and increasing physical activity

**2. Brief description of the target audience**

- Families and individuals of all ages living in Kansas, including populations with limited resources; low literacy skills; varying ethnicities; disabilities, diseases, or impairments; and documented or identifiable health disparities;
- Economic stakeholders, and policy and funding agencies;
- Health care, education, and nutrition professionals; KSRE faculty and staff with responsibilities for food and/or nutrition;
- Consumer groups (i.e., STOP)

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

| 2016 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| Actual | 90957 | 0 | 8200 | 0 |

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

**Patent Applications Submitted**

| | |
|---|---|
| Year: | 2016 |
| Actual: | 0 |

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

| 2016 | Extension | Research | Total |
|---|---|---|---|
| Actual | 0 | 0 | 0 |

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshop series conducted

| Year | Actual |
|---|---|
| 2016 | 142 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Children and youth increase their physical activity and/or reduce sedentary time. (Measured by percentage of number reached) |
| 2 | Youths increase fruit and vegetable consumption (Measured by number reporting increase) |
| 3 | Adolescents reporting healthier lifestyle habits (e.g., eating meals from a variety of food groups; increased frequency and/or time spent participating in physical activity per day) (Measured by increased percentage of those reached) |
| 4 | Children and youth increase consumption of foods as recommended by the U.S. Dietary Guidelines for Americans, such as increasing vegetables, fruits (Measured by percentage of those reached) |
| 5 | Families/caregivers adopt healthy eating patterns, such as eating breakfast, eating as a family, healthier snack choices (Measured by percentage of those reached) |
| 6 | Children and youth increase consumption of foods as recommended by the U.S. Dietary Guidelines for Americans, such as increasing whole grains (Measured by percentage of those reached) |
| 7 | Kansans of all ages engage in increased physical activity. |

**Outcome #1**

1. **Outcome Measures**

Children and youth increase their physical activity and/or reduce sedentary time. (Measured by percentage of number reached)

Not Reporting on this Outcome Measure

**Outcome #2**

1. **Outcome Measures**

Youths increase fruit and vegetable consumption (Measured by number reporting increase)

Not Reporting on this Outcome Measure

**Outcome #3**

1. **Outcome Measures**

Adolescents reporting healthier lifestyle habits (e.g., eating meals from a variety of food groups; increased frequency and/or time spent participating in physical activity per day) (Measured by increased percentage of those reached)

Not Reporting on this Outcome Measure

**Outcome #4**

1. **Outcome Measures**

Children and youth increase consumption of foods as recommended by the U.S. Dietary Guidelines for Americans, such as increasing vegetables, fruits (Measured by percentage of those reached)

2. **Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 5 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The prevalence of obesity among children aged 6 to 11 years increased from 6.5% in 1980 to 19.6% in 2008 and the prevalence of obesity among adolescents aged 12 to 19 years increased from 5.0% to 18%.1% during that same period (Centers for Disease Control and Prevention CDC, 2013).

**What has been done**
The 4-H Gardening program reached more that 250 youth from Riley County in 3rd through 6th grades. The youth participated in an eight session 4-H Garden project. The curriculum emphasized growth of plants and nutrition.

**Results**
Students planted and harvested lettuce, spinach, radishes and onions. They compared nutrition fact labels to make healthful food choices; made and tasted recipes for healthy snacks; made and tasted a salad from the vegetables they grew and harvested.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 703 | Nutrition Education and Behavior |
| 724 | Healthy Lifestyle |

**Outcome #5**

**1. Outcome Measures**

Families/caregivers adopt healthy eating patterns, such as eating breakfast, eating as a family, healthier snack choices (Measured by percentage of those reached)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 5 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Research indicates that the first three years of life are critical in children's brain development. Effective and positive parenting, along with quality child care and early education, can greatly enhance a child's lifetime development. Positive, consistent, and engaged parenting is necessary for positive development in the early years of a child's life and prepares them for success in

school, friendships and future roles in communities. Similarly, quality childcare and early education have been linked to positive social skill development, school readiness, and positive economic and human development outcomes. In addition, an individual's healthy growth and development into adulthood is greatly influenced by the quality of his or her early childhood (between birth to age 6) experiences.

**What has been done**
Extension agents provided leadership for child development-focused programming initiatives across the state that addressed healthy early childhood practices among primary care givers, family members, and early childhood education professionals. These efforts address the following K-State Research and Extension's Grand Challenges: Health, Developing Tomorrow's Leaders, and Community Vitality.

**Results**
Forty-two program activities with 2,985 total participants were reported throughout the state. Extension agents provided Kansas Department of Health and Education approved trainings to early childhood education professionals, with participants indicating improved skills in the development of children's physical, cognitive, social/emotional, and communication. The Healthy and Active Early Childhood Action Plan activities included work in collaboration with police departments, schools, the Kansas Department of Children and Families, and faith-based community coalitions.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 703 | Nutrition Education and Behavior |
| 724 | Healthy Lifestyle |
| 802 | Human Development and Family Well-Being |

**Outcome #6**

**1. Outcome Measures**

Children and youth increase consumption of foods as recommended by the U.S. Dietary Guidelines for Americans, such as increasing whole grains (Measured by percentage of those reached)

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Kansans of all ages engage in increased physical activity.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 14400 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The 2014 State Indicator Report on Physical Activity from the U.S. Centers for Disease Control and Prevention (CDC) indicates that people who are physically active generally live longer and have a lower risk for heart disease, stroke, type 2 diabetes, depression and some cancers. Physical activity can also help control weight.

However, only 46.8 percent of adults living in Kansas meet the minimum aerobic physical activity guidelines and just 16.5 percent meet strengthening guidelines. In Kansas, 65 percent of adults are overweight or obese and 75 percent have high blood pressure.

Despite compelling research about the benefits of muscle strengthening, the majority of older adults, particularly women, do not perform these exercises.

**What has been done**
K-State Research and Extension family and consumer sciences professionals work to improve the health and vitality of individuals and communities. Extension professionals and local partners offered Stay Strong and Stay Healthy, and Walk Kansas programs. These programs are evidence based and reflect current physical activity and healthful eating guidelines and have improved the health and fitness of adult Kansans.

**Results**
More than 400 older adults participated in Stay Strong Stay Healthy and reported the following benefits: increased physical activity, increased muscle mass and strength, restoration of balance and flexibility, improved bone density and decreased arthritis pain.

Walk Kansas reached more than 14,000 participants in 2016. Evaluation surveys revealed the following outcomes as a result of this 8-week program:
- 83 percent of participants were motivated to do at least 30 minutes of physical activity five or more days per week and 82 percent met activity goals.
- 90 percent were confident they would continue this amount of activity during the next six months.
- 51 percent did strengthening exercises at least twice per week.
- 73 percent are more aware of healthy eating recommendations and 78 percent increased fruit and vegetable consumption.
- 88 percent were confident they would continue this habit during the next six months.

### 4. Associated Knowledge Areas

| KA Code | Knowledge Area |
|---|---|
| 703 | Nutrition Education and Behavior |
| 724 | Healthy Lifestyle |
| 802 | Human Development and Family Well-Being |

## V(H). Planned Program (External Factors)

### External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

### Brief Explanation

Because of the similarity, Outcomes 2, 4 and 6 will be reported under Outcome #4.

K-State Research and Extension has been transitioning to a new reporting system over the last several years. The number of direct contacts reported this year is substantially different than last year. The numbers reported this year reflect our on-going effort to report accurate information.

## V(I). Planned Program (Evaluation Studies)

### Evaluation Results

Three to six months after a program:

- What changes do participants report regarding more healthful eating, meal planning, food preparation, budgeting for food and physical activity habits?
- What changes do participants report regarding use of food assistance programs, gardening, home food preservation, low cost meal preparation and other strategies that increase their access to high quality, abundant and safe food?
- Do participants who are new mothers report initiating breastfeeding, exclusively breastfeeding for a long time, and still breastfeeding at 6 months?
- What changes have staff and volunteers taken to support healthier food choices and physical activity in schools and public venues?
- What changes have staff and volunteers taken to support increased access to high-quality, abundant and safe food (e.g., promoting private and community gardens, increasing local food production for food insecure persons, donations to food pantries, CSAs, electronic benefit transfer devices at Farmers Markets)?

### Key Items of Evaluation

## V(A). Planned Program (Summary)

**Program # 5**

**1. Name of the Planned Program**

Healthy Communities: Youth, Adults and Families

☑ 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 |
|---|---|---|---|---|---|
| 724 | Healthy Lifestyle | 20% | | 10% | |
| 801 | Individual and Family Resource Management | 10% | | 15% | |
| 802 | Human Development and Family Well-Being | 15% | | 20% | |
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities | 15% | | 15% | |
| 806 | Youth Development | 40% | | 10% | |
| 903 | Communication, Education, and Information Delivery | 0% | | 30% | |
| | **Total** | 100% | | 100% | |

## V(C). Planned Program (Inputs)

**1. Actual amount of FTE/SYs expended this Program**

| Year: 2016 | Extension | | Research | |
|---|---|---|---|---|
| | 1862 | 1890 | 1862 | 1890 |
| **Plan** | 146.0 | 0.0 | 15.0 | 0.0 |
| **Actual Paid** | 108.0 | 0.0 | 18.0 | 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** |
| 543178 | 0 | 252666 | 0 |
| **1862 Matching** | **1890 Matching** | **1862 Matching** | **1890 Matching** |
| 3154648 | 0 | 2165400 | 0 |
| **1862 All Other** | **1890 All Other** | **1862 All Other** | **1890 All Other** |
| 5638050 | 0 | 473328 | 0 |

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

• Develop/identify theory- and evidence-based educational programs to promote healthy communities: youth, adults, and families.
• Disseminate, implement, and evaluate effectiveness of programs to promote healthy communities: youth, adults, and families.
• Strengthen collaborative capacity within K-State Research and Extension and among communities/ organizations to promote healthy communities: youth, adults, and families.
• Provide technical assistance and educational programs to citizens seeking to make their communities healthy and sustainable places for meeting human needs.
• Establish links between community development researchers and practitioners for cooperative efforts that result in healthy, sustainable communities.
• Provide experiential learning opportunities for children and youth to address key and emerging issues that affect their growth and development.
• Deliver and evaluate evidence-based community-development strategies for positive youth development in structured out-of-school settings (e.g., after-school programs, youth-serving organizations, clubs).
• Strengthen the support for a volunteer development system through training and education on the experiential learning model, 4-H essential elements, ISOTURE model, age appropriate learning experiences and emerging aspects of youth development.
• Provide imaginative, motivational, and experiential learning experiences to help youth build competencies and master life skills.

### 2. Brief description of the target audience

• Families and individuals of all ages living in Kansas, including populations with limited resources; low literacy skills; varying ethnicities; disabilities, diseases, or impairments; and documented or identifiable health disparities
• Economic stakeholders, and policy and funding agencies
• Health care and education professionals
• K-State Research & Extension faculty and staff with responsibilities for healthy communities: youth, adults, and families

### 3. How was eXtension used?

eXtension was not used in this program

### V(E). Planned Program (Outputs)

### 1. Standard output measures

| 2016 | Direct Contacts Adults | Indirect Contacts Adults | Direct Contacts Youth | Indirect Contacts Youth |
|---|---|---|---|---|
| Actual | 265393 | 0 | 18948 | 0 |

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

**Patent Applications Submitted**

Year: 2016

Actual: 0

**Patents listed**

### 3. Publications (Standard General Output Measure)

**Number of Peer Reviewed Publications**

| 2016 | Extension | Research | Total |
|---|---|---|---|
| Actual | 0 | 0 | 0 |

### V(F). State Defined Outputs

**Output Target**

**Output #1**

**Output Measure**

- Number of educational programs delivered to increase knowledge of healthy communities: youth, adults, and families

| Year | Actual |
|---|---|
| 2016 | 21000 |

**Output #2**

**Output Measure**

- Number of program participants

| Year | Actual |
|---|---|
| 2016 | 70749 |

**Output #3**

**Output Measure**

- Number of educational programs to increase knowledge of volunteer development, experiential learning, and youth development competencies

| Year | Actual |
|---|---|
| 2016 | 1300 |

**Output #4**

**Output Measure**

- Number of communities that participate in community capacity building trainings and activities led through Extension.

| Year | Actual |
|---|---|
| 2016 | 70 |

**V(G). State Defined Outcomes**

## V. State Defined Outcomes Table of Content

| O. No. | OUTCOME NAME |
|---|---|
| 1 | Community projects engage participants in process to address community goals (Measured by number of substantial community projects that reflect shared participation in addressing community goals) |
| 2 | Community members are engaged in community improvement programs (measured by number of volunteer hours) |
| 3 | Volunteers, faculty, and staff understand and demonstrate effective youth development principles in service to youth (e.g., 5 Cs of positive youth outcomes, essential elements to positive learning environments)(Measured by number demonstrating competency) |
| 4 | Youths improve competence, confidence, connection, and character and caring (measured by number of youths who improve: (a) Competence - believe they are capable and successful; that they have mastery. (b) Confidence - know they influence the world around them (i.e., people and events); that they have independence. (c) Connection - know they are cared about; that they belong. (d) Character and Caring - Youths practice helping others; they are generous.) |

**Outcome #1**

**1. Outcome Measures**

Community projects engage participants in process to address community goals (Measured by number of substantial community projects that reflect shared participation in addressing community goals)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 801 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
Kansas PRIDE (not an acronym) supports community development efforts by providing a structure to mobilize local organizations and governments as they address quality of life issues. Communities are encouraged to assess their needs, set goals, implement plans, evaluate the impact and celebrate.

**What has been done**
The PRIDE program adopted the community capitals model as a framework for the current program. This framework reveals the interactions between different parts of a community.

**Results**
In 2016, PRIDE communities were involved in 801 projects at the local level. PRIDE communities reported that 269 of these projects engaged youth.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 803 | Sociological and Technological Change Affecting Individuals, Families, and Communities |

**Outcome #2**

**1. Outcome Measures**

Community members are engaged in community improvement programs (measured by number of volunteer hours)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 57895 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
The philosophy of community development that Kansas PRIDE encourages is based on the fundamental valuing of volunteer hours.

**What has been done**
In 2016, PRIDE communities were involved in 801 projects at the local level. PRIDE communities reported that 269 of these projects engaged youth

**Results**
In 2016, 70 PRIDE communities reported 57,895 hours of volunteerism. This conservatively calculates to a dollar value of more than $1,274,848. Kansas PRIDE communities reported raising $773,862 for reinvestment in their communities during 2016.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 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**

Volunteers, faculty, and staff understand and demonstrate effective youth development principles in service to youth (e.g., 5 Cs of positive youth outcomes, essential elements to positive learning environments)(Measured by number demonstrating competency)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 4995 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**
More than 77,620 youth participate in the Kansas 4-H Youth Development program annually. 4-H learning experiences are based on principles and practices to enhance young people's ability to grow into tomorrow's leaders and communicators. Kansas 4-H plays a vital role in helping youth achieve future success because of a structured learning environment that includes encouragement and mentoring.

**What has been done**
Kansas 4-H conducted a study to determine the program's effectiveness in fostering positive connections, encouraging responsible decisions, and developing communication and citizenship skills. More than 2,600 Kansas youth ages 8 to 18 year old from rural and urban areas participated in the study.

Using a subset of Common Measures, an evaluation tool used nationally by 4-H, K-State Research and Extension professionals administered a survey to Kansas youth during the spring and summer of 2016. The goal of the study was to gather data on the potential benefits of a young person's participation in 4-H. The outcomes measured in this study were:
* Positive connections with others;
* Responsible decision making;
* Communication skills; and
* Citizenship and contributions to their communities.

**Results**
Among the youth who responded to the survey:

Positive Connection with Others: 96 percent reporting working successfully with adults and having

caring friends. 93 percent are connected to adults who are not their parents.

Making Responsible Decisions: 95 percent reported being comfortable with making their own decisions and 91 percent have a plan for reaching their goals.

Growth in Citizenship Skills: 94 percent reported they gained important skills by serving their communities and 97 percent reported a strong desire to help others.

Leadership: 95 percent reported an increased effort to allow everyone to have a voice. 95 percent reported they treat everyone fairly and equally when they are in charge of a group.

Communication: 4-H participants in their third year or more reported a 60 percent increase in their confidence in public speaking compared to newer participants.

The results of the survey of Kansas 4-H youth demonstrate the vital role 4-H youth development programs play in helping Kansas youth achieve future successes and becoming tomorrow's leaders.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 806 | Youth Development |

**Outcome #4**

**1. Outcome Measures**

Youths improve competence, confidence, connection, and character and caring (measured by number of youths who improve: (a) Competence - believe they are capable and successful; that they have mastery. (b) Confidence - know they influence the world around them (i.e., people and events); that they have independence. (c) Connection - know they are cared about; that they belong. (d) Character and Caring - Youths practice helping others; they are generous.)

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

| Year | Actual |
|---|---|
| 2016 | 2484 |

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Youth Development research indicates that youth involved in 4-H Youth development experiences are more 2.5 more likely to be involved in their communities. The ethic of community involvement help youth to feel they are capable and successful, helps youth build mastery and teamwork, demonstrates in a visible way how they are able to participate in the world around them and connect with others, and learn and practice a sense of generosity. Involvement in a local community service day is a way to engage youth, adults and the community at large in projects that improve the health and vitality of communities.

**What has been done**
For the third year, the Kansas 4-H Youth Leadership Council executive officers have provided leadership for a two-day service event that involves local 4-H groups, alumni and friends across the state to participate in 48 Hours of 4-H. As a finale for National 4-H Week, the statewide community service project required careful planning by youth and adults working together and coordinated communication plans. This 48-hour service project was a collaborative effort among the Kansas 4-H Youth Leadership Council, Kansas 4-H Foundation, 4-H Youth Development and the local Extension units and 4-H youth and volunteers across the state.

**Results**
The 48 Hours of 4-H project took place October 8 & 9, 2016 and was promoted as a weekend of service - a lifetime of impact. The project resulted in 78 community service projects across Kansas. The type of projects primarily included collections and donations; benefits; educational events; clean up and beautification projects. There were a total of 2,959 participants of which 475 were 4-H alumni. Results: $2,324 was raised for charities; 13,478 items collected (primarily nonperishable food); 49 new youth joined 4-H; and 932 hours of planning and completing projects.

**4. Associated Knowledge Areas**

| KA Code | Knowledge Area |
|---|---|
| 806 | Youth Development |

## V(H). Planned Program (External Factors)

**External factors which affected outcomes**

- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

**Brief Explanation**

K-State Research and Extension has been transitioning to a new reporting system over the last several years. The number of direct contacts reported this year is substantially different than last year. The numbers reported this year and in the future reflect our on-going efforts to report accurate information.

## V(I). Planned Program (Evaluation Studies)

**Evaluation Results**

**Short-Term (Knowledge)**
Youth increase their awareness and knowledge of positive youth development, adopt new

or
different attitudes; develop opinions, new aspirations and/or new motivation related to:

- Competence-ability to act effectively in school, in social situations and at work;
- Confidence-an internal sense of overall self-worth and efficacy;
- Connection-positive bonds with people and social institutions;
- Character-respect for society and cultural rules, an inner moral compass; and
- Caring-a sense of sympathy and empathy for others and a commitment to social justice.

Indicators:

- Percentage of youth who increased their knowledge about mastery of skills
- Percentage of youth who increased their knowledge, awareness and skills about self-awareness
- Percentage of youth who learned how to build healthy interpersonal relationships
- Percentage of youth who increased their awareness and attitude for developing positive interpersonal skills
- Percentage of youth who increased their awareness and knowledge of serving others

**Medium-Term (Behavior)**

- Youth use and act on their skills attributed to positive youth development, i.e., practice new behaviors or demonstrate new positive youth development abilities.

Indicators:

- Percentage of youth participating in opportunities to demonstrate competence such as project groups, competitions, academic achievements, etc.
- Percentage of youth practicing an internal sense of self worth
- Percentage of youth consistently participating in clubs, teams, groups
- Percentage of youth consistently demonstrating ethical behavior in society
- Percentage of youth consistently leading and participating in meaningful service - learning opportunities

**Long-Term (Change in Condition)**
All youth will grow up fully prepared for and fully engaged in life by having the ability to participate effectively by caring for themselves and by giving of themselves at home, in the community and in civic life.

Indicators:

- Youth are effective participants socially, at work and in school
- Youth are independent and self-confident
- Youth identify with people, social settings and everyday life
- Youth are law abiding citizens and contribute positively to society
- Youth are sympathetic and empathetic to others
- Youth are generous with their time, resources and compassion toward community and other people

**Key Items of Evaluation**

## 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. |