2018 University of Missouri and Lincoln University of Missouri Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

University of Missouri

University of Missouri Research and Extension contributed to better the lives of Missourians in 2018. Our program focused on food systems, natural resource management, and healthy people, families and communities. We developed and delivered high priority programs to address needs identified by our stakeholders despite declining state budgets. In FY 2018, our programs had total contacts of over 1.7 million among Missouri's 6.1 million citizens (899,021 direct contacts and 846,373 indirect contacts).

We continued to incorporate the use of technology into innovative service and product delivery systems, online resources for our stakeholders, and data mapping, visualization, and reporting tools. Our Extension website had millions of page views and content downloads. Funding from grants, gifts, and fee generation exceed the resources appropriated from our state, federal, and county partners. Our goal is to be reliable, responsive and relevant. We accomplished that goal in 2011 by providing research-based knowledge to Missourians aligned with their priorities of improving the community economies, health, and education outcomes.

Lincoln University of Missouri

In alignment with the USDA's top research and extension priority areas, Lincoln University's Cooperative Research and Cooperative Extension Programs continue to integrate and support agricultural education programs that provide high quality, experiential education at both graduate and undergraduate levels. The extension and research programs especially target underrepresented, underserved, small farmers and first generation students, and contribute to the diversity of nation's future agricultural workforce.

The LU research program continued to conduct cutting-edge, impactful food and agriculture research through multi-institution and multi-disciplinary collaboration to more effectively address urgent, emergent issues and develop sustainable solutions to the problems facing Missouri's agriculture industry and rural communities as well as strengthen university's capacity to provide better service for the needs of Missouri's small farms, especially underserved farmers. The research program focused on animal and crop production, food safety, natural resource management, and social-economics. The faculty members in the program were actively in pursuit of extramural funding to support current research and leverage resources provided by federal and state partners. We achieved our goal in 2018 plan of work by disseminating research-based knowledge to our target audience.

The extension and research programs continued to work with the state government and legislators to increase the appropriation required for state-match.

Extension efforts to improve the educational and economic opportunities for underrepresented populations in Kansas City, St. Louis, Jefferson City, and Southeast and Southwest Missouri continue. Expansion of the programs in Southeast Missouri will occur through acquisition of property and construction of a facility. Programs in all these areas will assist farmers, families, youth and the elderly as well as entire communities that have underserved and underrepresented populations. Programs of this type include (1) 4H, youth development, (2) family development, (3) community development, (4) health and aging, (5) food and nutrition and (5) urban gardening.

The Paula J. Carter Center for Minority Health and Aging maintains programs addressing health literacy, health disparity reduction and chronic disease prevention for underserved audiences ages fifty and

older. A grant from the Missouri Department of Senior and Health Services funded the Teenage Pregnancy Prevention and Abstinence Programs, which is designed to reduce teen pregnancy and out-of-wedlock births.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	266.0	36.5	66.0	44.5
Actual	242.0	26.2	103.4	26.0

II. Merit Review Process

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

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

2. Brief Explanation

University of Missouri

In 2018, University of Missouri Research and Extension senior administrators visited all 114 counties (elected leaders, Extension councils, local faculty and staff) to share new plans and receive feedback related to a more responsive and impactful faculty distribution and focus, based on our 2017 needs assessment. These visits and additional dialogues contributed to re-defined local priorities and program planning.

Also in 2018, policies related to Extension faculty were comprehensively re-written, with better definitions of competencies, duties, and evaluation. The policies included greater focus on peer review and measures of outcomes and impacts for individual and program evaluation. Four internal faculty panels designed new data visualization and reporting systems across major program areas in order to better measure program need and impact.

Lincoln University of Missouri

Combined External and Internal University Panels
Expert Peer Reviews
In addition, research faculty and state specialists also use current literature and relevant national databases to identify statewide priorities and critical issues facing Missouri residents for the program needs.

III. Stakeholder Input

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

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

- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

University of Missouri

In 2018, University of Missouri Research and Extension senior administrators visited all 114 counties (elected leaders, Extension councils, local faculty and staff) to share new plans and receive feedback related to a more responsive and impactful faculty distribution and focus, based on our 2017 needs assessment. These visits and additional dialogues contributed to re-defined local priorities and program planning.

County Extension Councils, which include elected officials and other stakeholders, helped create new program plans for each county, under the leadership of a newly redefined faculty position of County Engagement Specialist. A critical new duty for these faculty is to connect with broader types of stakeholders, develop in-depth needs assessments of their county, and ensure that university research and educational programming is aligned to meet local needs.

Lincoln University of Missouri

The types of actions taken by Lincoln University Cooperative Extension and Research (LUCER) depended on the location and type of activity. For example, the targeted audiences for the Kansas City Urban Impact Center (KCUIC) Senior Program were seniors, persons with disabilities and the homeless. The staff at the Urban Impact Center in St. Louis holds regular advisory committee meetings. Stakeholder input is solicited at those meetings. The Lincoln University Center for Community and Leadership Development planned and scheduled meetings with stakeholders to discuss and identify community issues. Stakeholders provided input to develop the method of approach. In Southeast Missouri, individuals were identified from the community who represented various entities, such as the church, school, nonprofit organizations, youth and parents. Semiannual meetings were held to address community needs. For the Horticulture Program employed one-on-one conversations as well as direct contact via email and social media, especially Facebook. The Paula J Carter Center on Minority Health and Aging has developed a Lay Leader's Program. There are more than 100 Senior Citizen Lay Leaders in the program. The lay leaders keep staff informed about the needs of their communities and the relevancy and effectiveness of programs. In general, invitations were sent to traditional and nontraditional stakeholder groups and individuals. Traditional and nontraditional stakeholder groups were also surveyed. And surveys were specifically conducted of nontraditional groups and individuals.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Needs Assessments
- Use Surveys

Brief explanation.

University of Missouri

University of Missouri Research and Extension built on years of successful stakeholder input (annual council surveys, community conversations [focus groups], rural surveys, etc.) to incorporate more data-informed strategies through new web tools (like allthingsmissouri.org), new participant survey tools (through CVent and Engagement Cloud technologies), and new needs assessments related to key program areas for every county.

Lincoln University of Missouri

Lincoln University Cooperative Extension and Research (LUCER) used the following methods to identify stakeholder groups and individuals: advisory committees, external focus groups, needs assessments and surveys. The types of actions depended on the location, type of activity and type of information required. All of the programs used a combination of multiple methods, employing those that would most accurately identify interested individuals and groups. All major programs have advisory committees/boards. Stakeholders serving on the boards are surveyed for input at least once per year, with programming adjusted based on needs and feedback. Participants were identified by the program specialist during face-to-face conversations, interviews and telephone conversations, responses to email questions from individuals and referrals from other Extension staff, minority stakeholders and collaborators.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

University of Missouri

Following on 2017's comprehensive statewide needs assessment (including community conversations, quantitative analyses, and external reviewers), in 2018 University of Missouri senior administrators met with all counties in county commission meetings and extension council meetings. These meetings were locally advertised and open to the public.

In addition, new duties have been assigned to County Engagement Specialists and Regional Directors to better connect with traditional and non-traditional community members and groups in order to ensure the university serves local needs.

Lincoln University of Missouri

Each program within Lincoln University Cooperative Extension and Research (LUCER) has a diverse advisory committee that meets at least once annually. When committees are assembled, input is sought from that body. LUCER also used meetings with traditional stakeholder groups and individuals, surveys of stakeholder groups and individuals, and meetings made specifically with nontraditional groups and individuals as well as meetings with invited selected individuals from the general public. Individual opinions were solicited and received on issues affecting stakeholders. Surveys and meetings were used to collect information from larger groups of people.

3. A statement of how the input will be considered

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

Brief explanation.

University of Missouri

Stakeholder input from the 2017 needs assessment and the 2018 county conversations has led to a comprehensive restructuring of University of Missouri Extension. Resources have been realigned to areas of public priorities, targeted cuts were made to program areas of low impact, and investments of new faculty are being made in high priority areas. Further, input gathered in this process has informed the University's new Strategic Plan (released in September 2018), included the ways the university will fulfill its research and extension/engagement missions.

Lincoln University of Missouri

The input received by Lincoln University Cooperative Extension and Research (LUCER) is used to redirect Extension and Research programs, as needed; in the staff hiring process; and to set priorities. The input is used to strengthen and focus efforts in needed areas and to adjust Extension and/or Research activities and the content of presentations. Recommendations were made to the administrator regarding new positions needed to address expressed needs. The core staff of Extension and/or Research will be expanded in response to information gathered. Additional workshops were organized to cover additional training. Requested information was used to submit grant proposals. Information was passed on to other agencies if needed.

Brief Explanation of what you learned from your Stakeholders

University of Missouri

Missourians' top priorities related to improving the economy of their communities (with agriculture being the largest industry in the state), improving the health of their families, and ensuring strong educational futures for their children. They see it as the university's role to contribute to these priorities and to serve the entire state.

Lincoln University of Missouri

There is a desire to engage, network, connect and share resources, information, services and programs. The stakeholders were able (and willing) to readily identify areas of concern and needs in their respective communities and their perspective of the causal agents. Getting their buy-in to their own community and providing a platform for change provided more of a vested interest in the success of the programs.

IV. Expenditure Summary

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

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	9114385	3010845	6696905	2046663
Actual Matching	9114385	1416251	7208939	1637588
Actual All Other	0	0	11771121	0
Total Actual Expended	18228770	4427096	25676965	3684251

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	993485	0	1323805

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Sustainable Food Production/Security and Environment/Natural Resource 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	4%	0%	4%	0%
111	Conservation and Efficient Use of Water	2%	0%	2%	0%
112	Watershed Protection and Management	2%	0%	2%	0%
123	Management and Sustainability of Forest Resources	6%	0%	6%	0%
135	Aquatic and Terrestrial Wildlife	5%	0%	5%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	12%	0%	12%	0%
205	Plant Management Systems	8%	0%	8%	0%
206	Basic Plant Biology	8%	0%	8%	0%
216	Integrated Pest Management Systems	2%	0%	2%	0%
301	Reproductive Performance of Animals	12%	0%	12%	0%
302	Nutrient Utilization in Animals	7%	0%	7%	0%
303	Genetic Improvement of Animals	10%	0%	10%	0%
307	Animal Management Systems	2%	0%	2%	0%
402	Engineering Systems and Equipment	4%	0%	4%	0%
502	New and Improved Food Products	3%	0%	3%	0%
601	Economics of Agricultural Production and Farm Management	5%	0%	5%	0%
605	Natural Resource and Environmental Economics	8%	0%	8%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	95.0	0.0	65.0	0.0
Actual Paid	89.0	0.0	103.4	0.0

Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
3866047	0	6696905	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
3774873	0	7208939	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	11771121	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Basic and translational research will be conducted and the results disseminated via scientific publications, scientific meetings, web publications, workshops, conferences.

Plant and animal scientists will conduct basic and applied research necessary to develop crop varieties and production strategies that can maintain high productivity in the face of increased climate variability and change.

Basic and applied research will be conducted to address underlying principles related to natural resources and to assist in the implementation of efficient, effective management actions to conserve natural resources and ensure the sustainable use of those resources.

On-farm research and demonstrations used to evaluate production and economic efficiencies.

Campus-based and region-based faculty members, in partnership with commodity groups, conservation partners, general public, and private industry, will:

Conduct focused management schools for crop, livestock and natural resources; artificial insemination courses; livestock facilities management short courses; Beef and Pork Quality Assurance Programs; Computer models/PDA record keeping programs; education about niche production markets and specialization opportunities; farm visits; on-farm research trials; educational workshops; meetings; and consultations.

Conduct workshops and seminars, host field days, assist with planning sessions, establish watershed committees, use mass media (printed, radio, television coverage), to increase awareness and knowledge of Missourians to implement practice and programs that will preserve, protect and sustain the state's natural resource base.

Develop curriculum-based natural resource management programs, including assessment and evaluation tools, marketing strategies and promotional materials.

Conduct training workshops for local natural resource teams (University of Missouri Extension, Missouri Department of Conservation, and USDANRCS) and potential local partners (e.g., Missouri Tree Farm, Conservation Federation of Missouri, Quail Unlimited, Wild Turkey Federation, Ducks Unlimited, Isaac Walton League, and Walnut Council).

Produce up-to-date, science-based information and deliver through guide sheets, newsletters, and websites.

2. Brief description of the target audience

Missouri farmers, landowners, and agribusinesses are the primary target audience for this work. This will include all traditional and non-traditional farmers regardless of scale, land managers, bankers, agricultural consultants and agribusiness professionals who provide products and services to farmers. The program's research and education efforts will also provide research based information for state and local policy makers, federal partners, and state agencies as they make decisions regarding Missouri natural resources and environmental issues.

3. How was eXtension used?

Individual extension faculty participated in eXtension activities, but it did not represent a significant activity for this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	26352	91776	7098	11119

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

Patent Applications Submitted

Year:	2018
Actual:	48

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	411	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed journal articles.

Year	Actual

2018	349

Output #2

Output Measure

- Number of other peer reviewed publications book chapters, proceedings, abstracts, etc.

Year	Actual
2018	62

Output #3

Output Measure

- Number of invited papers and invited presentations.

Year	Actual
2018	137

Output #4

Output Measure

- Number of graduate degrees awarded.

Year	Actual
2018	86

Output #5

Output Measure

- Number of in-service training session(s) for regional Extension specialists on an annual basis.

Year	Actual
2018	63

Output #6

Output Measure

- Number of new or revised guide sheets annually for regional Extension specialists to use in producer meetings.

Year	Actual
2018	20

Output #7

Output Measure

- Number of groups and individuals assisted to develop and implement forest, wildlife, and watershed plans.

Year	Actual
2018	127

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Missouri's crop and livestock producers and its agribusiness sector will improve their knowledge resulting in increased productivity, economic viability, regulatory compliance and profitability through the adoption of research based integrated management practices/systems and information provided by CAFNR and MU Extension.
2	Missouri farmers, business, communities and homeowners will increase their knowledge and skills and adopt new research based best management practices that will improve and protect the state's water, environment and natural resources.
3	Basic and applied research efforts will result in new knowledge that will improve our understanding of animal physiology, genetics, reproduction, nutrition, growth, and animal well-being. This knowledge will be translated into improved animal production practices that will be disseminated through the integrated livestock extension program.

Outcome #1

1. Outcome Measures

Missouri's crop and livestock producers and its agribusiness sector will improve their knowledge resulting in increased productivity, economic viability, regulatory compliance and profitability through the adoption of research based integrated management practices/systems and information provided by CAFNR and MU Extension.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	111254

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Severe drought caused major concerns for Missouri in 2018 due to localized intensities and impacts to agriculture and public water supplies. Eighty-six of Missouri?s 114 counties were in severe to exceptional drought at its peak. The most widespread impact was on pastures and hay land, leaving producers with half the normal hay crop, high nitrate problems in corn as well as scarce water supplies for livestock. Since the drought was localized to MO and surrounding states had had adequate moisture, producers faced low yields and low prices.

What has been done
University of Missouri Extension partnered with the National Integrated Drought Information System and National Drought Mitigation Center to develop an online survey for reporting drought impacts in Missouri. They activated the survey in July and called it the Missouri Extension Drought Impact Reporter. By the end of August, Missourians submitted more than 400 impact reports. The information was critical for assessing drought severity in Missouri and used extensively by decision makers at the state and national level.

Results
The Extension Drought Impact Reporter was critical in getting information to decision makers at the state and national level of near real-time drought impacts in Missouri. Input from citizens, statewide, helped decision-makers gain a more complete and accurate portrayal of the location and severity of the drought. State and federal agencies use the U.S. Drought Monitor to identify eligibility for various drought programs. The Missouri Extension Drought Impact Reporter was a useful resource in getting information to those agencies as it pertained to Missourians. This information helped Missouri?s producers get the help they needed. Various agencies offered

programs such as: access to public acreage for emergency haying, free water withdrawal at conservation area and state park accesses, cover crops funded through emergency programs and more than $8M of assistance committed to landowners. Extension specialists also used information from the Drought Impact Reporter to plan more than 20 strategically located drought survival meetings for producers in the areas of the state impacted most.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems
402	Engineering Systems and Equipment
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Missouri farmers, business, communities and homeowners will increase their knowledge and skills and adopt new research based best management practices that will improve and protect the state's water, environment and natural resources.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6939

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research projects addressed many key issues related to best management practices and skill improvement of Missouri farmers, business, communities, and homeowners. By improving the agricultural workforce's knowledge and skills, agricultural practices in the state can be quick to respond to challenges and first to adopt helpful innovations.

What has been done
Several research projects facilitated adoption of new technology and best management practices to improve and protect the state's water, environment, and natural resources. For example, projects facilitated adoption of unmanned aerial vehicles in agriculture and the dynamics of migratory birds.

Results
Research on UAV for agriculture revealed that although farmers were aware of UAV agricultural applications, only a small percentage of them were using (8%) or planning to use UAVs in the near future (19%). Results identified deterrents to UAV adoption included beliefs that the adoption of the UAV technology is not economically and environmentally rewarding, and concerns about the neighbors' reaction to the use of UAVs.
Research on the population dynamics of migratory birds (e.g., tree swallows) has helped researchers and conservationists understand that local weather conditions and not broader climatic drivers are most influencing survival of tree swallows longitudinally across North America.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Basic and applied research efforts will result in new knowledge that will improve our understanding of animal physiology, genetics, reproduction, nutrition, growth, and animal well-being. This knowledge will be translated into improved animal production practices that will be disseminated through the integrated livestock extension program.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2018 7025

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Missouri is a leading state in cow-calf production, with a beef cow inventory of 2.17 million. Reproductive failure is the single largest contributing factor to economic loss in the beef industry. Producers and stakeholders in Missouri?s beef industry look to University of Missouri Extension for leadership and guidance in efficient and profitable management of beef cattle. The profitability and sustainability of Missouri?s beef cow-calf production system is influenced by the length of a cow?s productive lifespan, the genetic merit of the herd, and use of management strategies that result in long-term productivity.

What has been done

The National Center for Applied Reproduction and Genomics in Beef Cattle (NCARG) is a multi-disciplinary partnership among faculty in the University of Missouri's College of Agriculture, Food and Natural Resources and College of Veterinary Medicine. With the University of Missouri's long-standing strengths in reproductive biology, genetics, agricultural economics, gene editing, theriogenology, and extension outreach, NCARG is poised to become a nationally recognized resource and training site. Development of the center began in 2018 and will continue through 2020.

Results

The primary mission of NCARG is to accelerate the rate of adoption of profitable reproductive and genomic technologies in the beef industry. In an era in which extension systems in many states are shrinking due to limited funding and personnel, the need for a national training site has never been greater. In addition to providing advanced training in reproduction and genetics, economic research conducted through NCARG will help producers assess the return-on-investment associated with using reproductive and genomic technologies. A primary focus of NCARG is to create impactful educational and extension programming. This will include development of educational opportunities for veterinary students and practicing veterinary professionals, hands-on training for extension livestock specialists, allied industry representatives, students, and beef producers and interactive online resources for reproductive and genomic education across the country.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

In the summer of 2018, Missouri experienced severe drought that was mostly localized to the state. Subsequently, the autumn harvest season was very wet. These factors contributed to poor yields. Also, world markets and the deteriorating relationship between China and the U.S. negatively affected commodity prices, especially soybean.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Agriculture and Natural Resources programs at the University of Missouri are all expected to evaluate impact. Many of those results are listed in the preceding narratives. Broadly, our ANR programs provide more than $1 Billion in economic impact to Missouri each year.

Key Items of Evaluation

Declining state and federal funds cloud the future for our programs. Without this base funding, continuity and "programmatic risk-taking" is hard. While our faculty have done well in generating new revenue, in real-terms, our programs in the future will undoubtedly be smaller.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Personal, Family and Community Wellbeing

☑ 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
602	Business Management, Finance, and Taxation	9%	0%	0%	0%
604	Marketing and Distribution Practices	1%	0%	0%	0%
607	Consumer Economics	1%	0%	0%	0%
608	Community Resource Planning and Development	4%	0%	0%	0%
610	Domestic Policy Analysis	1%	0%	0%	0%
703	Nutrition Education and Behavior	20%	0%	0%	0%
723	Hazards to Human Health and Safety	2%	0%	0%	0%
724	Healthy Lifestyle	5%	0%	0%	0%
801	Individual and Family Resource Management	2%	0%	0%	0%
802	Human Development and Family Well-Being	1%	0%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%	0%	0%	0%
805	Community Institutions, Health, and Social Services	7%	0%	0%	0%
806	Youth Development	37%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	171.0	0.0	0.0	0.0
Actual Paid	153.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
5248338	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
5339512	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Faculty will conduct workshops, multi-session programs and meetings, intensive courses, conferences; develop products, curriculum and resources; provide training and consultation; and work with and use various media to share state of the art knowledge and research.

We will engage with eXtension, partner with other organizations, leaders, agencies, and other states for training and delivery, and develop collaborative partnerships with local, state and national organizations for programming and funding (including the regional rural development center). Faculty will work collaboratively and across disciplines to develop and deliver programs that are based on research and best practice while engaging with the community for its development and to inform research and teaching on campus. We will provide internships for under grad and graduate students, class projects based in the community, research and evaluation opportunities that engage graduate students.

In addition, we will establish and assist COAD (Community Organizations Active in Disasters) and provide disaster educational materials and workshops to communities and organizations. We will support establishment and viability for 4-H clubs and programs, and local leadership development for youth and adults.

We will form planning committees/advisory panels, facilitate participatory visioning and planning workshops, moderate local dialogues about key issues, hold community meetings and conduct presentations, gather data and use decision support tools to analyze alternatives for the community, organizations, or interest groups with citizens and decision makers, work with communities to address a specific need or issue. We will also work with communities and regions to develop models of excellent entrepreneurial community practice, community economic development and regional economic development strategies. We will provide counseling and expertise, coaching, and training for businesses.

2. Brief description of the target audience

Programs are designed for families and individuals of all ages. From young children, teens, adults and older adults, we provide educational programs and technical assistance to individuals and in group settings, with special focus on underserved populations. Our faculty work closely with other agencies within their communities, the state, and extension faculty across the country.

Targeted audiences are all social groups in the community, including low-income and minorities, non-English speaking, community leaders and organizations, local government, professionals working in community and economic development, local businesses and potential business owners, home builders, and agencies that assist in disaster. We place no limitation on gender, ethnic or religious diversity, lifestyle choice, etc. We also will make a concerted effort to reach military personnel, veterans and their families.

3. How was eXtension used?

Individual extension faculty participated in eXtension activities, but it did not represent a significant activity for this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	133794	558186	731777	185292

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	22	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of youth engaged in science learning experience.

Year	Actual
2018	84095

Output #2

Output Measure

- Number of adults engaged in leading science experiences for youth.

Year	Actual

2018	8033

Output #3

Output Measure

- Number of in-depth training programs conducted.

Year	Actual
2018	38

Output #4

Output Measure

- Number of other conferences, courses, and workshops held.

Year	Actual
2018	43858

Output #5

Output Measure

- Percent of participants in workshops and training indicating they would recommend the program to others.

Year	Actual
2018	96

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants adopting research based practices as result of increasing their knowledge of family resource management, healthy food and nutrition practices, and healthy lifestyles.
2	No. of youth who pursue study in science career path as the result of participating in programming with direct access to the technological and research advances in agriculture, life sciences, human development, social sciences and engineering, young people in MU Extension's 4-H Youth Development programs that build problem-solving skills and increase their interest in STEM.
3	No. of persons reporting taking on new leadership roles as a result of their engagement in community development programs (decision making, emergency management, leadership development, organizational development and capacity building, community economic development, etc.).

Outcome #1

1. Outcome Measures

Number of participants adopting research based practices as result of increasing their knowledge of family resource management, healthy food and nutrition practices, and healthy lifestyles.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Missouri is a state with high levels of poverty and obesity, both of which are associated with poor nutritional status and poor health outcomes. These issues are a challenge in Missouri's two urban centers (St. Louis and Kansas City) as well as in the rural areas across the state. University of Missouri Extension provides a much-needed statewide service delivery system to meet the educational needs of residents across the state.

What has been done
University of Missouri Extension provides direct education on nutrition, resource management, housing, and positive family relationships. We leverage our strong partnerships with state and local agencies to enhance these efforts through coordination of services, referrals, and collaboration. Together these efforts reinforce individual and community changes to enhance the ability of Missourians to make healthy lifestyle choices.

Results
Missouri residents receive education on nutrition, food safety and physical activity for lifelong health and fitness. Education for adults also involves lessons on food resource management. Nutrition education for youths provides information in kid-friendly terms and lessons with hands-on activities. Activities include opportunities for taste-testing healthy foods and practicing skills that lead to good health. Evaluation data collected across the state reflect the positive impacts that occur in every county. Additionally in tax year 2018, University of Missouri Extension helped file 10,496 federal returns for low- to moderate-income individuals, with a total federal refund in excess of $6 million. Assuming that the average tax return costs $200 dollars to prepare, this has saved Missouri residents roughly $20 million in tax preparation costs, not counting other fees like

Refund Anticipation products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
607	Consumer Economics
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #2

1. Outcome Measures

No. of youth who pursue study in science career path as the result of participating in programming with direct access to the technological and research advances in agriculture, life sciences, human development, social sciences and engineering, young people in MU Extension's 4-H Youth Development programs that build problem-solving skills and increase their interest in STEM.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5176

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

4-H prepares youth for the work place. Youth today must be prepared to live and work in a changing world ? competing for jobs that do not yet exist and using technologies that have not yet been invented to solve problems that have yet to be identified. Rapid changes in technology have increased the demand for trained scientists, engineers and a broader understanding of technology by all citizens. 4-H is the only youth development program with direct access to technological advances in agriculture, life sciences, engineering, learning technologies and social

sciences from the university system. This brings relevant science content and hands-on learning to help youth thrive.

What has been done

4-H field and campus faculty and staff engaged 84,095youth across Missouri with ongoing science/STEM education. Due to campus and agency partnerships, Missouri 4-H is positioned to enable 4-H youth to enter the workforce with the knowledge, skills, attitudes and health needed for the workplace. The 4-H Common Measures evaluation tool is used to measure progress of youth gaining workforce skills.

Results

Missouri 4-H connects thousands of youth, parents, volunteers and professionals to MU. A volunteer system of 8,033 enables Missouri 4-H members to engage with more mentors than their non- 4-H peers. Positive and sustained relationships between youth and adults are a predictor of the program?s effectiveness in helping youth gain citizenship, leadership and life skills that enable them to be career ready. In 2018, 5,176 4-H members from 106 counties and 16 other states engaged with MU faculty and staff through 4-H events, contests and conferences studying science and considering careers in science/STEM. The 4-H Youth Futures College within Reach program promotes college for underserved youth through mentoring and college orientation conferences. Fifty-two percent of high school seniors enroll in higher education and 18% enter the workforce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

No. of persons reporting taking on new leadership roles as a result of their engagement in community development programs (decision making, emergency management, leadership development, organizational development and capacity building, community economic development, etc.).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	201

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Government representatives, civic leaders and community members at large often have ideas about what they would like to see changed in their community such as educational opportunities for youth, internet broadband access, improved infrastructure and a host of other issues. However, they often lack the capacity or understanding about how to become effectively engaged in addressing the issues of concern to them and their communities.

What has been done

Leadership programs were conducted (31) and conferences, workshops and courses were held (263) to develop the individual capacities of people to effectively participate in their communities and embrace leadership opportunities. Plans were developed with communities and organizations (62) to help people identify key issues and organize effective responses and new organizations were created (36) to provide leverage resources in the community and provide opportunities for new leadership to emerge.

Results

Community development academy participants reported leveraging 4321.5 volunteer hours valued at $100,302, increased resources leveraged for their communities of $8,6503,025. A planning process in one community led to the creation of a trails system hiring and increased participation in the community. A new housing site information system helped another community identify the best locations for future housing development. A program focused on youth disaster preparedness is establishing a new standard for youth preparedness across the county.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The contemporary arena in which community actions are pursued can seem

overwhelmingly complex. Also affecting programming are the devolution of authority for action and service delivery; maintaining quality with fewer resources; expectations for shared power; increased diversity, challenges of collaboration, and reconciling local development with globalization. Competing public priorities force citizens to prioritize their time and energy and can lead to polarization and citizens feeling marginalized even when they offer their input. The decline in tax revenues for some communities and state programs has affected the ability to implement new projects and continue to support others at the same level. With term limits and tighter budgets at local and state levels and internal university pressures, our funding and program priorities may fluctuate. With the increasing number of weather-related disasters, our work fluctuates and some planned programs have to be delayed or cancelled. Finally the challenge of tracking and evaluating change in family, individuals and community contexts is complex, can be time consuming, and relies on voluntary participation. The ability to provide volunteer training and educational experiences for youth is dependent on having a well-educated and motivated local and state faculty to guide and support volunteers. Typically, we have vacancies and turn over that threatens the on-going delivery of quality programming.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Conduct post/pre-post evaluations at the conclusion of the training/course/workshop to determine learning and intent to apply learning. Conduct follow-up evaluation of application within three to twelve months for most offerings to determine application of learning. We will monitor changes and collect data based on attribution in communities and organizations over time for the indicators identified in the North Central Region. General data collection for learning and application will follow similar protocols so that data can be aggregated by sub-regions of the state, the state and multi-state North Central region. 4-H campus and field faculty will use the Quality Matters 4-H observation tool on a subset of 4-H clubs annually. Once a baseline of quality is determined, 4-H faculty will use the National 4-H Common Measures for Universal or Life Skills and Science. Campus and field faculty will determine jointly specific events (e.g., camps, robotics build and competition), to evaluate youth outcomes for increased interest and engagement in science, develop positive attitudes towards science, develop science skills and abilities and for older youth to apply and make a contribution through science.

Key Items of Evaluation

In FY18, the Community Development program worked collaboratively with 201 communities and 375 additional partners to foster economic development and create capacity for sustainable communities and quality jobs through programs in economic development, leadership development, community decision-making, and building inclusive communities. Results reported included:

- 8.50 million grants and other resources or efficiencies acquired by communities and organizations
- $51,851 in volunteer hours generated by CD Extension to conduct programs
- $48,451 in volunteer hours generated by communities and organizations as result of programs
- 201 participants reported taking on new leadership roles
- 62 community and organizational plans developed
- 49 community and organizational policies/plans adopted and/or implemented
- 271 community/organizational programs and activities initiated or completed

- 36 new organizations created

In FY18 Youth and Families impacts included

- 4-H and Nutrition & Health programs are provided in all 114 counties and the City of St. Louis
- 181,900 4-H youth program participants
- 140,845 SNAP-Ed participants and an additional 360,691 reached via indirect education
- MU Extension Nutrition & Health faculty worked with school districts to increase their usage of fresh and local produce and animal products. The number of school districts increased from 98 as of 10/1/15 to 143 as of 9/30/18.
- MU Extension faculty and staff provided nutrition education programs at 751 school and community gardens (raised bed, container and traditional) in 59 counties. These gardens provided the individuals, schools and communities with over 9,000 pounds of produce with a retail value of over $36,500
- In tax year 2018, University of Missouri Extension helped file 10, 496 federal returns for low- to moderate-income individuals, with a total federal refund in excess of $6 million. Assuming the average tax return costs $200 to prepare, this has saved Missouri residents roughly $2 million in tax preparation costs.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%	10%	0%	8%
111	Conservation and Efficient Use of Water	0%	0%	0%	5%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	15%	0%	2%
204	Plant Product Quality and Utility (Preharvest)	0%	0%	0%	5%
205	Plant Management Systems	0%	0%	0%	10%
212	Pathogens and Nematodes Affecting Plants	0%	25%	0%	5%
216	Integrated Pest Management Systems	0%	30%	0%	5%
301	Reproductive Performance of Animals	0%	0%	0%	10%
302	Nutrient Utilization in Animals	0%	0%	0%	5%
303	Genetic Improvement of Animals	0%	0%	0%	10%
307	Animal Management Systems	0%	0%	0%	5%
311	Animal Diseases	0%	0%	0%	8%
313	Internal Parasites in Animals	0%	0%	0%	5%
503	Quality Maintenance in Storing and Marketing Food Products	0%	20%	0%	5%
601	Economics of Agricultural Production and Farm Management	0%	0%	0%	5%
604	Marketing and Distribution Practices	0%	0%	0%	2%
721	Insects and Other Pests Affecting Humans	0%	0%	0%	5%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	7.5	0.0	20.0

Actual Paid	0.0	6.0	0.0	15.0
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**
0	998493	0	697474
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	564199	0	1056973
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

a. Conduct research to control and prevent foot-rod diseases in small ruminants.
b. Small ruminant breeding to control internal parasites disease.
c. Determine embryonic and fetal loss in goats throughout season
d. Best management practices for beef production.
e. Develop sunfish cultigens for distribution to the industry.
f. Determine nutritional requirements of sunfishes.
g. Develop optimal production dynamics for sunfishes.
h. Provide aquaculture fish health services for stakeholders.
i. Conferences, meetings, workshops, and training and educational opportunities for small farmers.
j. Introduction and evaluation of new crops (especially native crops) and improved cultural practices.
k. Abstracts, publications, grant proposals, and guide sheets.
l. Promotion of backyard and community gardening.
m. Conduct analysis of the challenges of rural entrepreneurship and their impact on the prospects of community development.
n. Develop effective and environmentally and grower friendly IPM approaches to manage key insects of small fruits and vegetables.

2. Brief description of the target audience

Lincoln University's Cooperative Research and Extension programs focus on enhancing the quality of life for diverse, limited resources audiences, including low-income, limited resource farmers and ranchers, and underserved population in rural and urban communities. In addition, we also work with gardeners, commercial farms, organic and small farms, fruit and vegetable framers.

3. How was eXtension used?

Ask an Expert was used to search for solutions for various client questions, to respond to a client's question and also by posting questions from clientele.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8773	7974	3060	596

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	52	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Projects completed, presentations and manuscripts. Enhanced profitability of small farms. Enhanced vitality and strengthening of rural communities.

Year	Actual
2018	166

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-IPM: Improved knowledge and awareness of the environmental and economic benefits associated with IPM implementation by growers and Extension educators, increased awareness of pesticide and nutrient impacts on non-target organisms and habitats, increased protection and promotion of high-value agricultural products, reduced pesticide use by farmers, increased production of vegetables and small fruits grown with reduced-risk pesticides and with organic methods.
2	Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.
3	Farmers adopt new technologies for increased and sustainable production.
4	Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.
5	Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.

Outcome #1

1. Outcome Measures

Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-IPM: Improved knowledge and awareness of the environmental and economic benefits associated with IPM implementation by growers and Extension educators, increased awareness of pesticide and nutrient impacts on non-target organisms and habitats, increased protection and promotion of high-value agricultural products, reduced pesticide use by farmers, increased production of vegetables and small fruits grown with reduced-risk pesticides and with organic methods.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4858

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This research will help small, limited-resource farmers improve production and increase profits. It will also increase profits for commercial fish farmers and add to the economy of Missouri. The small average scale of organic vegetable farms in Missouri hastens the need for scale-appropriate solutions to the critical management concerns of these growers, especially solutions to pest problems that affect vegetable production.

What has been done
Research is focused on diets and operation for food-sized sunfish as well as breeding for the control of foot rod disease and native plant grazing for sheep and goats. Efforts were made to reduce fertilizer and insecticide use for organic farming practices. Trainings were organized for many farmers with hands-on training and demonstrations.

Results
Several novel bluegill crosses were created with considerable variation in their performance, and higher protein and lipid feeds resulted in greater growth and fillet yields in bluegill sunfish.
As a result of the research and educational activities, Missouri farmers increased the production

of high-quality vegetables and valued-added crops, using sustainable methods, by applying simple and effective hydroponic and IPM strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #2

1. Outcome Measures

Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It will help small, limited-resource farmers improve production and increase profits and add to the economy of Missouri. Many limited-resource, minority, socially-disadvantaged and beginning farmers find it hard to get technical advice on animal and crop production, pest management tools and strategies that are simple, effective and affordable.

What has been done

Workshops have reached approximately 1,000 potential fish farmers. Comprehensive educational materials and activities, such as one-on-one interactions, field days, workshops and trainings, have been delivered to many farmers (i.e., underserved, minority, limited-resource, beginning, conventional and organic) throughout the state. Organic producers were taught fundamental, multidisciplinary IPM knowledge and skills to improve their farming operations.

Results

As a result of the research and educational activities that were implemented, Missouri farmers increased the production of high-quality vegetables and valued-added crops, using sustainable methods, by applying simple and effective hydroponic and IPM strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #3

1. Outcome Measures

Farmers adopt new technologies for increased and sustainable production.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	51

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It will help small, limited-resource farmers improve food production and increase profits and add to the economy of Missouri.

What has been done
Comprehensive educational materials and activities, such as one-on-one interactions, field days, workshops and trainings, have been delivered to many farmers (i.e., underserved, minority, limited-resource, beginning, conventional and organic) throughout the state.

Results
At least 30 farmers adopted trap cropping as an effective IPM strategy to control pests. By informing customers that the produce was not sprayed with insecticides, some farmers increased sales, and they spent less time in the field.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #4

1. Outcome Measures

Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	31

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small, limited-resource farmers are urgently needed for technical assistance to improve production and increase profit, which will add to the economy of Missouri.

What has been done
Workshops and conference presentations were held and educational or training materials have been delivered to many farmers (i.e., underserved, minority, limited-resource, beginning, conventional and organic) throughout the state.

Results
Missouri farmers learned updated technologies and management practices to improve the production of high-quality vegetables and valued-added crops, using sustainable methods, simple and effective hydroponic and IPM strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #5

1. Outcome Measures

Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Lincoln University Cooperative Extension (LUCE) Innovative Small Farmers Outreach Program (ISFOP) educates Missouri?s small-scale, limited-resource and minority farmers and ranchers to improve their farming operations and income. ISFOP staff also encourages farmers to adopt environmentally sustainable practices.

What has been done
During FY 2018, the ISFOP served 170 families (32% minority farmers) and 24 community groups in 15 counties and the City of St. Louis. Staff made 215 farm visits and offered one-on-one consultations; organized and/or presented at 61 workshops and conferences; and taught classes with 641 total attendees. In 2018, 74 ISFOP clients reported that because of ISFOP?s help, income per farm rose an average of $1,200.

Results
In 2018, 74 ISFOP clients reported that because of ISFOP's help, income per farm rose an average of $1,200.
Staff helped 14 farmers to secure $154,500 from the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) to purchase high tunnels. Staff also trained and assisted growers to erect high or low tunnels and hoop houses. Fifty ISFOP clients used some kind of season extension techniques in FY 2018. The ISFOP helped 23 farmers secure direct grant payments totaling $281,000 from various agencies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

503 Quality Maintenance in Storing and Marketing Food Products

601 Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Lincoln University Cooperative Extension and Research (LUCER) was affected by flat federal and under-match of state funds.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Lincoln University Cooperative Extension and Research (LUCER) is expected to evaluate impact and our programs will help small, limited-resource farmers improve production and increase profits. It will also contribute to the economy of Missouri.

Key Items of Evaluation

Perhaps the most significant external factor which affected outcomes is appropriation changes. As a result of not having state matching funds, staff were fired or not hired. Program funds were reduced. Programs were eliminated. Positions were eliminated. Our faculty are all active in pursuit for extramural funding to support the program.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Community and Leadership Development

☑ 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
602	Business Management, Finance, and Taxation	0%	0%	0%	75%
608	Community Resource Planning and Development	0%	50%	0%	10%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	50%	0%	15%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	0.0
Actual Paid	0.0	1.0	0.0	1.0
Actual Volunteer	0.0	3.0	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**
0	31887	0	21569
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	139673
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Strengthening skills for small towns, communities. and organizations

The Lincoln University Community Leadership and Development Job Readiness training program was created and put into practice at United Gospel Rescue Mission in Poplar Bluff, Missouri. It gives men an opportunity to learn personal and professional soft skills. United Gospel Mission is a homeless shelter for men who are underemployed, unemployed and in recovery from drug and/or alcohol addiction. This is the first program of its kind in the area. The job readiness program has trained more than 100 people and helped 25 percent of those trained to become employed by local businesses in the Popular Bluff area. Most of those participating in the program are in recovery and have been released from prison. The Job Readiness program provides these people with a second chance at life. The program improves their quality of life and allows them to reconnect with families and loved ones.

Workshops and training sessions covering critical skill areas and topics such as: leadership, community resource planning, negotiation skills, planning, communication skills, self-awareness, understanding and leading people, getting results, strategic thinking, basic leadership skills, work planning and goal setting, customer/resident relations, effective communication skills, budgeting, funding accounting and grant administrations, managing personnel issues, and negotiations.

LUCE also works with the Haven House in Poplar Bluff to provide job readiness skills. Haven House is a shelter for women dealing with domestic violence. More than 100 women have been trained under the LUCE Job Readiness program

2. Brief description of the target audience

Men and women who are underemployed, unemployed and in recovery from drug and/or alcohol addiction.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	300	10	0	10

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Informational sessions including, workshops, presentations and face-to-face meetings.

Year	Actual
2018	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Demonstrate increased knowledge and understanding of community development planning. Demonstrate increased partnerships and resources for the community. Demonstrate increased civic engagement in deliberating community issues.
2	Community decision makers will increase inclusivity when seeking stakeholder input. Stakeholders will be empowered and concerned about improving the quality of life in their community. Community decision makers will seek extramural funds to make improvements. Community decision makers will review, and update ordinances to make operation more efficient.
3	Evidence of community goal attainment * Increased capacity to deal with future issues *Change in community practice *Improved community fiscal and economic performance * Those participating in local government are more representative of the population of the community * Sustained capacity for informed local decision making

Outcome #1

1. Outcome Measures

Demonstrate increased knowledge and understanding of community development planning. Demonstrate increased partnerships and resources for the community. Demonstrate increased civic engagement in deliberating community issues.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Men living in a small rural town Missouri town in southeast Missouri who are underemployed, unemployed and in recovery from drug and/or alcohol addiction.

What has been done
LUCE developed and implemented a program to teach personal and professional soft skills. Women in a domestic violence shelter were prepared with skills for job readiness.

Results
There were more than 100 men trained and more than 25 percent of them found employment.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Community decision makers will increase inclusivity when seeking stakeholder input. Stakeholders will be empowered and concerned about improving the quality of life in their community. Community decision makers will seek extramural funds to make improvements. Community decision makers will review, and update ordinances to make operation more efficient.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As small municipalities in Southeast Missouri gain population local officials and community members are constantly challenged by the need to balance fiscal, social, economic and environmental goals. One aspect of this challenge is deciding how much and what types of new development the community can accommodate without compromising the day-to-day quality of life for residents.

What has been done
Decision making training was conducted and best practices in community development were offered to municipal leadership. Support was given to municipal leaders to convene listening opportunities for stakeholders. The LUCCLD assisted communities and organizations in effectively addressing issues.

Results
The LUCCLD assisted communities in the development of processes that allowed them to create their desired future and also developed practical skills and programs to effectively involve and empower local citizens to become more effective leaders.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

803 Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #3

1. **Outcome Measures**

Evidence of community goal attainment * Increased capacity to deal with future issues *Change in community practice *Improved community fiscal and economic performance * Those participating in local government are more representative of the population of the community * Sustained capacity for informed local decision making

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
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Perhaps the most significant external factor which affected outcomes is appropriation changes. As a result of not having state matching funds, staff was fired or not hired. Program funds were reduced. Programs were eliminated. Positions were eliminated.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre and Post testing was done to determine whether information was understood. Follow up conversations were conducted with some program participants to determine intermediate and long term behavior change. Follow up assessment will be done to determine if participants remained employed.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Family and Youth Development

☑ 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	0%	20%	0%	0%
801	Individual and Family Resource Management	0%	20%	0%	0%
802	Human Development and Family Well-Being	0%	20%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	20%	0%	0%
805	Community Institutions, Health, and Social Services	0%	10%	0%	0%
903	Communication, Education, and Information Delivery	0%	10%	0%	0%
	Total	0%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	22.0	0.0	0.0
Actual Paid	0.0	16.5	0.0	0.0
Actual Volunteer	0.0	379.0	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**
0	1732552	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	852052	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The activities in the four regions; Kansas City, St. Louis, Central, and Southeast regions have similarities and differences. However, all have been developed to design, implement, and evaluate educational programs for youth and families at-risk. Program implementation includes club member retention, workshops, camps, and after-school programs.

Specific examples of activities from the Kansas City area include:

• Mentoring Program that matches community volunteers who will spend time with interested youth. Delta Sigma Theta sorority and Phi Beta Sigma and Alpha Phi Alpha fraternities often assist with this program.
• ACT Preparation: Work with students to prepare for the English and Math portions of the ACT test.
• Fatherhood Programs: This includes youth and adults and these are meetings that address topics related to self-esteem, nutrition, fitness, computer skills, relationships and parenting.
• Afterschool Tutoring Program: Programs are to assist students K-8 with homework, tutoring, computer classes, reading and math labs, life skills, arts, and crafts and recreation. Collaboration with the National Book Bank provides donations of books to non-profit organizations.
• Fitness Program: LUCE currently offers the Division of Youth Service classes in their physical education component. The community also participates in exercising to increase their energy level and to improve their overall health.
• The Abstinence Program, for youth to learn the advantages of remaining abstinent.

Specific examples of activities from the St. Louis area include:

A computer literacy service for senior citizens was established. A cyber cafe provided one-on-one tutoring for seniors to increase their knowledge and/or improve technological skills.

• Teen Drop In: This program has open enrollment for neighborhood youth and is to provide an after-school community safe haven. The teen drop in offers an array of opportunities for youth between the ages of 12 to 17. Activities and educational workshops include but will not be limited to homework assistance, open-microphones to develop their skills in public speaking/poetry, teen talk to discuss youth community issues and concerns, and educational games as well as activities that teach to enhance their life skills. Offered through the school year.
• After School Neighborhood Initiative: Our initiative is to provide a power-hour implementing homework assistance for youth after school, provide life skills activities that teach addressing communication skills, drug and alcohol prevention, conflict resolution, etc., as well as health and nutrition via snacks and physical activity. This program offers open enrollment to youth participants.

• Urban Garden Beautification Project: This collaborative effort works with communities to continue transforming weed infested vacant lots into a neighborhood asset that will assist in stabilizing the neighborhood and revitalize community.

Specific examples of activities in the Southeast Missouri Region include:

Southeast Missouri collaborated with the Sikeston Public Library (SPL) to offer a comprehensive educational program. The theme for K-8th grade students was "Library Rocks." The program was supported by a mini-grant from the Missouri State Library and Institute of Museum and Library Services.

• Health and Fitness Classes.
• Health fair designed to educate youth on nutrition, fitness, and the dangers of alcohol, tobacco, and other drugs.
• Field Days - a culmination of educational workshops on a variety of topics for all ages.
• HIV/AIDS/STD Awareness Day.
• Summer Camps, to provide fitness and health, character development, arts and crafts, self-esteem building, recreation, and field trips for 5 weeks.
• Women's Wellness Conference.

Specific activities in the Central Region include:

• Underserved minorities and other disadvantaged older adults 50+ in Cole County area will become more aware and knowledgeable about importance of adopting a healthy lifestyle.
• Participants will become proactive in seeking health information.
• Participants will become more aware of ways to manage their personal health.
• Youth will develop increased communication skills, receive feedback, certificates of award and recognition for their efforts.
• Provision of culturally specific parenting education classes.
• Family and community empowerment experiences to assist parents helping their children to close the educational achievement gap.

Activities that have been implemented in all four Regions include:

• Black History Programs for youth (K-12) in the school districts. This is an educational program on the accomplishments and struggles of African-Americans.
• Program to address childhood obesity for parents and youth.
• Financial Management and Youth Program, which is designed to teach youth about basic financial management in order to help them make better economic and life decisions.
• Programs for making healthy choices when dealing with oppressive issues. By providing youth with positive mentors and role models, the issue of increased high school dropout rate is addressed and children are more likely to complete high school and attend college. By providing the youth with positive mentors and role models we are also aiding suicide prevention and combating in lowering suicide attempts

2. Brief description of the target audience

Minority and other under-represented youth in urban St. Louis, Kansas City and selected locations in the Bootheel region of the state (Primarily Sikeston, Charleston, and Caruthersville). Minority and under-represented populations in Central Missouri, especially those living in housing developments.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9770	13091	13641	24136

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Education classes, invited speeches, workshops, in-service education, consultations, media appearances, web sites, newsletters

Year	Actual
2018	428

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short term: 1) Enhanced academic productivity, 2) Improved rate of community volunteerism 3) Development of leadership skills, 4) Increased knowledge and life skills.
2	Medium term: 1) Completion of current grade and promotion to the next, 2) Increased graduation rates from high school, 3) Reduced probability of acts of crime, 4) Increased self-esteem, and 5) Better life choices.
3	Long term: 1) Improved education levels, 2) Increased standard of living, 3) improved quality of life.

Outcome #1

1. Outcome Measures

Short term: 1) Enhanced academic productivity, 2) Improved rate of community volunteerism 3) Development of leadership skills, 4) Increased knowledge and life skills.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Academic achievement is a concern. Children were struggling with reading writing and comprehension. Many of our children living with limited resource do not have books in the home and people to encourage their reading. Poor reading comprehension may also result in negative behaviors in school as well as negative life consequences.

What has been done
Aiming Higher is a program designed for 5th and 6th grade students to increase their amount of time reading and to improve their self-confidence. The program collaborated with the Public Library to provide books for each student.Character Counts!® was implemented with 100 Kansas City elementary schools students.

Results
By the end of the year, they were excited about reading and competing to read first.

After the Kansas City youth participated in the program, they were able to catch up on their schoolwork. In addition, their teachers reported that they now displayed acceptable behavior.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Medium term: 1) Completion of current grade and promotion to the next, 2) Increased graduation rates from high school, 3) Reduced probability of acts of crime, 4) Increased self-esteem, and 5) Better life choices.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A report by the U.S. Department of Education showed that in 2015, only 12.8 percent of the students enrolled in degree-granting institutions were African-American.

What has been done
To address this problem, Men On Business ? A College Assurance Program mentors male high school students. The program focuses on agriculture as well as on increasing academic achievement, improving positive social development and developing social competencies (e.g., respect, integrity, honesty). A parallel component for high school females, Ladies of Success (LOS), was requested and added to the program.

Results
Each of the 115 students participating in the program matriculated to the next grade level. All of the 35 seniors graduated from high school.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management

802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Long term: 1) Improved education levels, 2) Increased standard of living, 3) improved quality of life.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many people assume that everyone has equal access to the internet as well as the computer skills to successfully use it. A computer literacy program was created. My Digital Life seeks to minimize the digital divide between senior citizens, their families, community service providers, business people and government agencies. Research has found critical relationships between nutrition and isolation and their impact on the mental and physical well-being of aging populations. -Underserved, senior adults need healthy living alternatives, physical activity and positive lifestyle changes to be fit and productive.

What has been done
Lincoln University Cooperative Extension (LUCE) partnered with AARP® and the University of Missouri Extension St. Louis Storytelling Festival. The festival is a new addition that meshes with various computer literacy classes and programs. It gives them a chance to engage in research to capture and share stories with their families.
-The LUCE-Kansas City Urban Impact Center offers a 12-month, ongoing Senior Program. Research-based educational workshops provide information on health and wellness.

Results
One impact of this programming was that participants increased their knowledge and skills. They were able to research information using the internet for personal and professional reasons. This included viewing medical records and finding historical information or material about upcoming elections. Senior citizens also increased their knowledge of how to use cell phone

apps. They learned approximately 10 new apps, such as Google maps, voice texting and how to text cell phone pictures. -Seniors reported an improvement in physical activity and overall quality of life. Attendees made fewer visits to the doctor as a result of having better health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Perhaps the most significant external factor which affected outcomes is appropriation changes. As a result of not having state matching funds, staff was fired or not hired. Program funds were reduced. Programs were eliminated. Positions were eliminated.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

To determine program success, changes in behavior, acquisition of skills and knowledge, the intent of participant to infuse information into a lifestyle, educators conduct pre and post test evaluations. Follow up sessions may be conducted with participants. Educators call, use social media and email to follow up with participants to determine long-term impact.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%	30%	0%	10%
111	Conservation and Efficient Use of Water	0%	15%	0%	5%
112	Watershed Protection and Management	0%	0%	0%	5%
123	Management and Sustainability of Forest Resources	0%	0%	0%	5%
125	Agroforestry	0%	0%	0%	5%
134	Outdoor Recreation	0%	0%	0%	5%
136	Conservation of Biological Diversity	0%	0%	0%	10%
141	Air Resource Protection and Management	0%	0%	0%	5%
205	Plant Management Systems	0%	10%	0%	10%
213	Weeds Affecting Plants	0%	0%	0%	5%
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%	0%	0%	10%
403	Waste Disposal, Recycling, and Reuse	0%	25%	0%	10%
704	Nutrition and Hunger in the Population	0%	8%	0%	5%
723	Hazards to Human Health and Safety	0%	12%	0%	10%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	16.0
Actual Paid	0.0	1.0	0.0	9.0
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**
0	77515	0	25471
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Water Quality Studies

Missouri region is one of several areas in the United States having confined animal feeding operations (CAFOs) under various animal units' classifications. Water quality of streams near CAFOs may deteriorate due to inputs of Escherichia Coli (E. coli), nitrogen (N), phosphorus (P), dissolved organic matter (DOM), metals, and antibiotic drugs from animal wastes. In addition, land use and management practices in various watersheds may also impact surface water quality. The studies were to determine if there are significant contributions of N, P, E. coli, metals, pesticides, DOM) and antibiotic drugs from runoffs/seepage from cattle and swine wastes and various land uses on water quality of selected Missouri streams. The approved project will explore ecological links between bioindicators of environmental health, i.e., the role of water quality, nutrient flow, and invasive species in determining species abundance of aquatic turtles and mussels.

Improving Drinking Water Quality for Small Rural Community

Elevated dissolved organic matter in drinking water source, due to operations in agricultural watershed, is a health and environmental thread because of toxic disinfection byproduct (DBP) formation in drinking water. This research is to develop cost-effective water treatment technology for reducing DBP formation for small water system, using advanced oxidation techniques.

Health Assessment of Forestry Ecosystem

This study is to use the remote sensing and geospatial technology for investigating tree mortality and health in Missouri forestry ecosystem and link tree health to weather conditions. The primary task is to locate and assemble relevant geospatial data on selected ecosystem consisting of various layers including digital elevation, land use/land cover, geology, soil, hydrology, wetlands, and remote sensing data (satellite and air photo) and validate remote sensing data by ground measurement.

Behavior of Silver Nanoparticles in Soil: Interactions with Physicochemical and Microbiological Properties:

The objectives of this study are 1) Identify the microbial consortia that will evolve in the soil exposed to AGNPs; 2) Determine the effect of different AGNPs on plant nutrient uptake; 3) Measure the activities of enzymes involved in the cycling of C, N, P and S in the presence of AGNPs; and 4) Determine the impacts of soil physicochemical properties (e.g, pH, CEC, free Fe and Aloxides, organic C, particle size distribution) on sorption of AGNPs in soils.

Hydrologic Processes Controlling Stream Water Quality in Missourian Watersheds

Stream water contamination by soil applied herbicides and nutrients continue to be a major water quality problem in Missourian watersheds. The project is aimed at improving our understanding on the

controls of stream water quality in Missouri. The research objectives are to understand the hydrologic pathways controlling stream flow under storm event and baseflow conditions at multiple catchment scales and the factors controlling nutrient and herbicide transport to stream water.

Differentiation of Environmental E. coli from Enteric E. coli for Water Quality Assessment

E. coli is a fecal bacteria indicator. It is used in testing worldwide to determine water quality and manage water safety. E. coli is used because it is a part of the bacteria living in the intestines of warm-blooded animals. However, a significant part of the global E. coli population might come from outside the body. These "environmental" E. coli can be a factor in the high number of E. coli in water. This causes false alarms of fecal pollution. Thus, methods must be developed to tell the difference between "environmental" E. coli and enteric (in the intestine) E. coli. A newly funded project is to develop a rapid assay to do the differentiation, which can reduce unnecessary beach closures and other management procedures

2. Brief description of the target audience

(a) Farmers
(b) Engineers
(c) Policy makers
(d) Students
(e) Community leaders
(f) Local citizens
(g) Extension workers
(h) Scientists & other Researchers
(i) Regulatory Agencies

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	534	1050	194	300

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	31	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Short term output measures are: Abstracts(16), Presentations (20), Training students (10),and Workshops (4). Intermediate output measures are publications. Long-term: After five years

Year	Actual
2018	82

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Chemical and biological characterization of the ecosystems.
2	Expected change in agricultural practices from farmers. Better management of agricultural and natural ecosystems complex.
3	Environmental sustainability; Improved quality of life
4	Contribution to understanding of interactions between human practices and natural ecosystems; Enhanced stakeholders knowledge and understanding of environmental issues; Better management of agricultural and natural ecosystems complex.

Outcome #1

1. Outcome Measures

Chemical and biological characterization of the ecosystems.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water contamination is causing serious environmental and health problems. The chemical and toxic leachates, pathogens and biological organisms can negatively impact public health, groundwater and stream water quality. Water runoff from CAFOs contaminates the water quality of streams near CAFOs and potentially affects drinking water quality.

What has been done
Stream water samples were collected from selected agricultural watersheds and water contaminants were determined. We identified potential land use controlling factors and increased our knowledge of contaminant behaviors and risks in the soil ecosystem.

Results
Results showed that there were elevated contaminants with selected watersheds and the hydrogen peroxide treatment effectively reduce DBP formation in drinking water, thus lowering the risks to human health. Extensive education was given to members of the target audience. This resulted in better management to improve water and soil quality.

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
123	Management and Sustainability of Forest Resources
125	Agroforestry

134	Outdoor Recreation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
205	Plant Management Systems
213	Weeds Affecting Plants
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
403	Waste Disposal, Recycling, and Reuse
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Expected change in agricultural practices from farmers. Better management of agricultural and natural ecosystems complex.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need to understand the source of water contamination from agricultural fields and to devise strategies to mitigate the contamination. Deterioration of water quality due to runoff from CAFOs is a problem. Conservation and protection of native plants and other natural resources helps to protect watersheds, which results in cleaner water, air, soil and healthier and safer environments.

What has been done
Soils were collected from agricultural fields, pastures and forests in Central Missouri to identify potential sources for soil contamination. Water samples were also collected and analyzed to determine the levels of E.coli, dissolved organic matter, nitrogen, phosphorous and antibiotic drugs. Through field days, conferences, seminars and other events, awareness was increased about the importance of protecting natural resources.

Results

We have a better understanding of greenhouse gas emissions and a new approach to measure these emissions from fields, pastures and forests. Stakeholders were educated to alter agricultural practices to reduce emissions from agricultural fields. Better management practices are being used to improve water quality.

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
123	Management and Sustainability of Forest Resources
125	Agroforestry
134	Outdoor Recreation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
205	Plant Management Systems
213	Weeds Affecting Plants
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
403	Waste Disposal, Recycling, and Reuse
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Environmental sustainability; Improved quality of life

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water contamination from runoff associated with agriculture and CAFOs is a public health risk for those who live in and near contaminated sites. Drinking water treatment methods are being developed and the public needs to be informed on this topic.

What has been done
Risk reduction of water and soil contamination was conducted. This helps restore water and soil to protect humans from environmental contamination. Participants in field days, seminars and workshops were introduced for conservation practices.

Results
The health and ecological risks associated with water contamination and forestry were assessed. This research helps sustained natural resources and improved environmental quality and quality of life. Better management practices were instituted.

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
123	Management and Sustainability of Forest Resources
125	Agroforestry
134	Outdoor Recreation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
205	Plant Management Systems
213	Weeds Affecting Plants
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
403	Waste Disposal, Recycling, and Reuse
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Contribution to understanding of interactions between human practices and natural ecosystems; Enhanced stakeholders knowledge and understanding of environmental issues; Better management of agricultural and natural ecosystems complex.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This research is leading to reducing the health and ecological risks associated with water and soil in agriculture watershed, sustains natural resources and improves environmental quality and quality of life. Better management practices are needed.

What has been done
Over 100 workshops and presentations were given to help educate the target audience. Research was conducted to evaluate water quality in agriculture ecosystem. Samples were taken from fields and stream for further analysis to help determine the level of contamination and impacts to groundwater.

Results
The overall results, so far, are a better understanding of the relationship between soil properties and water quality as well as heath of ecosystems. More of the target audience has been informed about environmental issues and the complex interaction between natural ecosystems and human practices. Better management practices and conservation practices have been instituted.

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
123	Management and Sustainability of Forest Resources
125	Agroforestry
134	Outdoor Recreation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
205	Plant Management Systems
213	Weeds Affecting Plants
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

403	Waste Disposal, Recycling, and Reuse
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

The factors above could have impacted outcomes, but in the past year, there were few external factors that did hinder the projects. The under-state match is always an issue.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 7

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
402	Engineering Systems and Equipment	0%	10%	0%	25%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%	60%	0%	50%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%	30%	0%	25%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	4.0
Actual Paid	0.0	1.0	0.0	1.0
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**
0	161519	0	1302149
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	440942
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Develop micro- and nano-sensors for food contamination detection.
2. Develop biological control methods to reduce vegetable-borne pathogens
3. Present and publish experimental results in journals and scientific conference.
4. Conduct seminar and workshop to distribute information on nutrition and physical activity to clientele.

2. Brief description of the target audience

Farmers, scientists, african-Americans, low-income families and other under-represented groups in state of Missouri, especially St. Louis, Kansas City, Bootheel areas

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6660	1543	750	8400

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publication, presentations, workshops and contacts.

Year	Actual
2018	48

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Measurable improvements in public health and reduction in health care costs for specific population such as African-Americans, low-income families and other under-represented groups. Expect 80% positive response of those contacted.
2	Children and adults make short-term and long-term decisions on healthier choices and increased physical activities.

Outcome #1

1. Outcome Measures

Measurable improvements in public health and reduction in health care costs for specific population such as African-Americans, low-income families and other under-represented groups. Expect 80% positive response of those contacted.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
All families that prepare foods want to know that the food they purchase is safe, nutritional and free of toxic bacteria and pathogens.

What has been done
The sensors for detecting food contamination were developed and tested, and biological methods to control vegetable pathogens studied. Workshops and presentations were made to community groups, schools and students to stress the importance of food safety and nutritious.

Results
We expect an 80% positive response of those contacted. Some of the research findings were presented in conferences and published in journals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Children and adults make short-term and long-term decisions on healthier choices and increased physical activities.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health officials, food processors and handlers as well as low-income and underserved populations are deferentially impacted by food safety. Safe, clean food is necessary to help prevent illnesses and lower health care costs.

What has been done
Early testing of a sensor to more readily identify bacteria and other food pathogens has been developed. Early experiments indicate that the testing device is very sensitive, with sensitive detection so far.

Results
Early elimination of contaminated food to prevent human illnesses and costly market recalls. Experiments are still being conducted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Changes in any of these external factors could ultimately impact funding dollars that are necessary to continue the project.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Effectiveness of the detection sensors and biological method is the key to evaluate the results. The positive feedback from contacts are critical.

Key Items of Evaluation

This research will provide a fast detection for E. coli and other bacteria and reduce food pathogens. An early detection of contamination will prevent the food from being sold and prevent people from becoming ill and will prevent costly food recalls.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

☐ Reporting on this Program

Reason for not reporting

The faculty in this expertise resigned from the university. Currently the program has no faculty in this expertise.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	2.0
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

Proposed studies are designed to fully develop, evaluate, and demonstrate the capabilities of the innovative technology for economical and efficient production of algae-derived oils for use as the source of biofuel. To achieve the overall goal, the proposed work will be performed in two major areas: 1) Micro-

algae cultivation and harvest, and 2) Algae oil extraction and trans esterification.

The ultimate goal of another project is to maximize the bioenergy (biomethane, and bio-oil) production from switchgrass with producing biochar as a valuable soil amendment. To achieve this goal, experiments along with energy and mass balance models will be combined to optimize the net energy production from two conversion systems including integrated biochemical and thermochemical conversion processes. Microalgae will be used as an amendment to adjust the C:N ratio and moisture content of switchgrass prior to the biochemical conversion processes.

A third study will evaluate the application of biochar to soil as a novel approach to establish a long-term sink for atmospheric carbon dioxide in the terrestrial ecosystem. The application of biochar to soil has the potential to improve soil fertility and increase crop production. This project will address whether carcinogenic polycyclic aromatic hydrocarbons (PAHs) are formed in the process of slow pyrolysis of air-dried biomass, and if so, how the process could be modified and standardized to reduce or eliminate the possibility of PAHs formation. A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

2. Brief description of the target audience

- Undergraduate/graduate students
- Small Farmers
- Local Electric Cooperatives
- Scientists and other Researchers
- Extension workers
- Policy makers/ Regulatory Agencies
- Local Citizens/Community Leaders
- Engineers

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2018

Actual: {No Data Entered}

Patents listed
{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Short term output measures are: Abstracts, presentations, training students, and workshops. Intermediate output measures are publications

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Identify high yielding, hardy pest resistant microalgae strains.
2	Develop commercial cultivation system for mass production of algal biomass
3	Educate stakeholders on research status for environmental solutions
4	Educate farmers, scientists, and engineers about the economic feasibility of biomass production.
5	A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

Outcome #1

1. Outcome Measures

Identify high yielding, hardy pest resistant microalgae strains.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

Develop commercial cultivation system for mass production of algal biomass

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Educate stakeholders on research status for environmental solutions

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

Educate farmers, scientists, and engineers about the economic feasibility of biomass production.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

A "Biochar Thermal Index" will be developed based on thermochemical decomposition of lignin constituent of biomass.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Childhood Obesity

☑ 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
607	Consumer Economics	0%	20%	0%	0%
701	Nutrient Composition of Food	0%	20%	0%	0%
702	Requirements and Function of Nutrients and Other Food Components	0%	20%	0%	0%
703	Nutrition Education and Behavior	0%	20%	0%	0%
704	Nutrition and Hunger in the Population	0%	20%	0%	0%
	Total	0%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	2.0
Actual Paid	0.0	1.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	8879	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Perform experiments and publish results.
- Presentation of experimental results in scientific conference and seminars.
- Conduct workshops.
- Distribution of nutritional information and physical activities

2. Brief description of the target audience

African-Americans, low-income families and other under-represented groups in St. Louis, Kansas City, the Bootheel, and Jefferson City areas in the state of Missouri.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1540	2545	1920	5910

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of publications, presentations, workshops, and contacts.

Year	Actual
2018	32

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase knowledge of good nutrition measured by surveys pre- and post-nutrition education. Increased awareness about relationship between nutrition and physical activity and chronic diseases measured by periodic surveys. increase nutrition knowledge, awareness, and importance of nutrition for prevention of chronic diseases.
2	Number of citations of publications by other scientists in scientific papers. -Use of research results by nutrition extension and health care specialists. Improvement of eating behavior and physical activities. -Decrease in percentage of overweight and obesity in research and extension participants. Medium-term: 2010 - measurable weight reduction (1-5%) in overweight and obese subjects and clientele. Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). measurable weight reduction (1-5%) in overweight and obese subjects and clientele 2011 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2012 - Same as 2011. 2013 - Same as 2012 and number of citations of publications = 10 2014 - Same as 2013 and number of citations of publications = 15

Outcome #1

1. Outcome Measures

Increase knowledge of good nutrition measured by surveys pre- and post-nutrition education. Increased awareness about relationship between nutrition and physical activity and chronic diseases measured by periodic surveys. increase nutrition knowledge, awareness, and importance of nutrition for prevention of chronic diseases.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Missouri is ranked high in the nation for obesity. Many stakeholders have an interest in finding educational information for food nutrition and change of life style.

What has been done
Numerous presentations, publications and workshops have informed all targeted audiences about the present research status.

Results
More informed and interested stakeholder audience are aware of food nutrition and obesity-associated health risks and willing to change their life style and physical activities in order to prevent chronic disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #2

1. Outcome Measures

Number of citations of publications by other scientists in scientific papers. -Use of research results by nutrition extension and health care specialists. Improvement of eating behavior and physical activities. -Decrease in percentage of overweight and obesity in research and extension participants. Medium-term: 2010 - measurable weight reduction (1-5%) in overweight and obese subjects and clientele. Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). measurable weight reduction (1-5%) in overweight and obese subjects and clientele 2011 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). 2012 - Same as 2011. 2013 - Same as 2012 and number of citations of publications = 10 2014 - Same as 2013 and number of citations of publications = 15

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
All stakeholders always have an interest in finding more useful research and educational information on this topic.

What has been done
Several training, publications and workshops have informed all targeted audiences about the current research.

Results
A more informed and interested stakeholder audience has participated in outreach activities on this topic.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components

703 Nutrition Education and Behavior

704 Nutrition and Hunger in the Population

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

Changes to any or all of above external factors could have a substantive impact on continued research and extension activity.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre- and post-program surveys will be utilized to measure educational and change results.

Key Items of Evaluation

Consistency with participants in following through with program events, goals, and plans can affect results.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
50	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
2	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)	
2	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
2	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.