2019 Annual Report of Accomplishments and Results

Missouri
University of Missouri
Lincoln University of Missouri
[insert name of Institution reporting in this document]
[insert name of Institution reporting in this document]

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

1. Executive Summary (Optional)

University of Missouri

University of Missouri Research and Extension contributed to better the lives of Missourians in 2019.

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 2019, 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 2019 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 collaborations to effectively address critical and urgent 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 farms, especially underserved farmers. The research program currently 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 2019 plan of work by disseminating research-based knowledge to our target audience.

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 construction of a facility. The 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.

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

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates

1. The Merit Review Process	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 **University of Missouri** In early 2019, University of Missouri Research and Extension senior administrators visited all 114 counties (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 in-depth 2017 needs assessment. These visits and additional dialogues contributed to re-defined local priorities and program planning. In the fall, the Vice Chancellor for Extension and Engagement (director) and senior administration met with the eight regional extension councils and regional faculty and staff groups to further discuss program direction and funding priorities. In 2019, the policies related to Extension faculty, re-written in 2018, were adopted. 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** In addition to the merit review processes mentioned above, research faculty and state specialists also use current literature, relevant national databases, and stakeholder's inputs to identify statewide priorities and critical issues facing Missouri residents for the program needs.
2. The Scientific Peer Review Process	We have made significant updates to this section in our 2021 Plan of Work in order to more directly respond to the information requested by NIFA. Please refer to our 2021 Plan of Work for all updates.

III. Stakeholder Input

The NIFA reviewer will refer to your Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	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 **University of Missouri** In early 2019, University of Missouri Research and Extension senior administrators visited all 114 counties (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 in-depth 2017 needs assessment. These visits and additional dialogues contributed to re-defined local priorities and program planning. In the fall, the Vice Chancellor for Extension and Engagement (director) and senior administration met with the eight regional extension councils and regional faculty and staff groups to further discuss program direction and funding priorities. County Extension Councils, which include elected officials and other stakeholders, reviewed 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. Methods to identify individuals and groups and brief explanation.	Method to identify individuals and groups: ● Use Advisory Committees ● Use Internal Focus Groups ● Use External Focus Groups ● Needs Assessments ● Use Surveys **University of Missouri** University of Missouri Research and Extension continues to build 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 C-Vent and Engagement Cloud technologies), and updated needs assessments related to key program areas for every county. The County Engagement Specialist (CES) faculty also have responsibility for one of three roles: 4-H and Youth Development, Community and Economic Development or Nutrition and Health. The Community and Economic Development CES worked in their assigned counties to conduct "Connect Strategy Interviews" with key stakeholders in the communities. **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.
3. Methods for collecting stakeholder input and brief explanation.	Methods for collecting Stakeholder Input ● Meeting with traditional Stakeholder groups ● Meeting with traditional Stakeholder individuals ● Meeting specifically with non-traditional groups ● Survey specifically with non-traditional individuals ● Meeting specifically with non-traditional individuals ● Meeting with invited selected individuals from the general public **University of Missouri**

	To continue following up on 2017's comprehensive statewide needs assessment (including community conversations, quantitative analyses, and external reviewers), in 2019 University of Missouri senior administrators met with all counties in extension council meetings. In the fall, the Vice Chancellor for Extension and Engagement (director) and senior administration met with the eight regional extension councils and regional faculty and staff groups to further discuss program direction and funding priorities. 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.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	● 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 **University of Missouri**

	Stakeholder input from the 2017 needs assessment and the 2019 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. Planned Program Table of Contents

V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	Basic and translational research will be conducted and the results disseminated via scientific publications, scientific meetings, web publications, workshops, conferences. • 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	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. • Parts of Missouri experienced record rainfall and record flooding in 2019. Data from the U.S. Department of Agriculture shows that about 1.4 million acres of Missouri land were reported for prevented planting. Of those acres, 1.2 million were directly affected by major flooding. University of Missouri Extension created a Flood Resources landing page as a one-stop resource location for those affected. The page included links to articles, publications and sources providing aid to farmers and families displaced by the flooding and a plentitude of information on managing the aftermath at home and on the farm. Due to the 2019 flooding, FEMA provided more than $93 million in federal funding and $68.7 million in flood insurance claims to Missouri residents and policyholders. The Flood Resources landing page connected affected Missourians to aid and information they needed to get back on their feet or recover losses. The MU Extension flood resources page contributed to farmers and families in 81 of Missouri's counties receiving the assistance they needed 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.	Sustainable Food Production/Security and Environment/Natural Resource Management

	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.	• Farm yields can vary significantly due to variations in the field and environment – soil, weather, weeds, insects, moisture, and disease. These factors and others determine crop growth and farming success. Overuse of fertilizers and pesticides to address these issues can have negative impacts on the environment and farm profitability. Excess fertilizers can contribute to algae blooms in surface waters, pathogens and nitrates in drinking water, and the emission of odors and gases into the air. The University of Missouri Extension Precision Agriculture program seeks to manage variations in the field accurately using inputs, such as nutrients, pesticides, seeds or water, in a sparingly and strategic way. The practice uses new technology and management practices to improve productivity and resource efficiency, reduce costs and exert minimal environmental impact. Tools used include GPS receivers, remote sensing units, drones, GIS hardware/software and variable-rate fertilizer application. Precision agriculture gives farmers the ability to more effectively use crop inputs. More effective use of inputs means greater crop yield and (or) quality, without polluting the environment. However, it has proven difficult to determine the cost benefits of precision agriculture management. One particular trial suggests a positive impact for the farmer of $18.00 per acre. At present, many of the technologies used are so new that pricing of equipment and services is hard to pin down. Precision agriculture can address both economic and environmental issues that surround production agriculture today. Many farmers are at a sufficient level of management that they can benefit from precision management. Questions remain about cost-effectiveness and the most effective ways to use the technological tools we now have. Ultimately, the success of precision agriculture depends largely on how well and how quickly we develop the knowledge needed to guide the new technologies. 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. • Increasingly, women involved in agriculture own and operate their own farms and ranches. The 2017 Census of Agriculture found that the number of women-owned farms in Missouri more than doubled from 2007 to 2017. One-third of the farm operators in the state are women. The census also reported that the number of women-operated farms increased in all sales classes, suggesting that size does not matter when it comes to agricultural opportunity for women. University of Missouri Extension Women in Agriculture program seeks to improve the economic viability and overall sustainability of Missouri farms by providing research-based educational programs that strengthen agricultural businesses, increase stewardship of natural resources, empower and support women in agriculture. Programs such as Pearls of Production and Annie's Project teach women to be better business partners and offer hands-on training in leadership and livestock production. After six years of conducting the program, 82% of women attending the Pearls of Production conference have changed daily production operations to implement the knowledge they gained. One hundred percent of women attending reported that they would recommend the program to other women in the industry. In 2019 alone, Annie's Project educated more than 70 Missouri farm women at various events. The majority of these women reported that their knowledge of general business practices had increased and that they planned to share what they learned with others.	
2.	Faculty will conduct workshops, multi-session programs and meetings, intensive courses, conferences; develop	Percent of participants adopting research based practices as result of increasing their knowledge of family resource management, healthy food and nutrition practices, and healthy lifestyles. 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	Personal, Family and Community Wellbeing

	products, curriculum and resources; provide training and consultation; and work with and use various media to share state of the art knowledge and research.	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. • 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. 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. 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 2019, University of Missouri Extension helped file 7,422 federal returns for low- to moderate-income individuals, with a total federal refund in excess of $3.4 million. Assuming that the average tax return costs $200 dollars to prepare, this has saved Missouri residents roughly $1.2 million in tax preparation costs, not counting other fees like Refund Anticipation products. 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. • 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. 4-H field and campus faculty and staff engaged 84,095 youth 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. 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. Missouri 4-H connects thousands of youth, parents, volunteers and professionals to MU. A volunteer system of 11,912 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 2019, 45,869 4-H members from 116 counties and 6 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. 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.). • Government representatives, civic leaders, employers 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, improving/growing job markets, internet broadband access, improved infrastructure, improved quality of life and a host of other issues. However, they often lack the capacity or understanding about the interconnected nature of these opportunities and how to become effectively engaged in addressing the issues of concern to them and their communities. Missouri Community and Leadership Development has implemented significant organizational and focus changes to address the needs of our state focusing efforts on Community Economic Development, creating an interconnected unit with expertise in Workforce Development, Local Government/Public Policy, Business Development, Community Engagement, Regional Economic Development, and Ag-Business Development. The field of Community and Leadership Development is rapidly changing with emphasis shifting to the building of engaged networks of citizens and Extension personnel, and is being addressed by the CES reorganization. Community Economic Development – County Engagement Specialists have engaged 37 Missouri counties through the Connect Strategy, completing data profiles, stakeholder interviews, and developing issue statements of local needs in Missouri communities. Identifying the following issues as common to our citizens: Workforce, Leadership & Cooperation,	

		Infrastructure, Place-making, Economic Development, Equity, and Health. Over 16,000 direct contacts were educated in leadership, business/ag-business, workforce, and regional economic development programs (69) and conferences, workshops and courses were held (806) to develop the individual capacities of people to effectively participate in their communities and embrace leadership opportunities. Plans were developed with communities, businesses, and organizations (32) to help identify key issues and organize effective responses and new organizations were created (36), 3,248 jobs created and over 17,000 jobs retained, to leverage resources in the community and provide opportunities for new leadership to emerge. Community development academy participants reported leveraging 4,068 volunteer hours valued at $97469, increased resources leveraged for their communities of $84,947. 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. Missouri businesses have leveraged $157,687,604 in loans and investments, increased sales by $219,336,022 and secured contracts of $301,679,283. In 2019, the Missouri Business Development Program advanced rural access to resources and education for technology companies throughout the state. Through a defined strategic plan the BDP began offering training to rural businesses through online video conferencing. Business owners, innovators, and researchers were able to attend the events at their local centers to ensure reliable connectivity. In another effort to reach a more rural audience, the Missouri BDP in Southeast Missouri collaborated with regional organizations to bring business resources to the small business	

		community. Partnership projects included livestreamed interviews with business leaders through the Cape Girardeau Chamber, Food and Consumer Trends workshop with Kennett Economic Developer, Strategic Planning workshop in Poplar Bluff with local Co-Working space Smart Space, and several other business workshops hosted throughout the communities. In FY19, the Business & Communities Extension program worked collaboratively with 206 communities, 37 Missouri counties, and 375 additional partners to foster economic development and create capacity for sustainable communities and quality jobs through programs in regional economic development, business and workforce development, leadership, community decision-making, and building inclusive communities. Results reported included: • $219.34 million in increased sales and $301.68 million in government contracts secured by Missouri businesses • $84,947 in grants and other resources or efficiencies acquired by communities and organizations • $157.69 million in loans and investments secured by Missouri businesses • $97,469 in volunteer hours generated by B&C Extension to conduct programs • $56,701 in volunteer hours generated by communities and organizations as result of programs • 206 participants reported taking on new leadership roles • 32 community, business, and organizational plans developed • 13 community and organizational policies/plans adopted and/or implemented • 151 community/organizational programs and activities initiated or completed	

		• 3,248 new jobs created and over 17,000 jobs retained • 36 new organizations created	
3.	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. a) Conduct research for out of season breeding and production of small ruminants. b) Small ruminant health and production management. c) Poultry nutrition and production management d) Best management practices for beef production. e) Develop sunfish cultigens for Missouri small farms.	Livestock-Develop improved approaches to out of season production in small ruminants. 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. • 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. Research is focused on diets and operation for food-sized sunfish as well as breeding for the out of season production 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. Research is focused on diets and operation for food-sized sunfish as well as breeding for the out of season production and native plant grazing for sheep and goats. Efforts	Global Food Security and Hunger

	f) Determine nutritional requirements of sunfishes. g) Develop optimal production dynamics for sunfishes. h) Provide aquaculture fish health services for stakeholders. i) Introduction and evaluation of new crops (especially native crops) and improve production management practices. j) Hydroponic vegetable production k) Organic production practices for animal and vegetable production l) Industrial hemp variety trial for Missouri farmers m) Promotion of backyard and community gardening. n) Conduct analysis of the challenges of rural entrepreneurship and their impact on the prospects of community development. o) Develop effective and environmentally and grower friendly IPM approaches to manage key insects of small fruits and vegetables	were made to reduce fertilizer and insecticide use for organic farming practices. Trainings were organized for many farmers with hands-on training and demonstrations. Transfer new technologies for sunfish, specialty crop, small and large ruminant production to farmers. Farmers will use learned technologies. • 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. 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. 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. Farmers adopt new technologies for increased and sustainable production. • It will help small, limited-resource farmers improve food production and increase profits and add to the economy of Missouri. 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. 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.	

	p) Soil management for building soil organic matter and improving soil health q) Conferences, meetings, workshops, and training and educational opportunities for small farms. r) Abstracts, publications, grant proposals, and guide sheets.	• 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. • Small, limited-resource farmers are urgently needed for technical assistance to improve production and increase profit, which will add to the economy of Missouri. 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. 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. 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. • 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. During FY 2019, the ISFOP served 147 families (32% minority farmers) and 24 community groups in 13 counties and the City of St. Louis. Staff made 226 farm visits and offered one-	

		on-one consultations; organized and/or presented at 93 workshops and conferences; and taught classes with 2639 total attendees. In 2019, 108 ISFOP clients reported that because of ISFOP's help, income per farm rose an average of $1,628.00 1,200. Because of these activities, 108 client farmers reported a total *income increase* of $175,770 from farming, which averaged to $1,628 per farm. Staff helped farmers to secure funds 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. Farmers used some kind of season extension techniques in FY 2019.	
4.	<u>Strengthening skills for small towns, communities and organizations</u> 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	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. • 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. Women in domestic violence shelters need employment skills. 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. There were more than 50 men trained and more than 10 percent of them found employment. 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. • As small municipalities in Southeast Missouri gain population local	Community and Leadership Development

	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	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. 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. 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.	

	leadership skills, work planning and goal setting, customer/resident relations, effective communication skills, budgeting, funding accounting and grant administrations, managing personnel issues, and negotiations.		
5.	**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.** **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.	Short term outcome measures: 1) Enhanced academic productivity, 2) Improved rate of community volunteerism 3) Development of leadership skills, 4) Increased knowledge and life skills. • 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. 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 youth in Kansas City elementary schools. Brain Builders: A Growth Mindset Development is a research-based program designed to teach how to develop a Growth mind set. 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. BB Students learned how the brain works to overcome challenges, develop learning strategies, and increase confidence while improving academic achievement. Students were pre- assessed to determine their current mindset and were later post-assessed at the end of the program.	Family and Youth Development

	• Program to address childhood obesity for parents and youth. • 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. Kansas City • Mentoring Program that matches community volunteers who will spend time with interestedyouth. Delta Sigma Theta sorority and Phi Beta Sigma and Alpha Phi Alpha fraternities often assist with this program. St. Louis • A computer literacy service for senior citizens was	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. • 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. 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. Each of the 115 students participating in the program matriculated to the next grade level. All of the 35 seniors graduated from high school Long term: 1) Improved education levels, 2) Increased standard of living, 3) improved quality of life. • 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. 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	

	established. A cyber cafe provided one-on-one tutoring for seniors to increase their knowledge and/or improve technological skills. South East Region • 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. Central Region • 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.	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. 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.	
6.	**Stream Water Quality** Missouri region is one of several areas in the United States having confined	Chemical and biological characterization of the ecosystems. • Water contamination is causing serious environmental and health problems. The chemical and toxic leachates, pathogens and biological	Climate Change

	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, natural organic matter 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	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. Reduced soil organic matter could negatively impact soil health and productivity. 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. Cover crops were evaluated for their effects on soil organic matter building up, soil biological properties and soil productivity. 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. Expected change in agricultural practices from farmers. Better management of agricultural and natural ecosystems complex. • There is a need to understand the source of water contamination from agricultural fields and to devise strategies to mitigate the contamination and soil quality degradation. Deterioration of water and soil quality due to runoff from CAFOs is a problem. Conservation and protection of native plants and other natural resources helps protect watersheds, which results in cleaner water, air, soil and healthier and safer environments. 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. We have a better understanding of aquatic chemistry and soil organic matter dynamics and	

	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 and Productivity Assessment of Forestry Ecosystem** This study is to use the remote sensing and geospatial technology for investigating tree mortality and health in Missouri	develop new approach to improve water and soil quality in agricultural watersheds. Stakeholders were educated to alter agricultural practices to control stream contamination from agricultural fields. Better management practices are being used to improve water and soil quality. Environmental sustainability; improved quality of life • 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. 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. 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. • 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. 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. 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. 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	

	forestry ecosystem and link tree health and productivity 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	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.	

	of soil physicochemical properties (e.g, pH, CEC, free Fe and Aloxides, organic C, particle size distribution) on sorption of AGNPs in soils. **Improving Soil Health using Cover Crops** Soil organic matter degradation is of agricultural and ecological concern due to intensive agriculture practices and weather change. Building up soil organic and improving soil health are critical for soil quality and productivity. This project is aimed at improving soil health by building up soil organic matter content using various cover crops The research objectives are to understand the cover crop impacts on soil organic matter dynamics and biological properties and develop the best management practices for improving soil health and		

	productivity. **Differentiation of Environmental E. coli from Enteric E. coli for Water Quality Assessment** E. coli is a fecal bacteria indicator for stream water quality. It is used 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		
7.	• Develop micro- and nano-sensors for food contamination detection. • Develop biological control methods to reduce vegetable-borne pathogens • Present and publish experimental results in journals and scientific conference. • Conduct seminar and workshop to distribute information on nutrition and physical activity to clientele.	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. • All families that prepare foods want to know that the food they purchase is safe, nutritional and free of toxic bacteria and pathogens. 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. We expect an 80% positive response of those contacted. Some of the research findings were presented in conferences and published in journals. Children and adults make short-term and long-term decisions on healthier choices and increased physical activities. • 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. 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. Early elimination of contaminated food to prevent human illnesses and costly market recalls. Experiments are still being conducted.	Food Safety

8.		Did not Report – no faculty expertise	Sustainable Energy
9.	Conduct workshops and distribution of nutritional information and physical activities	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. • 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. Numerous presentations, publications and workshops have informed all targeted audiences about the present research status. 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. 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: - 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 - Utilization of research outcomes by the extension specialist (2-3 good nutrition guides). number of citations of publications = 15 • All stakeholders always have an interest in finding more useful research and educational information on this topic. Several training, publications and workshops have informed all targeted audiences about the current research. A more informed and interested stakeholder audience has participated in outreach activities on this	Childhood Obesity

		topic.	