

2019 Annual Report of Accomplishments and Results

Oklahoma State University
Langston University

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)
No Updates – See Plan of Work

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 <u>Merit Review Process</u>	No Updates – See Plan of Work
2. The <u>Scientific Peer Review Process</u>	No Updates – See Plan of Work

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	No Updates – See Plan of Work
2. Methods to identify individuals and groups and brief explanation.	No Updates – See Plan of Work
3. Methods for collecting stakeholder input and brief explanation.	No Updates – See Plan of Work
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	No Updates – See Plan of Work

IV. **Planned Program Table of Contents**

No.	Program Name in order of appearance
1.	Youth Development
2.	Family and Child Resilience
3.	Human Health and Hunger
4.	Personal Finances and Job Readiness
5.	Environment and Natural Resources
6.	Animal Production Enterprises
7.	Plant Systems
8.	Economic Development and Poverty Alleviation
9.	Food Safety and Food Insecurity

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.	STEM Technologies	<p>Issue - When considering the importance of science, technology, engineering, and mathematics (STEM) education, many reports speak of job opportunities and economic drivers in a global environment. Research strongly suggests that STEM educational initiatives are not just creating scientists and engineers but producing STEM-literate persons in all areas of the workforce.</p> <p>4-H SCIENCE MISSION MANDATE: The need for science, engineering, and technology education is essential for today’s young people. 4-H programs prepare youth for the challenges of the 21st century by engaging them in a process of discovery and exploration.</p> <p>Response - Five STEM in-service trainings were held for 4-H OCES Educators. 68 educators participated two workshops and one booth at OCES Biennial conference. Oklahoma 4-H partnered with the Science Museum Oklahoma to offer a STEM Night at the Museum with approximately 600 youth and adults attending.</p> <p>An Innovate 4-H teen leadership Summit was organized to train teens to teach STEM workshops to younger youth and generally promote STEM projects across the state of Oklahoma.</p> <p>The 4-H STEMist program was offered for the third year. This program trains and supports select college students to travel across the state providing STEM support to 4-H Educators as they offer summer camps and day-camps. Four STEMists were trained to teach youth programming on eight topics; Water Power, Wind Power, Coding, Medical Technology, Bio-Technology, Structural Engineering and Photography.</p> <p>Results - Through the STEMist’s hard work 2,369 Oklahoma youth learned about Science, Technology, Engineering and Math within 40 counties. Our Innovate teens reported teaching 54 workshops to a total of 2552 contacts. Approximately 1000 contacts with agriculture and 1,500 in CS, as of October 1,</p>	Youth Development/#1

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		<p>2019. The interesting fact about this program is, that when National Council offered its 2019 CS teen leader program, Oklahoma had 25 teens sign up, many of which were working as Innovators. In 2018 we only had three register as CS Leaders. We credit the Innovator program for sparking this new interest in teens teaching.</p> <p>The County Educators reported reaching 105,562 youth in 2019 with STEM programming. Oklahoma’s Common Measures Evaluation system indicated our STEM programming enhanced following:</p> <p>STEM Common Measures Evaluation 2019</p> <ul style="list-style-type: none"> • 53% Ask how things work • 56% Try new things to see how they work • 71% Are interested in a Science related job • 64% Are interested in an Engineering related job • 67% Learned new things about Science in 4-H • 85% Learned new things about Engineering in 4-H • 73% can “sort of” plan an experiment • 40% can analyze data to draw conclusions <p>Youth Quotes regarding their 4-H STEM experience:</p> <p>"I love thinking outside the box and using logic that I have learned to make things. Through my Science and Technology project area, I learned was to never give up no matter how hard the task. This skill will help me in the future as I pursue my degrees in Electrical and Computer Engineering,"</p> <p>"Agriculture taught me many lessons throughout the years including responsibility and sportsmanship. The lesson that has helped me the most though is determination. Most of my down time was spent working with animals or prepping for my next workshop. I learned I have to give my all in every situation and stay optimistic about my goals,"</p>	
	<p>4H Youth STEM Technologies (LU)</p>	<p>Issue</p> <p>With increasing demand for diversity within STEM career fields throughout the nation there is a need for minority youth to be exposed to STEM technologies early in their academic career. The 4H youth program is a proven way to provide STEM exposure and experience to minority youth. With local schools reducing school to a four-day week and many urban schools reducing funding for STEM activities there is a need for more STEM activities.</p> <p>Response</p>	

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		<p>A two-day event called “Kids, Kows, and More” was held Jan. 31 and Feb. 1 The purpose of the event was to provide an interactive opportunity for northeastern Oklahoma youth to learn about agriculture and safety that is relevant to their surroundings. This event brought together youth from schools all around the Tulsa Public Schools and surrounding school systems.</p> <p>A one-day youth expo was held at the Tulsa Fair Grounds that exposed kids to agriculture and the STEM careers available to them. This was held in partnership with the Tulsa Regional STEM alliance.</p> <p>A STEAAM (Science, Technology, Engineering, Agriculture/Arts, Math) 3 week summer camp was held for youth at Langston University School of Agriculture and Applied Sciences.</p> <p>Results</p> <p>The two events were well attended with approximately 900 youth attending the “Kids, Kows, and More” event and approximately 1,200 youth attending the Youth Expo event.</p> <p>24 youth grades 5 through 12 attended the STEAAM camp. Many of the youth expressed interest in math and science after attending the STEAAM camp.</p>	
<p>2.</p>	<p>Citizenship and Community Service</p>	<p>Issue - The Essential elements of positive youth development (PYD) are critical to effective youth development programs. These elements help youth become competent, contributing citizens. Created from traditional and applied research characteristics that contribute to PYD, they help professionals and volunteers who work with youth view the whole young person, rather than focus on a single aspect of life or development. These elements focus on social, physical, and emotional well-being, and are necessary for positive youth development. All eight elements are present in a healthy 4-H club.</p> <p>Community service teaches compassion and understanding. Caring and compassion are two of the traits identified as vital components to positive youth development</p> <p>Response - Oklahoma 4-H participated in the “National 4-H Day of Service” with over 25 service-learning projects being reported up 40% more projects than 2018. Over 2,000 4-H members and adults worked effectively to plan, implement and evaluate service-learning projects all around the state. These projects included working as guest chefs at the Ronald McDonald House Charities, making bags of supplies for foster children, planting flowers along Main streets, and collecting new and gently used backpacks for low income families. These youth and adults</p>	

		<p>spent approximately 85 hours implementing the projects but many more hours planning, researching and learning about community needs.</p> <p>The Oklahoma 4-H Leadership Council set a goal to raise \$20,000 for the Children’s Hospital Foundation for research. The council also learned about a new opportunity to collect pop tabs and work directly with patients at the Children’s Hospital through opportunities set up by the Children’s Hospital Foundation and Ronald McDonald House Charities.</p> <p>Oklahoma 4-H has partnered with Retired Major General Douglas Dollar and the Oklahoma Military Hall of Fame to help document military service of Oklahomans. Youth are contributing video interviews about service members in their family or community. An in-service for Educators to learn more about the Oklahoma Honors Campaign has been taught to 15 educators who are working directly with youth to schedule and record these interviews.</p> <p>Results - The State Leadership Council raised \$22,764.56 surpassing their goal of \$20,000 for the Children’s Hospital Foundation and will be recognized by the Children’s Hospital Foundation at the end of 2020 (due to COVID-19) as a partner with the Children’s Hospital Foundation. These youth leaders also learned how to plan and implement projects at the Children’s Hospital. The Oklahoma 4-H Leadership Council worked at 6 events alongside healthcare workers and other volunteers at the OU Children’s Hospital. Youth served drinks at patient family dinners, helped patients and siblings make crafts and danced with the youth in attendance at the family dinners.</p> <p>During the 2019 year, Oklahoma 4-H members became partners with the Oklahoma Military Hall of Fame Honors Campaign. This program helps document service members stories of service for the Hall of Fame and posterity. Youth conducted video interviews with the service members about their military service, what life was like during service, and life after military service. To date the Oklahoma 4-H members have contributed 59 videos to the project. These youth are not only learning about the service member but also learning about how to conduct an interview, the importance of preserving our National history, and also how military service affects the lives of service members and families. The Oklahoma Military Hall of Fame Honors campaign has recognized Oklahoma 4-H clubs as partners and invited 4-H members to the Oklahoma Military Hall of Fame induction ceremony for their contributions to the project.</p>	
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<p>3.</p>	<p>Family and Child Resilience</p>	<p>Children in Oklahoma are twice as likely as the national average to experience three or more adverse events such as abuse, neglect, or violence during their lifetime. Family dysfunction increases these numbers to at least 300,000 children per generation. The state ranks among the top 5 in the nation for number of divorces. Divorce has negative impacts on parents and youth and increases the risk of negative outcomes in youth. Youth whose parents divorce have a 25-30% increased risk of suffering a mental health condition. Improving parenting skills, family breakdown, and youth ability to overcome adversity are critical to Oklahoma’s future.</p> <p>So as to advance the socio-economic development of the state and have an impact on issues that address the critical areas of child and family resilience, Family and Consumer Sciences Extension educational programs and resources were provided to Oklahoma children, youth, and adults; specifically targeting parents.</p> <p>Oklahoma State University’s Co-Parenting for Resilience program helps divorcing or separating parents reduce the negative impacts of the divorce on their children and fulfills the state-mandated requirement of education for divorcing parents. In 2019, Co-Parenting for Resilience classes were provided both in-person and online, to 2,046 parents in 41 Oklahoma counties. Evaluation results show that Co-Parenting for Resilience is effective at helping reduce the impact of divorce on children and increasing paternal coping and positive parenting. Comments from parents who completed the program include: “I learned I really need to be careful of my emotions when I am around my kids. They had been pretty sad about the divorce and I can now see it has hurt them. I won’t make that mistake again” and “After she took this class, my ex threw out the original custody arrangement and gave me more time with our daughter. I think we would have been able to work things out if we had first taken this class together.”</p> <p>84% of Co-Parenting for Resilience participants became more likely to point out to their child positive aspects of their other parent</p> <p>85% of Co-Parenting for Resilience participants became more likely to approach parenting as a joint effort and view their child’s other parent as a valued member of the team</p> <p>In order to improve parent-child relationships, the <i>Active Parenting First Five Years</i> program was presented to 61 parents over four weeks. A parent who completed the program said, “I used to spank my kids, but I learned a new</p>	<p>Family and Child Resilience/#2</p>
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		<p>method through the Active Parenting program. I wish I would have learned it sooner!”</p> <p>70% of parents improved in knowledge of infant and child development, including understanding the importance of comforting crying infants, establishing predictable routines, and allowing infants and children the freedom to explore.</p> <p>72% of parents improved in responsive parenting, including such supportive behaviors as playing with children and praising their good behavior; setting limits, including communicating expectations and explaining rules; and teaching and reading to children.</p> <p>78% of parents increased in confidence in their own parenting abilities, including feeling they could continue to work with their child until things began to change.</p> <p>68% of parents increased their mindfulness, including increasing their concentration ability and their acceptance of their own thoughts and feelings.</p> <p>69% of parents reported that their children increased in positive behaviors, including sharing with other children, being kind, helping others, and complying with adult requests.</p> <p>73% of parents reported a reduction in their children’s hyperactive behaviors, including distractibility and inability to stay still, and an increase in their children’s attention span.</p>	
4.	Human Health and Hunger	<p>Poor diet and physical inactivity increase the risk of obesity, which in turn increases the risk of diabetes and cardiovascular disease. Fifteen percent of Oklahoma adolescents are considered overweight and an additional 12% are considered obese. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. Oklahoma’s above average poverty rate has led to high levels of hunger and food insecurity, which is associated with chronic disease. Food insecurity is linked to lower reading and math scores, and lower high-school graduation rates for youth. For the adult population, food insecurity decreases educational achievement, increases healthcare costs, and weakens the labor force. Poor food resource management skills and a lack of food preparation and food safety skills are detrimental to the health and welfare of Oklahomans. In order to advance the socio-economic development of the state, and have an impact on issues that address the critical areas of food, nutrition, and health, Family and Consumer Sciences Extension educational programs and resources were provided to Oklahoma children, youth, and adults; with target groups including parents, teachers, adult volunteers, middle to low income families, caretakers, agencies & service providers, schools, restaurant employees, food</p>	Human Health and Hunger/#3

	<p>handlers, community leaders, and policy makers. In Oklahoma, 15,500 lives could be saved annually through better prevention and treatment of chronic disease. Community Nutrition Education Programs (CNEP), a service of the Oklahoma Cooperative Extension Service, utilizes Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program Education (SNAP-Ed) funding to improve the health and nutrition status of low-income Oklahomans. Youth programs are taught both in- and outside school settings and adult education is delivered in either short or long-term programs. In 2019, 35,614 youth participated in programs such as Show Me Nutrition, OrganWise Guys, Farm to You, and Kids in the Kitchen. Participant and instructor comments include: "A young girl in one of the classes showed her mother how to read a food label in the grocery store. Her mother was going to buy Sunny D but decided on 100% orange juice after reading the ingredients." "Students have brought fruits and vegetables for snacks and lunch instead of high sugar/high carbohydrate food." "One offering of this program was in a youth emergency shelter. A participant, who had never been allowed to do anything in the kitchen, learned how to measure and cut vegetables and cook on the stove." In 2019, 2,805 adults completed the Fresh Start program and learned valuable skills needed to consume a healthy diet and be physically active on a limited income. A CNEP educator commented: "A 700+ pound male living with his parents was referred to our program. The family reports they are cooking healthier foods. They have learned about portion sizes, reading food labels, and decreasing fast food. He states his life has changed." 78% of 14,746 Show Me Nutrition graduates improved their abilities to choose healthy foods. 75% of 1,463 OrganWise Guys graduates improved their abilities to choose healthy foods. 79% 185 Kids in the Kitchen graduates improved their abilities to choose healthy foods. 92% of 1,666 Fresh Start graduates improved in one or more dietary quality areas. In order to improve the health of Oklahomans with Diabetes, the program Live Well, Eat Well, be Active, with Diabetes (LEAD) was presented to 162 Oklahoma adults. One participant reported on her progress, "I took the LEAD class five months ago. I have lost 13 lbs. and my A1C (blood glucose indicator) is down 1.3 points. This is because of the class and I want to take it again!"</p>	
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		<p>78% of Live Well, Eat Well, be Active, with Diabetes participants have maintained or lost weight</p> <p>57% of Live Well, Eat Well, be Active with Diabetes participants are in better control of their blood glucose.</p> <p>In order to improve food handling, preparation, and preservation skills, programs such as Cooking for 1 or 2, Food Safety for Seniors, and My Plate for My Family were presented to 928 adult participants. The Home Food Preservation program was attended by 658 adults and youth. Participants reported on important food safety lessons learned; “My family has been using unsafe canning practices and I will teach them the correct way.” and “I never thought about not mixing raw meat and vegetables. I had never heard of the danger zone, now I will keep our food safer.”</p> <p>77% of Cooking for 1 or 2 increased their safe food handling practices</p> <p>81% of Food Safety for Seniors participants improved their safe food handling and food storage skills</p> <p>94% increase in adults and 77% increase in youth planning to use safe and effective food preservation practices</p> <p>In order to assist Oklahomans in managing their food budgets, programs like My Plate for My Family were presented to 1164 Oklahomans. A participant said, “I’m going to teach my four sons how to prepare their own snacks and meals when I’m at work. It will be better for them and less expensive than what I have been buying from the store.”</p> <p>86% of participants became more likely to use financially responsible food shopping practices such as comparing prices and using coupons</p> <p>89% of participants became more likely to improve their food resource management practices, such as eating food before it spoils and buying produce in season</p> <p>In order to increase physical activity among Oklahomans, especially seniors and others with mobility issues, the programs Walk with Ease, Arthritis Foundation Exercise Program, and Tai chi: Moving for Better Balance were presented to 797 adults. Program participants commented: “I was afraid to walk alone because of frequent falls. At first, we only walked twice around the track. By the end we walked 1.25 miles in 28 minutes! I’m going to keep walking with my dog. He’s gotten fat!” “When I first started the exercise program, I could hardly turn my head to look over my shoulder while driving. Now I can turn my head without turning my whole body. This program has made me a safer driver.” and “I was</p>	
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		<p>afraid of falling and hoped it would improve my balance. I'm not athletic and doubted I could do it well. I was so surprised by the end; my balance has improved, and I can do all the Tai chi forms!"</p> <p>86% of participants said the program has helped them increase physical activity 85% of participants report that participation in the program has helped them function better during daily activities</p>	
	<p>EFNEP (LU)</p>	<p>Issue Over half a million Oklahomans live in households that are food insecure. Nearly a quarter million live in households with "very low food security," meaning their eating patterns were disrupted and food intake was reduced because they couldn't afford enough food, according to Food Security and Health. Oklahomans also face a number of diet-related chronic health problems such as obesity, heart disease and diabetes. According to the United Health Foundation, Oklahoma ranks 46th among all states for overall health. Up to one out of every five children in the United States is overweight or obese, and this number is continuing to rise. Oklahoma has obesity prevalence equal to or greater than 30%, according to the Centers for Disease Control and Prevention. Oklahoma placed last in line for fruit and vegetable consumption. The rising epidemic of obesity in the State of Oklahoma has increased (all statistical data has been provided as of 2013 from their respective sources listed). Unhealthy eating habits have been identified as the reason for diseases such as high blood pressure, diabetes; weight control, cancer and other illness.</p> <p>Response The LU EFNEP program has focused on three main priorities which includes improving diet quality and physical activity for adults and youth, improving food resource management, and improving food safety. The curriculum used was Fresh Start Nutrition You, Food & Fun for Everyone, and Let's Move and this has diet quality and physical activity included in the lessons. My Plate was utilized for each group for the participants to learn meal planning.</p> <p>Results Participants gained knowledge and skills that assist in changing their behaviors relating</p>	

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		<p>to eating more vegetables and fruits, consuming more low-fat dairy products, eating fewer high fat foods, meal planning, reading food labels, comparing food prices, sanitation, food preparation, food budgets and related areas. Participants have provided testimonials that their awareness of healthier eating has been improved because of the courses provided by Langston University Extension staff. Over 2,900 participants were reached this year through the EFNEP program.</p>	
<p>5.</p>	<p>Personal Finances and Job Readiness</p>	<p>Oklahoma is 43rd in the nation in unbanked and 37th in the nation in underbanked households, families without savings accounts, and consumers with subprime credit. Oklahoma has one of the highest student loan default rates in the nation, at 39th. The percentage of Oklahomans in low-wage jobs is 30%, which is 38th nationally.</p> <p>In order to advance the socio-economic development of the state, and have an impact on issues that address employment, personal financial management, and quality of life, Family and Consumer Sciences Extension educational programs and resources were provided to Oklahoma children, youth, and adults; with target groups including youth, adults, community leaders, job seekers, and businesses. To teach adults basic money management skills such as budgeting, setting financial goals, and credit management, programs such as Check and Balance, Dollar Decisions, were presented to 288 adults. By using the skills they learned, participants will have greater confidence in their financial future. Participant comments include: "I never had any instruction on credit, credit scores, or credit repair and I am very grateful for this information." and "During this program I learned how to budget for the first time, and I managed to save \$20.00. That's more than I've ever been able to save in my life!"</p> <p>91% of adult participants increased in intent to improve financial planning and responsible money management practices.</p> <p>We presented Reality Check and Welcome to the Real World, both interactive financial simulations, to 2978 youth in grades 8-12 in order to teach them basic life skills such as budgeting and managing a bank account. Students are assigned a role with certain circumstances such as marital status, number of children, income, and monthly expenses. The goal is to go through day-to-day activities representing one month without overspending. A student commented, "I found out being an adult is a lot harder than I thought, but it's not impossible. I should thank my parents more."</p> <p>82% increase in youth who understand the importance of saving money</p>	<p>Personal Finances and Job Readiness/#4</p>

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		<p>To assist Oklahoma businesses and communities, PRIDE, a customer service workshop, was presented to 176 front-line employees in the service industry. Participants learned that their attitude, customer service skills, and the first impression they make, can have a positive or negative impact on not only their employer, but also their community. Comments include “Don't get discouraged by a bad experience--keep giving good customer service” and “We can not only influence people within our office, but also those who are just visiting our community.”</p> <p>80% increase in understanding the role of customer service in building community support for a business</p> <p>78% increase in understanding the role dissatisfied customers play in business loss</p> <p>We conducted job readiness programs such as Pathways to Success, which teaches basic living skills to low-income Oklahoma adults, with 1089 older youth and adults to help Oklahomans improve both their marketability to potential employers as well as opportunity for success in the workplace. A participant said, “Thank you for coming. I have laid out my long-term goal to complete college and feel reassured of my plans.”</p> <p>75% improvement in skills necessary for successful workplace conduct and interactions</p> <p>90% improvement in skills necessary to successfully obtain employment</p>	
<p>6.</p>	<p>Restoring and Sustaining Agricultural Production on Oklahoma’s Grasslands and Forests by Mitigating Impacts of Invasive Species and Climate Change</p>	<p>Issue – Agricultural production and other ecosystem goods and services on grasslands and forested areas in Oklahoma are threatened by invasive species and climate change. Early research has suggested that negative effects of invasive species are and will continue to be exacerbated by climate change. Research and Extension faculty and students are studying a variety of invasive species/climate change topics that are relevant to either maintaining or restoring the health and sustainable function of these agroecosystems. Old world bluestem (OWB) was planted as possible improved forage grass on extensive tracts of rangeland in the southern Great Plains in the mid twentieth century. However, they now have invaded native grass stands and threaten their stability, including what remains of the tallgrass prairie ecosystem. Kudzu is an invasive perennial vine that has been spreading rapidly since its introduction in the southeastern United States in 1876. Research suggests that warmer weather</p>	<p>Environment and Natural Resources/#5</p>

		<p>due to climate change has facilitated its migration northward. Feral swine are invasive throughout the southern states and have become an increasing problem in southern Oklahoma. Direct consumption and foraging behaviors such as rooting, digging and trampling result in damage and economic losses to a pecan industry in Oklahoma that generates about \$28 million dollars in revenue, annually. Invasive Eurasian earthworms are widespread in North America, causing substantial harmful effects on plants that are dependent on AM hyphae. We are studying how these interactions influence soil health, plant species composition, and plant forage quality in Great Plains rangelands. Drought and climate change that may intensify drought effects have the potential to reduce productivity of the approximately 1,000,000 acres of loblolly pine plantation (as well as native shortleaf pine stands) in Oklahoma, which form the underpinning of a \$3.1 billion industry.</p> <p>Response/Action – Recent studies have attempted to identify the level of dependence of tallgrass prairie species such as big bluestem, little bluestem and Indiangrass on AM symbiosis in contrast to OWB that appears to grow well without the AM relationship. To restore land that has been invaded by OWB or abandoned cropland to native grassland, efforts are underway to determine the feasibility of inoculating soils with AM fungi that have declined or disappeared due to the prolonged absence of native grasses. Recent collaborations with China Agricultural University have enabled establishment of inter-continental cross-site studies to assess the role of AM symbiosis in soil carbon dynamics and plant community responses to grazing, climate, and management of grasslands. To determine the future expansion of kudzu, the Biodiversity Modeling species distribution model was applied to southcentral states Nebraska, Kansas, Missouri, Arkansas, Oklahoma, and Texas. In addition, an economic analysis was completed to understand the direct, indirect, and induced economic impacts of Kudzu invasion in Oklahoma. For feral swine, OSU and the Noble Research Institute collaborated to identify areas and timing of use of pecan groves and orchards by feral swine, and to quantify the effects of rooting damage on the efficiency of the shake-and-harvest pecan harvest method. A before-after-control-impact (BACI) study design quantified the pecan harvest</p>	
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		<p>efficiency in areas with and without feral swine. For drought effects on pine production, we tested the effects of fertilization and a 30% precipitation reduction (via partial rain sheltering) on plantation growth and ecosystem carbon status.</p> <p>Results/Output - We found that AM fungal diversity is linked with aboveground production of native grass species, but not invasive grass like OWB. AM fungi may shape plant community structure, native grass re-growth following livestock grazing, native grass tolerance to prolonged drought, and soil microbial populations by influencing delivery of exudates from roots into the soil. Thus, AM fungi are essential for the sustainable management or restoration of native grassland species. Distribution modeling revealed that kudzu will begin to shift from southern areas to more northern latitudes in the mid to late 21st century. In Oklahoma, kudzu could invade approximately one thousand soybean farms and result in production losses ranging from \$225 thousand to \$1.8 million in five years. Similarly, the timber industry could experience a loss of over \$160.4 million in production output due to kudzu expansion. Our economic impact analysis, along with other outreach and educational materials, can help engage landowners and other non-traditional stakeholders towards creating and enforcing effective management strategies.</p> <p>After assessing movements of feral swine, we developed risk maps that can be used to prioritize management intervention to reduce depredation or damage, as well as to assess potential for contamination by zoonotic diseases carried by feral swine. We produced an online Pecan Loss Calculator, based on these results that producers can use to evaluate harvest loss due to feral swine substrate damage compared to inherent efficiency of the harvest method (linked here): https://nobleapps.noble.org/agcalculators/calculators/pecanloss. This</p>	
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		<p>information can help in determining the cost effectiveness of any proposed feral swine control methods.</p> <p>Regarding earthworm invasions, we published a global-level literature review in the prestigious journal “Science” that outlines the ways that invasive earthworm effects on AM hyphae can lead to harmful impacts on soils, native plants, and biodiversity. We have also begun investigating whether invasive earthworm-AM fungal interactions drive plant health, productivity, and species composition in a related study in grasslands of California and in a preliminary greenhouse experiment at OSU.</p> <p>For pine stands, 30% rain sheltering did decrease stem volume growth by 10-20%, but fertilization increased water use efficiency, stem volume growth, aboveground carbon sequestration, and carbon stored in the soil compared to unfertilized trees. These results indicate that while drought has a negative effect on loblolly pine plantation growth, nutrient management can help mitigate these impacts on timber production and can increase ecosystem carbon sequestration that provides an important ecosystem service beyond faster growth rates.</p>	
<p>7.</p>	<p>Mitigating Eastern Redcedar Invasion on Oklahoma’s Natural Landscapes</p>	<p>Issue - Over 12 million acres of rangeland and prairie have been encroached by eastern redcedar (<i>Juniperus virginiana</i>). The primary reason for this encroachment is the lack of natural fires that maintained grassland prairies and savannas prior to European settlement in the late 1800’s. A major concern is that conversion of grasslands to eastern redcedar woodland decreases runoff to streams and therefore reduces water available for municipal and agricultural uses, reduces grass production needed for livestock forage, and negatively affects forest production by invading Cross-timbers and pine stands. Prescribed fire is the most effective tool for returning these landscapes to grasslands but its adoption is limited. At the same time, a biofuel and bioproducts feedstock system that includes the utilization of native herbaceous vegetation, eastern redcedar, and dedicated biofuel feedstocks, such as switchgrass, can provide the underpinning of a</p>	

		<p>regional biofuel/bioproducts industry. Finally, contrasting stakeholder perceptions of factors that affect watersheds such as climate change increasingly impose challenges to successful watershed management. Sustainable management of watersheds require an integrated and collaborative approach among the stakeholders.</p> <p>Response/Action - A series of small watersheds (each 5-10 acres in size) measure runoff from either native prairie vegetation or eastern redcedar woodland. Eastern redcedar was harvested on two watersheds; one was allowed to recover to native prairie, while the other was planted to switchgrass as a potential biofuel. A daylong symposium related to the Cimarron River watershed was held in Stillwater to gauge stakeholder perceptions of watershed management. Responses to 16 management factors were collected in an on-line survey, grouped as strengths, weaknesses, opportunities and threats, and ranked by priority using an Analytical Hierarchy Process (AHP). Some of the stresses that were identified included woody plant encroachment, reduced flow in streams, increased sedimentation, and drought. Numerous Prescribed Burning Associations have been formed in Oklahoma. OSU Extension efforts via field days and other outlets continue to introduce more ranchers and landowners to prescribed fire as a landscape management tool. A Community-of-Practice with eXtension was created by Dr. Elmore and John Weir that serves as a clearing-house of knowledge for prescribed fire and highlights the leadership that OSU provides in the fire ecology discipline. In addition, using a resource assessment model called EVALIDator and coupled with other economic information, researchers quantified the potential economic output, employment, value-added, and labor incomes that would be generated by the introduction of an eastern redcedar bioproduct (mulch, particleboard, cedar oil) industry in Oklahoma.</p> <p>Results/Output - Removal of eastern redcedar increased water yield by 4-5 fold. Runoff was similar between the restored native prairie and switchgrass watersheds even though grass productivity was twice as high with switchgrass (10 vs 5 tons/acre). Thus, water yield and biomass</p>	
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		<p>production can be increased by converting eastern redcedar woodlands to switchgrass for use as dedicated biofuel feedstock. The stakeholder survey of watershed management revealed that university researchers found ‘climate change and drought’ as the most pressing issues in the management of watersheds, while Government agencies found an ‘inability to track water use’ as their main concern. Both groups agreed that, while risks outweigh opportunities, there was a good possibility of cooperation rather than conflict in future watershed management should collaborative management become established. This “human-dimension” study, while limited in scope to a single watershed, provided important insights into priorities of research and government expert stakeholders through the appraisal of internal and external factors related to sustainable management of a watershed.</p> <p>Nearly 30 Prescribed Burning Associations have been formed in Nebraska, Kansas, Oklahoma and Texas. In addition, prescribed fire courses at OSU provide an active “hands-on” approach to training students in the classroom and the field and educating the public about how to apply prescribed fire and what role fire plays in forest, rangeland and riparian ecosystems. Results of a published survey in 2018 indicated that since the year 2000, former students of Prescribed Fire and Advanced Prescribed Fire have conducted 6,247 burns on over 1.8 million acres since taking these courses. Many students reported that the courses changed their career trajectories by stimulating interest in obtaining fire-related jobs. NREM Prescribed Fire extension is impacting the use of prescribed not only in Oklahoma, but throughout the US and Canada. Regarding the Community of Practice related to prescribed burning, as of 2018, there were 67 members who have contributed 58 FAQs and 70 articles related to prescribed fire.</p> <p>Economic analysis suggested that a new medium-sized particleboard industry, having annual biomass feedstock capacity of 500 thousand tons, may result in \$50 million of economic output with 100 direct job opportunities. In summary, a region wide effort to control eastern redcedar will increase water yield for new economic development, grass growth for livestock forage or biofuel, and reduce the negative economic consequences associated with drought. The harvesting of eastern redcedar may generate a</p>	
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		<p>viable biofuel/bioproducts industry by harvesting grass that is grown instead of redcedar, or processing cedar directly into bioproducts such as particleboard.</p>	
<p>8.</p>	<p>Reversing Gamebird Decline in Oklahoma Caused By Changes in Fire Frequency</p>	<p>Issue - Oklahoma includes unique grasslands, shrublands, savannas, and woodlands that are considered some of the most imperiled landscapes in the world. These landscapes make up over half of the state and are critical for livestock production and wildlife populations. Changes in fire frequency is the greatest current threat to continued agricultural production and many species of wildlife such as northern bobwhite (<i>Colinus virginianus</i>) and greater prairie-chicken (<i>Tympanuchus cupido</i>) on these landscapes. It is critical that we develop and implement conservation and management practices that can maintain productivity of these lands for agriculture and wildlife populations that are economically and culturally important.</p> <p>Response/Action - Research and Extension has been focused on developing an innovative approach to managing grazing lands for livestock production, wildlife management and biological diversity for the past 20 years. The basis for this effort was initially focused on ecological effects of the invasion of woody plants and the potential for integrating fire and livestock management. We have developed approaches to manage Oklahoma landscapes with an interaction of fire and grazing that can enhance livestock production and wildlife diversity by limiting woody plant invasion and enhancing landscape heterogeneity. Using radio and GPS transmitters attached to birds, we have been evaluating how bobwhite and prairie-chickens use the landscape and how management affects their populations. We have also established demonstration plots across the state to evaluate and illustrate to the public how different management strategies may influence vegetation structure and consequently influence bird populations.</p> <p>Results/Output - OSU has led in the integration of prescribed fire and livestock management on rangelands throughout the Great Plains and beyond. Due to our Extension efforts, we have documented a change in management on over 250,000 acres of private land in the Flint Hills and we</p>	

		<p>intensively monitor 112,000 of those acres. Despite long-term declines of greater prairie-chickens on surrounding properties, the prairie-chicken population has more than doubled in this focus area since management changes based on OSU research were implemented. Additionally, livestock gains have been maintained under these management strategies. OSU has led this impressive and effective largescale cooperative effort with the USDA, the Oklahoma Department of Wildlife Conservation, The Nature Conservancy, private industry, and multiple landowners. Private ranch managers throughout the world have adopted our heterogeneous-based management approach for livestock and wildlife. The impact of this research is evident by the fact that management approaches developed and tested at OSU have now been integrated into management plans in other large landscapes throughout North America including Wichita Mountains National Wildlife Refuge (Oklahoma), Charles M. Russell National Wildlife Refuge (Montana), and Muskwa-Kechika Management Area (British Columbia) and around the world including Kruger National Park (South Africa).</p>	
<p>9.</p>	<p>Promoting Sensor-Based Technology to Improve Irrigation Management</p>	<p><i>Issue</i> - Irrigated agriculture is the largest user of freshwater in Oklahoma, accounting for about 40% of total water demand. The irrigation demand is expected to increase, while the state comprehensive water plan calls for using no more water by 2060 than in 2011. Despite recent advances in sensor technologies, their use in irrigation decision making has remained limited. According to the most recent survey by USDA, only 11% of irrigated farms in Oklahoma used sensors for irrigation scheduling. The main barriers toward adoption of these technologies seem to be the lack of educational material at the appropriate technical level, as well as the lack of unbiased information on the performance and accuracy of new types of sensors introduced continuously to the market. Identifying robust sensors and educating growers on how to use them can have a significant impact on optimizing irrigation management and minimizing water losses.</p>	

		<p>Response/Action - A comprehensive program was continued to increase the use of sensor technologies in irrigation management. This program involved developing six demonstration sites in collaboration with local producers in 2019. These sites covered a total irrigated area of over 700 acres scattered across the state under a wide range of crops. The results were disseminated through ten presentations at extension events, totaling 168 contact-hours. In addition, two events dedicated to this program were organized: the 2019 OK Irrigation Conference and the Sensor Demonstration Field day. A new collaboration with USDA-ARS researchers, Australian researchers, and industry partners focused on flood (gravity) irrigation systems was also initiated in 2019.</p> <p>Impact - The findings of our field demonstrations show a great potential for conserving water early in the growing season (especially after a wet spring like in 2019) and towards the end of the season (early irrigation termination). The project has received significant attention from producers and policy makers in OK and the region. As a result, the use of sensor technologies will be included in the Master Irrigator program, which will initiate in late 2020. The state will fund the purchase and transfer of sensors to producers as part of the Master Irrigator program. USDA-NRCS is also working with us to offer more EQIP funding targeting sensor-based irrigation scheduling. Cotton Incorporated has recognized our efforts and provided funding in 2019 to support this program. In addition, several producers who participated in demonstration sites have purchased sensors and will continue using them beyond 2019.</p>	
<p>10.</p>	<p>Improving sustainability of beef grazing systems</p>	<p><i>Summary Impact Statement</i> Over 2 million beef cattle graze Oklahoma pastures. Ranchers are constantly in need of information and technologies to make ranching easier, more productive, more profitable, and better for the environment. We are conducting research into new ways to use high-tech tools to precisely manage grazing systems, and reduce methane emissions from grazing</p>	<p>Animal Production Enterprises/#6</p>

		<p>cattle, making them simultaneously more efficient and have a lower environmental footprint.</p> <p>Issue - Population growth and demand for animal-derived protein is expected to double over the next 50 years, placing increasing pressure on the 236 million hectares of grazinglands in the U.S. These grazinglands underpin the grazing livestock industry, which is critical to the domestic and international food supply and to many rural economies. Without intervention, degradation of these critical lands and permanent impacts to their productivity and the ecosystem services they provide are likely to occur. Therefore, transformative solutions are needed to ensure the long-term sustainability of grazinglands and grazing livestock production. Our long-term goal is to revolutionize grazing system management through development and deployment of precision technologies aimed at increasing grazingland productivity, nutrient cycling, water quality, and other ecosystem services, while reducing wildfire-related losses.</p> <p>Response/Action - We conducted 3 grazing experiments at 3 different OSU research units to identify ways to reduce the environmental footprint of stockers grazing native range through strategic supplementation with high-fat whole cottonseed. We also evaluated the feasibility of a new, automated precision supplementation system to make supplementation of grazing cattle easier, more cost effective, and more efficient.</p> <p>Impact - If ranchers adopt our findings and use 1.5 kg of whole cottonseed or other similar feeds to supplement Oklahoma’s 2M+ cattle, they could produce about 2400 metric tons less methane per summer. This would be the equivalent of taking 13,000 cars off the road for a year, and we would get more beef produced for consumers. The precision feeding technology we investigated could make implementation of this kind of precision supplementation feasible. We are currently training 5 graduate students in</p>	
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		<p>skills to manage this kind of technology and the data that comes from it, so we can help ranchers take advantage of our advancements.</p>	
<p>11.</p>	<p><i>Evaluating nutritional, metabolic, and management interventions to reduce bovine respiratory disease (BRD) incidence</i></p>	<p>Issue - Oklahoma currently ranks in the top 5 cattle producing states for all cattle and calves and cattle are the number one agricultural commodity in Oklahoma, with cash receipts in excess of \$3 billion annually. Bovine respiratory disease is the most significant production problem for the beef industry, accounting for the majority of morbidity, mortality, and decreased production in feedlot cattle with estimated annual economic losses in excess of \$2 billion. The disease is an extremely complex illness complicated by a multitude of stressors, viruses, and bacterial pathogens that can potentially contribute to its onset. At its core, BRD is a viral and bacterial disease of the respiratory tract. However, risk factors including various stressors can suppress the calf’s immune system, allowing for these viral and bacterial pathogens to rapidly multiply within the animal’s respiratory tract.</p> <p>Response/Action -</p> <p>Impact - Identifying and understanding the various risk factors associated with BRD incidence, especially those risk factors influenced by nutrition, metabolism, and animal management will aid in BRD prevention. More specifically, this research will increase our ability to determine why certain animals are more likely to become sick with BRD compared to others and improve the nutritional and management programs for animals that are at a high risk of becoming ill due to BRD. This knowledge will allow cattle producers to better manage beef cattle production systems to reduce overall BRD incidence and BRD related mortality across all market sectors.</p> <p>Research activities will focus on improving our understanding of the BRD complex and the relationships between the various risk factors for BRD and actual disease occurrence. Multiple research experiments will be designed to evaluate nutritional, metabolic, and management</p>	

		<p>interventions as methods to reduce BRD incidence and improve our understanding of the development and pathogenesis of the disease.</p> <p>The primary impact of this research will be to increase our knowledge of the BRD complex and the nutritional, metabolic, and animal management interventions that can be employed to reduce BRD incidence. By understanding the relationship between BRD and the various risk factors for the disease, cattle producers will be able to reduce production losses and improve the profitability of their operations through the implementation of various intervention strategies.</p>	
<p>12.</p>	<p>Horn Fly Resistance Management</p>	<p>Issue - Ticks and flies can have a devastating impact on everything from food security to human health. In the United States, an estimated \$22.9 billion in yield losses due to insect pests are prevented by expenditures of \$1.2 billion per year on insecticides and their application. Although nonchemical insect management tactics are also utilized, insecticides remain a critical tool for mitigating insect pests. However, continuous exposure to insecticides with the same mode of action can lead to reduced effectiveness if the insect population develops resistance. Insecticide resistance can develop in any situation where insecticides are used to control pest populations especially flies that parasitize livestock. Livestock producers are the primary sector of agriculture that are commonly faced with insecticide resistance and vector borne diseases transmitted by ticks and flies. Also, livestock producers are at the forefront of maintaining a “One Health” approach to pathogens that can be transmitted from livestock to the public health. But mainly due to the fact that livestock producers see limited options in the form of new control technologies which then positions them into practices that utilize only insecticides. Cattle producers within the United States lose approximately \$1.3 billion annually due to external parasites as a result of both production losses from the pest and increase control costs due to insecticide resistance. Both research and extension programming efforts can lead to alternative control tactics that combine insecticides with other ranch management techniques such as burning pastures to reduce the impact of external parasites on animals.</p>	

		<p>Response/Action - Extension agents, researchers, and area animal science specialists conducted educational programs focused on management of parasites in different livestock systems throughout Oklahoma and the Central Plains of the United States. These included workshops on parasites of cattle and goats as well as new information to urban clientele that raise backyard poultry. Activities conducted by the OSU Horn Fly Resistance Management Team included assessment of producer knowledge of horn fly control or impact, field demonstrations with current control practices, research trials with new insecticide-impregnated ear tags, and producer trainings on how to monitor horn fly populations in relation to control efforts. Delivery of information from this team was disseminated in unique manners by first posting each year of the insecticide demonstrations to the OSU Livestock Entomology website: www.livestockbugs.okstate.edu so that all county and area wide extension personnel could access the information in a timely manner. Also, livestock entomology team members developed unique extension guides for horn fly control in cattle. Certain team members developed pocket sized guides that included information on when to treat cattle, how to properly rotate between insecticide classes and alternative control tactics that did not include insecticides. Area animal science specialists developed guides for insecticide-impregnated ear tags by listing all available products and which insecticide class they belong in to ensure proper insecticide rotations were utilized.</p> <p>Impact - Field demonstration plots included producer cooperators that participated by donating land as well as cattle that allowed team members to take digital photos of cattle in different horn fly treatment groups. These images were then processed by the OSU Livestock Entomology lab and then the horn fly populations were then relayed back to the participating cooperators. These demonstration plots generated the highest adoption rate of horn fly insecticide resistance management practices since the producers shared their thoughts on how their own horn fly control practices either contributed to insecticide resistance or how the demonstration exercise over the summer changed how they will manage horn flies in the future. New insecticide-impregnated ear tags were evaluated by the livestock entomology team. These newly evaluated product trials not only provided data on horn fly populations but also performance from the calves in the form of weaning weights. These research</p>	
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		<p>trials demonstrated that cattle protected from horn flies with the use of new control technologies resulted in a \$5.37 net profit per head due to increased performance. All team members contributed to producer trainings on how to monitor horn fly populations on cattle throughout Oklahoma, by showing how to properly assess insecticide performance, and how to identify potential horn fly insecticide resistance.</p> <p>The OSU Horn Fly Resistance Management Team has been actively engaging cattle producers in understanding insecticide resistance and how to implement strategies to limit insecticide resistance development. At each meeting and field demonstration producers were asked if they would implement strategies on their ranch that would reduce the likelihood of resistance development and over 91% of respondents stated they would implement at least one strategy on their operation. Counties where this information was disseminated represented 1.13 million head of cattle and 6 counties had active demonstration sites where producers visited during field days and pasture tours represents 32% of those 1.13 million head of cattle being treated with less insecticides. Eighty-two percent (82%) of producers surveyed at demonstration sites stated they would apply less insecticides and rely on timely monitoring to implement horn fly control practices.</p>	
	<p>Goat Internet Website – 2019 (LU)</p>	<p>Issue</p> <p>There are few institutions or universities with personnel dedicated to providing goat production information to producers, county extension educators or young farmer advisors. Many producers also obtain information from the World Wide Web. While proper, scientifically-based information does exist on the internet, producers with little to no livestock experience have no background to discern “good” versus “bad” information. Many producers have turned to the Langston University web site for unbiased, research-based information.</p> <p>For the QP program, meat goat production is one of the fastest growing sectors of the livestock industry in the United States. New producers, as well as some established ones, have an expressed need for current, correct information on how to raise goats and produce safe, wholesome products in demand by the public. As the meat goat industry grows and evolves, a quality assurance program is essential. Such a QA program ensures the production of a wholesome product that satisfies consumers and increases profit for the meat goat industry.</p>	

		<p>Response</p> <p>Langston University has developed a web site to disseminate unbiased, research-based information to goat producers and to anyone interested in learning more about goats. In 2010, to better understand internet users' preferences, tracking code for Google Analytics was embedded in each web page. Google Analytics is the enterprise-class web analytics package that evaluates website traffic. To establish the QP program, Langston University was awarded funding by the Food Safety and Inspection Service of USDA to develop training and certification for meat goat producers and under the USDA/NIFA project #OKLXMERKEL11 entitled "Extension Education Delivery Tools for Dairy Goat Producers: a Web-based Certification Program and E-book" a certification for dairy goat producers. For the Meat Goat Producer Certification Course, Langston University established 21 core and 12 elective modules and for the Dairy Goat Producer Certification Course 18 core and 10 elective modules. All modules have accompanying images, and pre- and post-tests for those producers wishing to pursue certification. All modules are also available in pdf for easy printing. The website (http://certification.goats.langston.edu/) was well received by the goat community. In 2019, an additional 29 participants were certified as Quality Meat Producers and 44 as Quality Dairy Producers.</p> <p>Results</p> <p>Tracking code for Google Analytics was added to the new Drupal server. Overall in 2019, there were 99,211 visits (up 60% from 2018). Visitors spent an average 1 minutes and 31 seconds, which is down slightly from 2018 (1 minutes, 34 seconds). The United States accounted for 51% of all users.</p> <p>More than 2000 goat producers have enrolled in the on-line certification program and 561 goat producers has been certified via the site to date. They represent nearly every state in the United States, several provinces in Canada, and eight foreign countries. 99,211 adults and approximately 400 youth were contacted through this program in 2019.</p> <p>Goat producers desire unbiased, science-based information on goat management and production and they were thankful the online certification course was offered through Langston University.</p> <p>Information gathered in 2019 assisted the web masters in maintaining and enhancing the web site, especially the upgrading to Drupal and the branding with</p>	
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	<p>Demonstration Clinic Artificial Insemination for Goats – 2019 (LU)</p>	<p>Issue The use of superior sires is imperative in improving the genetic composition of breeding stock. Artificial insemination has long been used in the dairy cattle industry and is a simple technology that goat producers can acquire. However, opportunities for goat producers to the necessary skills via formal and practical instruction are not widespread. Langston University has instituted a practical workshop for instruction in artificial insemination in goats. Producers are instructed in the anatomy and physiology of the female goat, estrus detection and handling and storage of semen. Producers participate in a hands-on insemination exercise. An understanding of the anatomy and physiology enable the producer to devise seasonal breeding plans and to troubleshoot problem breeders. An understanding of estrus detection enables the producer to effective time inseminations for favorable conditions for conception and to effectively utilize semen. An understanding of semen handling and storage enables the producer to safeguard semen supplies, which can be scarce and costly. The experience of actually inseminating a female goat enables the producer to practice the knowledge that they have gained. The acquisition of these inseminating skills will allow producers the use of genetically superior sires in their herds that they normally would not have access to. It also allows producers to save money by conducting the inseminating themselves instead of hiring and inseminator.</p> <p>Response In 2019, AI workshops were held on October 5, 2019 at Langston University. Fourteen (14) participants attended the workshop.</p> <p>A workshop on Artificial Insemination was held on Saturday, October 5, 2019. The morning session was held in the multimedia room of the Agricultural Research, Extension and Education complex on the Langston University campus. The hands-on afternoon session was held at the Small Ruminant Education, Research, and Extension Facility at the South Farm. Fourteen participants attended the workshop. In the morning session, I gave a presentation on basic anatomy and physiology of female reproduction. Dr. Lionel Dawson gave an overview presentation on the small ruminant reproduction emphasizing estrus detection</p>	

		<p>and estrus synchronization. Mr. Les Hutchens and I directed the examination of harvested female reproductive tracts. Mr. Les Hutchens of Reproductive Enterprise and I gave an instructional presentation on AI kit contents. After lunch, Mr. Hutchens gave an instructional presentations on semen tanks and semen handling. Mr. Hutchens and I supervised the practical hands-on insemination of live animals.</p> <p>Results Workshops were held in AI for goats. Goat producers are under-served in this area because traditional AI courses are geared toward cattle and the AI techniques differ drastically between the species. 14 adults and 2 children were contacted through this program in 2019.</p> <p>The single-most important aspect of the workshop that the participants appreciated was the hands-on practicum that was the culminating point of the workshop. The second-most important aspect was the affordable and low-cost nature of the workshop.</p> <p>Responses from attendees to what aspect was most useful to them.</p> <ul style="list-style-type: none"> • I enjoyed the hands on part. • Aling a goat • I loved it all! • The practice on live animals and seeing the various stages of estrus timing. • Hands on and instructor availability. • Hands on • Speaker and goat lab • It was awesome • We got to practice artificial insemination on does. • Hands on, Instructor patience • Presenters of the workshop were great and excellent. They were friendly. Hands on training was excellent. 	
	<p>Meat Buck Performance Test – 2019 (LU)</p>	<p>Issue Several of the factors affecting the profitability of meat goat production include parasite resistance, growth rate, and feed efficiency. For breeders to make</p>	

		<p>selection decisions to improve these traits, objective performance records are needed. However, comparing individuals from different farms/ranches clouds the decision process. A central performance test is a tool that permits the comparison of individuals objectively because all the animals make their record in the same environment.</p> <p>Response</p> <p>The Agricultural Research and Extension Program at Langston University and the American Kiko Goat Association partnered to establish a buck performance test open to all meat goat breeders. This performance test was different from previous performance test in that it incorporates both pasture and feedlot environments. The Meat (Kiko) Buck Performance Test was successfully held from June 13 to December 13, 2019.</p> <p>The Kiko Buck Test began on June 13 and 14 (entry) with 171 bucks from the following states</p> <p>The performance test was conducted in two phases, 6 weeks on pasture followed by 9 weeks in confinement. The pasture phase was conducted on a 57-acre pasture with native grasses and forbs in Logan county. On pasture, bucks were supplemented at 0.5% body weight daily to facilitate visual inspection of animals.</p> <p>The average body weight at the beginning of the pasture phase (June 25) was 57 lbs and was 62 lbs at the end (August 8). On average the bucks gained 0.19 lbs/day with a range from -0.17 to 0.44 lbs/day. At the end of the pasture phase, ten bucks had a negative growth rate on pasture.</p> <p>Packed cell volume (PCV), which is the percent of blood that is red blood cells, is an indirect indicator of parasite load and of general health. PCV increased and followed the trend of body weight gain except for the final sampling period on pasture. The trend in fecal egg counts (FEC) was the inverse of the PVC trend as seen in FEC. This trend in FEC was because 72 (42%) bucks were dewormed on either June 25 or July 10 based upon FAMACHA eye score. Bucks with a score of 4 or greater were dewormed immediately. This management practice was suspended on the July 24 sampling period so that parasite resistance variability could increase to better differentiate bucks.</p> <p>A total of 15 (9%) bucks died during the pasture phase with the majority of these bucks succumbing in the early part of the pasture phase due to shipping and related stressors.</p>	
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		<p>As related by the breeders who consigned bucks to the performance test, the single-most important aspect of the buck performance was identification of resistance to internal parasites via the artificial challenge. The second-most important aspect was the identification of resistance to internal parasites on pasture. The third-most important aspect was the growth rate on pasture. The fourth-most important aspect was the growth rate (feed efficiency) in confinement.</p>	
<p>13.</p>	<p>Plant breeding and genetic resources</p>	<p>Issue - Whether it is a wheat variety that provides a better quality flour for family dinner or a turfgrass variety that reduces water consumption on a golf course, plant breeding and molecular genetics are rudimentary to plant-based agriculture, and the end products of plant breeding affect every person, every day. In addition to the scientific discoveries and end-use products fueled by plant breeding, the genetic material developed and released from our program provides economic opportunity for everyone in the value chain from the independent seeds person selling an OSU-released wheat variety in rural Oklahoma to the corporate licensee marketing a turfgrass variety to a sports field manager in Kansas City.</p> <p>Response/Action - We have developed cross-disciplinary teams of researchers and extension specialists focused on scientific innovation and dedicated to incorporating scientific advancements into products that affect the lives and livelihood of our stakeholders. Current emphasis areas include field-based plant breeding programs focused on small grains, turf, forage, and biofuel crops. In addition, team members focus on basic science and discovery at the molecular level to build genetic resources and knowledge that will one day find its way into end-use products.</p> <p>Impact - Wheat varieties released by the Oklahoma Agricultural Experiment Station were verified to be sown on approximately one half of Oklahoma wheat acres, and it is estimated that OAES-released varieties are sown to a significant portion of “variety unknown” acreage. Using conservative estimates, OAES-released wheat varieties are sown on 65% of hard red winter wheat acres in</p>	<p>Plant Systems/#7</p>

		<p>Oklahoma. The OAES-released variety Gallagher was the most widely sown variety in Oklahoma, the second most widely sown variety in Texas and southern Kansas.</p> <p>Offering end-use quality desired by millers and bakers is essential to maintaining domestic and export markets for US wheat farmers. Wheat Improvement Team members work closely with end-use industry representatives to ensure that released varieties have both the agronomic and end-use traits necessary to be successful at the farm and the mill. OAES-released wheat varieties accounted for one-third of a preferred varieties list distributed throughout the hard red winter wheat production region by the largest independent miller in the US. Research and extension faculty work collaboratively to test milling and baking performance of all wheat varieties tested in Oklahoma and data are distributed to stakeholders via extension current reports annually. Ultimately, emphasis on milling and baking quality in our wheat breeding program, public-private partnerships focusing on bringing farmers and end-users together, and extension efforts focused on educating farmers regarding wheat quality should result in value-added marketing opportunities for southern Great Plains wheat producers and increased farmgate value for their product.</p> <p>Bermudagrass varieties released by the OAES continue to be utilized by the turfgrass industry domestically and abroad. The OAES released 'Latitude 36' and 'NorthBridge' in 2010 and 'Tahoma 31' in 2017. 'Latitude 36' and 'NorthBridge' have been produced on 39 sod farms in 16 southern states. These bermudagrass lines are a favorite among sports field managers and are utilized by several teams including: Washington Football Team-FedEx Field, Philadelphia Eagles Field, St. Louis Rams-practice fields, Arrowhead Stadium, Kauffman Stadium, FC Dallas-Toyota Stadium, Texas Rangers baseball field, Tulsa Drillers-ONEOK Field, University of Oklahoma-football and soccer fields, Texas A&M University-Olsen and Kyle Fields, etc. 'Tahoma 31' has been licensed to 13 sod farms in the US and one group of farms in Australia, and one sod producer in Spain, and one sod farm in Japan. Collectively, the three cultivars have been used in 13 professional football facilities, 13 professional baseball fields, more than 10 professional</p>	
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		<p>soccer fields, more than 30 college/university athletic facilities, and more than 60 golf courses.</p> <p>Public Value Statement - When you support plant breeding and genetics research and extension, participants will increase the diversity and quality of plant varieties available to the public, which leads to a more robust, sustainable, and profitable agricultural production system, and will benefit this county and Oklahoma by improving yield and quality of the agricultural products in our state.</p>	
<p>14.</p>	<p>Precision Nutrient Management and Soils</p>	<p>Issue - Without healthy and productive soils, we lack the ability to grow crops that sustain life and underpin our nation’s ability to devote time, talent, and resources to nonagricultural pursuits. A thorough understanding of soil properties, nutrient cycling, and crop nutrient needs is essential to maintaining agricultural productivity and minimizing environmental impact of food production systems.</p> <p>Response/Action - We have developed cross-disciplinary teams of researchers and extension specialists focused on scientific innovation and dedicated to incorporating scientific advancements into products and services that affect the lives and livelihood of our stakeholders. Current emphasis areas include precision nutrient management, environmental soil chemistry, nutrient use efficiency, soil test and sensor-based crop nutrient assessment and associated research-based algorithms for sagacious fertilizer recommendations, and investigation into soil microbial communities and their impacts on overall soil health. In addition, we offer soil, water, and plant testing to the public at minimal charge and provide science-based recommendations based on results and extension-based support and interpretation for stakeholders.</p> <p>Impact - The Soil, Water and Forage Analytical Laboratory (SWFAL) successfully analyzed 59,774 soil, water, and plant samples in a timely fashion. The SWFAL directly serves more than 10,000 urban and rural clientele yearly. Assuming that one soil sample accounts for 50 acres, the soil samples analyzed by the SWFAL represent over 1.5 million acres annually. Soil sample results show an average 20 lbs nitrate-N per acre in the soil, and SWFAL recommends that farmers account for this nitrate-N when creating crop nitrogen budgets. Following these</p>	

		<p>recommendations would save approximately \$10 per acre in nitrogen fertilizer cost for as much as \$15M in total direct financial impact. The soil analyses and associated recommendations from the SWFAL help prevent overfertilization of crop, pasture, garden, and lawn areas, thus creating sizable economic and environmental benefits to the public at large.</p> <p>The SWFAL director has been an integral part of establishing nutrient management guidelines for application of animal manure to agricultural lands in Oklahoma and Arkansas. His extension program is viewed as an unbiased and trusted source of information and recommendations by stakeholders and industry, and his extension program has been essential in developing understanding and compromise among the poultry industry, environmentalists, and state policy makers.</p> <p>The program has very strong national and international recognition as an innovator and leader in the areas of variable rate fertilizer sensing and application technologies as well as nitrogen use efficiency. The soil fertility and precision sensing group at OSU are responsible for the seminal research and associated journal articles regarding spatial variability of soil nutrients. This research and extension effort ultimately resulted in farmer use of hand-held sensors and affordable variable rate technologies for phosphorus and nitrogen. We estimate that more than 500,000 acres of Oklahoma’s winter wheat crop utilizes nitrogen-rich strips and sensor-based recommendations developed by our team. The use of nitrogen-rich strips and sensor-based nitrogen recommendations is estimated to have an economic impact of \$10 per acre, per year (Butchee et al. 2012) for a yearly state-wide impact in excess of \$5M per year.</p> <p>Public Value Statement When you support precision nutrient management and soils research and extension, participants will increase efficiency of crop nutrient inputs, which leads to decreased environmental impact of crop production and increased profitability for the farmer and will benefit this county and Oklahoma by making agricultural operations more sustainable.</p>	
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<p>15.</p>	<p>Crop Production and Management</p>	<p>Issue - Research and extension efforts focused on crop production and management help stakeholders make science-supported decisions regarding their cropping systems. This results in judicious use of pesticides and fertilizer inputs and systems that emphasize economically optimal yield goals. Agricultural producers are the primary consumers of the research-based information, but the value extends throughout the production chain from agricultural retailers to landowners to processors and end users.</p> <p>Response/Action - We have assembled an extension and research team to address the agronomic needs of Oklahoma’s major cropping systems. Emphasis areas include improved forages, crop diversity, cropping systems, nutrient management, weed control systems, integrated pest management, and variety testing. Extension efforts emphasize local relevance and control. Efforts are team focused and include county educators, area agronomists, state specialists, commodity representatives, and farmer-cooperators.</p> <p>Impact - Research and Extension faculty working in this area conduct variety testing programs on crops such as wheat, grain sorghum, cotton, alfalfa, bermudagrass, barley, rye, and triticale. Programs emphasize producer involvement and research-station and on-farm sites are utilized for replicated trials and non-replicated demonstration sites. Variety trial and demonstration sites are used annually for field-day events that are well-attended by farmers and industry representatives. Variety performance data are distributed to stakeholders through numerous outlets including print, web-based, social media, television segments, and radio interviews. A partnership with a regional magazine, for example, distributes wheat variety test data to over 8,000 stakeholders annually as magazine insert. Funding for variety testing efforts are a public-private collaboration that includes support from commodity groups and seed companies.</p> <p>Public Value Statement - When you support research and extension programs in crop production and management, participants will make better-informed decisions regarding crop inputs and land utilization, which leads to less environmental impact of crop production operations and greater profitability for</p>	
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		<p>all those in the production chain, and will benefit this county and Oklahoma by strengthening our rural economy.</p>	
	<p>Horticulture Plasticulture Program (LU)</p>	<p>Issue There is an expressed need of stakeholders for unique programming that Langston SAAS provides in the areas of food production, horticulture, market gardening, and new technology like Plasticulture. Small Scale Horticulture Producers in Oklahoma struggle with controlling weeds and conserving water. Horticulture technology like Plasticulture is in demand because it helps small scale producers reduce their labor used in weeding and in extending the growing season to better match market demand in the Spring and the Fall.</p> <p>Response LU conducted a plasticulture conference in order to pull together existing growers utilizing the technology and new growers who wanted more information. The purpose of the conference was to provide information about market gardening production and utilization of technology like plasticulture and related innovations for market gardeners. The audience was the network of market gardeners developed by Mr. Micah Anderson, LU Extension Horticulturalist, over 11 years of conducting Plasticulture conferences around the State representing ODAFF (Oklahoma Dept. of Food and Forestry). This conference brought together this network and additional producers into a Langston Horticulture and Plasticulture network. Some of the sessions included helping growers new to Plasticulture understand the key points to follow and pitfalls to avoid. This helps new growers reduce the risk they have in implementing plasticulture in their market gardens.</p> <p>Results Over 90 participants attended the February Plasticulture conference from around the State of Oklahoma. Reviews provided by attendees were appreciative of the specific focus on Plasticulture technology. Several growers made arrangements to utilize plasticulture technology on their growing land in 2019. Through these connections 4 producers were assisted in setting up their newly purchased Plasticulture laying machines.</p>	

<p>16.</p>	<p>Rural Library Hotspot Lending Pilot Program in Oklahoma</p>	<p><u>Impact Statement:</u> Access to (and use of) broadband Internet has become essential to fully participating in today’s society. Use of this technology has spread across nearly every facet of our lives, including keeping in touch with family and friends, searching or applying for jobs, or staying up to date on local events. There is, however, a very real “digital divide” between those who have their own home broadband connection and those that do not. Census survey data from 2018 (Table S2801) indicates that 37% of households with annual incomes of \$20,000 or less lack a home broadband connection, which is more than seven times higher than the rate for households making \$75,000 or more (5%).</p> <p>This extension program seeks to build upon recent library efforts to “loan out the Internet.” By lending wireless hotspot devices (which connect to a local cellular provider), participating libraries are providing home (and road!) broadband connections for their constituents to use as they please. In June 2018, 4 rural libraries began their own program with support from OSU: Sayre, Guthrie, Okemah, and Grove (median population 3,200). In November 2018, 3 more libraries were brought on board (Davis, Atoka, Marietta) via an AARP grant. 5 of these 7 libraries were able to continue the program on their own following the 1-year pilot. In May 2019, we were able to add 4 more rural libraries: Inola, Pauls Valley, Hulbert, and Blackwell (median population 2,700). Each library was provided with between 4-7 hotspot devices with unlimited data to loan out, and each developed their own lending policies. 15 total rural libraries are currently participating in this program across the state.</p> <p>The hotspot devices were loaned out over 700 times in the first 12 months they were available at our 7 pilot sites from 2018. Our 4 new libraries (started in 2019) have already reached 250 loans in the short time (~ 6 months) they have been available. Wait lists in each community range from 5 to over 20 people, and survey results have been extremely positive – with an average ranking of 9.6 / 10. The survey results suggest the program is reaching its target demographic (45% have incomes < \$25,000; 51% have a high school degree or less) and that the hotspot is being used with a variety of devices (smartphones, tablets, laptops; 74% connect with more than 1 device). While entertainment ranks as a top use, other highly-listed uses include research, connecting with family and friends, keeping informed of current events, and helping a child with schoolwork. In fact,</p>	<p>Economic Development and Poverty Alleviation/#8</p>
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	<p>Annual Small Farmers Conference (LU)</p>	<p>Issue</p> <p>Oklahoma is a state that lags behind in local foods and small farms programming. Fresh fruit and vegetable production and consumption per capita is in the lower third of all states in the United States. Oklahoma is also a state with low rankings in adult and child hood obesity. Rankings for socially disadvantaged groups are also poor. The local food movement in Oklahoma is growing but still faces significant barriers. The movement for local food purchasing is strongest in Oklahoma City and Tulsa but is also growing in other areas. There is an increasing need for educational programming that is specifically tailored for existing and beginning farmers who are farming on land of 50 acres are less. This is an important opportunity for Langston University Small Farms Program to fill this</p>	

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		<p>unmet niche for the benefit of socially disadvantaged farmers throughout the state.</p> <p>Response The School of Agriculture and Applied Sciences at Langston University hosted the 24th Small Farmers Conference at the Sheraton Midwest City Hotel in Midwest City, Oklahoma. The conference dates were May 21-23, 2019. The conference included a tour of Langston University's research facilities on Tuesday, May 21. Additional tours include a diversified small farm and Commonwealth Urban Farm in Oklahoma City. Conference Presentations were held on May 22 and 23. The theme of the conference was <i>“Enhancing Productivity and Viability of Oklahoma Small Farmers and Ranchers through Technical Assistance and Training”</i> Concurrent sessions included Alternative Enterprises, Value-Added Enterprises, Nutrition and Wellness, Farm Access, Livestock Management, Marketing, Rural Prosperity, Youth Development and Opportunities in the Agricultural Science.</p> <p>Results The conference was well attended with over 65 participants. The conference was an opportunity to strengthen collaborations and partnerships among stakeholders and provided opportunities to share new ideas in research, extension and community engagement. Feedback received from participants emphasized the need for agricultural based employment opportunities for African-American youth and for Native American communities in Western Oklahoma and in Eastern Oklahoma.</p>	
17.	Food Safety Modernization Act training and technical support for produce growers	<p>Issue: - With the finalization of the Produce Safety Rule (Food Safety Modernization Act (FSMA), Oklahoma produce growers are required to follow new stringent standards for the growing, harvesting, packing and holding of produce for human consumption. The produce growers must be trained on the new practices, as well as understand the new regulatory paradigm in order to remain operationally viable. The overall goal of this proposal is to build an infrastructure in Oklahoma to support FSMA-compliant food safety training and technical assistance as it relates to the produce industry. This step is critical in order to advance awareness, understanding, and implementation of FSMA-derived regulations among produce growers.</p>	Food Safety and Food Insecurity/#9

		<p>Response/Action - Ongoing discussions with stakeholders; including: specialty crop growers, trade organizations and government agencies; have identified a lack of financial resources to conduct training and scarcity of trainers to disseminate FSMA-compliant standardized curricula as two major obstacles in delivering training to owners and operators of small and medium-sized farms, as well as farmers affected by FSMA associated rules. In order to receive financial support, Jadeja has been actively applying for state and federal grants. Since 2015, Jadeja has received 10 grants totaling over \$3 M as PI or CO-PI. As a result of these efforts, 7 Extension personnel from Oklahoma State University were able to attend a lead instructor training in Arkansas. Jadeja and the team also presented a total of 18 produce safety grower training (15 in Oklahoma, 1 each in Texas, Arkansas, and Tennessee). Two of these trainings were also opened as in-service training for Extension Educators and farmers market managers.</p> <p>Impact - The team has presented a total of 18 FDA approved “Produce Safety Alliance Grower Training” workshops in 2017-19, reaching 360 participants including 15 Extension personnel. Due to the training provided, over 220 participants were able to receive FDA recognized certificates. This is an on-going project with the long-term goal of training at least 500 growers with FSMA produce rule requirements.</p>	
	<p>Addressing Food Insecurity through Growing & Food Banks (LU)</p>	<p>Issue Food insecurity in urban food deserts is a pressing issue that community members want to alleviate. Over half a million Oklahomans live in households that are food insecure. Nearly a quarter million live in households with “very low food security,” meaning their eating patterns were disrupted and food intake was reduced because they couldn’t afford enough food, according to Food Security and Health. This issue is especially relevant in North Tulsa communities which is an area predominately African-American and Hispanic.</p> <p>Response Langston University worked together with an existing 501c3 organization “Food on the Move” to provide donated food from local restaurants and organizations to families that are food insecure in the North Tulsa area. This food bank activity occurs monthly and includes educational opportunities for the families so they also know how to prepare the donated food. This effort helps fill the gap between what families are able to provide for themselves and their food deficit each month.</p>	

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		<p>Another focus that Langston University initiated was to work to equip local African-American community members in North Tulsa with Gardening skills to grow vegetables in their back yards and vacant house lots near their homes. LU worked with OSU Horticulture Extension to initiate the Market Garden School in North Tulsa every Saturday for 9 months in order to pass on the theory and hands on skills to get started in growing for market gardens and backyard gardens.</p> <p>Results The Food on the Move Food Bank effort has resulted an average of 200 families each month being assisted. The Market Garden School was attended by 24 participants who were excited about the opportunity to learn how to improve their ability to grow food and to begin growing for their local farmers' market.</p>	
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