2018 Oklahoma State University and Langston University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The Division of Agriculture Sciences and Natural Resources (DASNR) at Oklahoma State University has an integrated approach to research and extension programs. Over the past years the Oklahoma Agricultural Experiment Station (OAES) and the Oklahoma Cooperative Extension Service (OCES) have developed multidisciplinary Teams of research and extension faculty members working on priority research and extension needs. The teams are based on priorities identified by stakeholders, faculty and specialists. Langston University takes a similar approach to research and Extension, integrating these efforts into numerous planned programs responsive to the public needs and their mission. All Planned Program areas as identified in our Plan of Work serve as overarching guides for the priority areas of research and extension. Each of the faculty members and specialists remains administratively connected to a disciplinary department or geographic region unit. However, each also plans and conducts research and/or extension program efforts in close collaboration with other individuals within at least one multidisciplinary team. Langston University's Research and Extension Programs work collaboratively to make a positive difference in the lives of stakeholders in Oklahoma, the nation and globally. Program areas play vital roles in reaching and making a difference in the lives of youth, families, producers, consumers, communities, and citizens in the State of Oklahoma.

The Oklahoma Agricultural Experiment Station did not experience any further reductions in state funding in 2018, but did not received any increases either. We are strategically re-filling only selected positions and maintaining 73 faculty research FTEs in 2018. These reductions have impacted the service to Oklahoma and the agriculture industry. As state allocations were reduced, dependence on extramural funding increased and the faculty responded by increasing the number of proposals and awards to state and federal agencies, industry, and commodity groups. The research results were presented in over 325 peer-reviewed journal articles and in numerous presentations at state, national, and international meetings. It would be impossible to reiterate all the findings from this amount of research and number of publications so only several examples will be listed.

The Oklahoma State Cooperative Extension Service conducted almost 22,000 meetings and workshops with over 1.7 million contacts in 2018. These values are slightly reduced from previous years due primarily to county, area, and state positions being unfilled because of reduced state funding over the last few years. We are currently maintaining at least one educator in each county and have garnered additional funding from about half of the counties to stabilize staffing in their counties. We have maintained approximately 31 FTEs of tenure track state specialists and all open positions are being heavily scrutinized. Even with reduced staff the impact of Extension programs remains significant with many successes highlighted in this report.

To summarize some of the programs within OAES and OCES we will highlight 8 distinct areas.

4-H Youth Development

State 4-H Healthy Living Ambassadors met regularly throughout 2018 to work on issues related to health. As a result of attending the National 4-H Healthy Living Summit, the Ambassadors created a back home action plan to launch a YouTube channel around health and safety. Currently the channel hosts 31 Yoga for Kids Poses and 3 safety videos. Through a youth adult partnership, the Ambassadors co-taught a workshop at the 4-H National Healthy Living Summit on the Oklahoma curriculum, Get Fit 4 Life. While attending the summit Ambassadors learned about healthy living resources focusing on social, emotion and

physical health. They brought ideas and information home to present in Oklahoma. Ambassadors had healthy living displays at Roundup, Oklahoma Youth Expo and other events around the state. More than 65,000 youth participated in a program related to foods and nutrition, health or personal safety.

Community

Local Food Systems is a joint project between the OK Small Business Development Center (SBDC) and OCES to cultivate and support new businesses to produce, process and distribute agricultural products marketed as local or regional. In 2018 a web-based Local Food Impact Calculator was deployed and used 247 times to estimate the economic impact of a local food project. Trainings have been conducted on managing farmers' markets, agritourism and grant writing. This team of specialists consulted with 19 agri-businesses who received more than $63,000 in capital investment for their operations. The team also advised non-agricultural businesses; in total, they supported 94 clients, 4 of which were new business starts, who created 8 new jobs and realized at total of $1.5 million in capital investments.

Crops

One of our signature programs is the Wheat Improvement Team which released a record 4 new varieties in 2018. "Showdown", "Green Hammer", "Baker's Ann" and "Skydance" are new varieties of hard red wheat with specific adaptation to the soils, precipitation, and disease pressures experienced in Oklahoma, Texas, and Kansas. The latter two varieties are specifically developed for grain quality. Currently OSU varieties of wheat are planted on 60% of the wheat acres in Oklahoma and 15% of the wheat acres in the southern Great Plains.

The Turfgrass development team also released a new variety of Turfgrass in 2018. OKC 1131 has received a commercial name of "Tahoma31" and has been licensed to a private company with an emphasis in the eastern US, in countries bordering the Mediterranean, and in Australia.

Food Safety

Meat color can have a positive, or a detrimental, effect on beef sales. OSU researchers developed a post-harvest processing technology that enhances the red color of dark cutting beef to normal red color by rosemary in combination with novel nitrite- embedded film packaging. A 50% increase in redness was noticed with new packaging. Other programs include training and technical support about the Food Modernization act for produce growers, grain bin safety training, timing the withdrawal of grazing animals from pecan orchards to reduce pathogen outbreaks, and safety of farmer market products.

Health & Wellness

Oklahoma has the fifth highest rate of obesity for youth ages 10 to 17. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. Oklahoma Cooperative Extension Service programs are committed to the physical, mental and emotional health of our nation's youth so they may lead healthy and productive lives into and throughout adulthood. In 2018, Family and Consumer Sciences programs focused on physical activity were presented to 881 Oklahoma youth and 3,856 adult participants. This include the popular Tai Chi for Better Balance program in which 1,510 Oklahomans participated. The purpose of this program is to reduce risk of fall among older adults. Participants are taught to perform a series of exercises, in a community setting, over a period of eight weeks.

Livestock

A multidisciplinary team from Animal Science, Agricultural Economics, Vet Med, and Entomology developed a brand-neutral health management protocol, verify its use, and sponsor sales at Oklahoma livestock marketing barns. The Oklahoma Quality Beef Network sponsored feeder cattle auctions increased revenue to Oklahoma cow-calf producers by an estimated $895,000 in 2018. Over 2 million beef cattle graze Oklahoma pastures. Grazing experiments were conducted in 2018 to identify ways to reduce the environmental footprint of stockers grazing native range through strategic supplementation with high-fat whole cottonseed. If ranchers adopt these research 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.

Water

Programs in Water are coordinated through the Oklahoma Water Resources Center located within the Division of Agricultural Sciences and Natural Resources. 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 2018. These sites covered a total irrigated area of over 756 acres scattered across the state under a wide range of crops. For Oklahoma growers, the results showed the potential to improve irrigation management, even for advanced systems such as subsurface drip irrigation. In particular, considerable water saving was observed during wet years. For some cotton fields, 25% reduction in irrigation application, and consequently energy costs, could be achieved without affecting the yield. The ThinkWater Extension urban water conservation program educates Oklahomans to responsibly use water through implementation of sustainable irrigation and landscape practices that preserve Oklahoma's limited water resources. On a system wide basis in Oklahoma City, water conservation programming and outdoor watering reduction have resulted in an average savings of 65,000,000 gallons during peak use summer months, which equates to $182,000 in water utility customer savings.

Natural Resources

Researchers and Extension Specialists in the Department of Natural Resource Ecology and Management attached radio transmitters to over 150 female greater prairie-chickens to monitor habitat selection and survival. The fire and grazing management has been altered on cooperating ranches based on previous research findings. Prairie-chicken numbers have been monitored in response to these ranch level management changes. This team has documented a change in management on over 250,000 acres of private land and intensively monitors 112,000 of those acres. The greater prairie-chicken population has more than doubled in this focus area since management changes were implemented based on OSU research despite long-term declines of greater prairie-chickens on surrounding properties. Additionally, livestock gains per head have been maintained.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	230.0	21.0	83.0	22.0
Actual	230.0	16.6	73.7	28.5

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- Combined External and Internal University Panel
- Expert Peer Review
- Other (Administrative Review)

2. Brief Explanation

All Oklahoma Experiment Station projects, whether supported by Hatch or McIntire-Stennis funds, are peer reviewed prior to submission. It should be noted that stakeholder input into the planning process, position priorities, and research areas to be pursued by the scientists could be considered as the initial step in the review process. This valuable input helps in the merit and relevancy of our projects; it is a continual practice during the decision process to fill new positions, and direct research efforts and approaches to high priority needs.

Each department in OAES is required to have three reviews for a project (selected by the appropriate Department Head), with one of those reviews being external to the department. In those cases, this will be from another department in the Division, from another College at OSU, or another state with expertise in the area. These reviews are approved at both the departmental and OAES Directorate levels before submission to NIFA. The principal investigator is required to respond to the comments provided by the reviewers before final approval is granted. Most departments utilize the attached checklist.
All OAES/OCES teams are required to have a team plan of work which is reviewed by team members, the administrative leaders, and the appropriate OAES/OCES assistant and associate directors. All team plans of work are reviewed with respect to relevance, the Division Strategic Plan, stakeholder input, and team competitive advantage. All individual OCES plans of work developed by county, area, district and state program professionals are reviewed in reference to quality and relevance by at least two individuals with program and/or administrative responsibility pertinent to the individual's program area. The reviewers assess the merit of the program plans of work with respect to issues, needs, and the problems identified through stakeholder input, quantity of effort planned in relation to appointment, and plans to evaluate and report program quality and impact. County plans are reviewed by the appropriate district subject matter specialist, district director, and/or state program leader. Area and district specialist plans are reviewed by the district director, and the subject matter department head. State specialist plans are reviewed by the appropriate department head and/or the appropriate assistant director/state program leader.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (Professional journals, meetings, etc.)

Brief explanation.

A broad array of actions was used to encourage stakeholder input for Oklahoma State University research and Extension programs. Personal invitation and public notice are regularly used in Extension Program Advisory Committees as well as when we seek input to experiment station projects. Most all statewide and unit advisory groups are notified through direct contact. Several programs have targeted nontraditional stakeholder participation including sustainable agriculture, agribiosecurity, water, wildlife, youth, human health, Spanish speaking audiences, Native American tribes, etc. OAES and OCES have been in discussions with the Director of the OSU Center for Sovereign Nations in order to see how we can better serve Native Americans in Oklahoma. Numerous Native American tribal leaders have been invited to state and district discussions. Farm commodity groups regularly are invited to campus and we attend most of their meetings in order to hear input. A few of our advisory groups are statuary in nature such as our Food and Agriculture Products Center advisory group.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Dialogue with individual stakeholders led to the identification of additional stakeholders for Langston University research and Extension programs. Stakeholders were also identified at field days, meetings, workshops, farm visits and through e-mail correspondence. When people contacted us to request information on published materials, they were identified as stakeholders and placed on our contact lists. New stakeholders were identified via these methods in 2018.
Every Oklahoma Cooperative Extension (OCES) County office holds 2-4 program advisory meetings annually. OCES and OAES also meet with numerous boards, commissions, associations, public agencies, departmental advisory committees, special needs groups, consumers, school leaders, government officials, and individuals each year. See section 2(b) of this state report to get a partial list of groups providing input.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Other (Peer reviews, grant proposal reviews, telephone surveys)

Brief explanation.

Following are some examples of stakeholder groups providing input to Oklahoma State research and Extension programs (OAES, OCES) - this list is in no way exhaustive. Representatives from OAES and/or OCES met with the following stakeholder groups.
Division of Agricultural Sciences and Natural Resources Advisory Council (twice per year)
Oklahoma Wheat Commission (ten times per year)
Oklahoma Peanut Commission (twice per year)
Oklahoma Sorghum Commission (twice per year)

Oklahoma Wheat Growers Association Board (twice per year)
Oklahoma Oilseed Commission
Soil Fertility Research and Education Advisory Board (two times per year)
Great Plains Canola Association
Oklahoma Grain and Feed Association
Oklahoma Seed Trade Association
Oklahoma Genetics Inc.
Board Oklahoma Cattleman's Association
Oklahoma Home and Community Education
Oklahoma Ag in the Classroom Advisory Committee (Quarterly)
4-H Shooting Sports Committee
Land Judging Committee
Oklahoma Farm Bureau
OK Youth Forestry and Wildlife Camp Committee (six times)
Northeast Oklahoma Beekeepers Association
USGA Advisory Committee
Oklahoma Pecan Growers Association
American Farmers and Ranchers
Rural Health Works Committee
Rural Health Works National Advisory Committee
Stormwater Advisory Committee
Tribal On-Site Waste Project Advisory Committee
Integrated Environmental Research and Education Site Advisory Committee
Oklahoma Sustainable Agriculture Research and Extension Advisory Committee
Oklahoma Food and Agricultural Advisory Center Advisory Committee (twice per year)

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (In team planning and budget requests)

Brief explanation.

In previously described settings we listened to the expressed problems, concerns, opportunities and situations faced by the various groups. This is in addition to the county PACs which were described earlier and result in over 1,000 people providing input at the local level. Likewise we periodically conduct surveys with respect to particular issues or groups of people.

Brief Explanation of what you learned from your Stakeholders

Depressed commodity prices continues to be a concern. Other areas of concern expressed by Oklahoma State University Extension and research PAC attendees included:
The state economy and economic development
Forage production and management
Herd health issues

Cattle nutrition
Wheat variety selection and marketing
Pest and weed management in crops
Herbicide resistance and drift and invasive species
Nitrogen management
Local food production
Health issues
Managing personal finances
Farm bill and government programs
Risk management and crop insurance
Local leadership development
Mental health and chronic illness
Water use and water conservation
Employment and job creation and skills
Youth alcoholism and teen pregnancy
Youth leadership development
Youth health and safety
Alternative crops
No-till cropping systems
Improved parenting
Science projects for youth
Cattle management
Gardening and consumer horticulture
Use of cover crops and crop rotations
Tax laws
Food Safety
Other implications relating to water use and availability continued to be of high interest. These included irrigation, water quality, quantity, pond management, and water rights.

IV. Expenditure Summary

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

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	8533254	252932	3283217	297654
Actual Matching	8533254	208494	3283217	115830
Actual All Other	18787608	1916469	17059401	1287915
Total Actual Expended	35854116	2377895	23625835	1701399

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	8483254	0	0	0

V. Planned Program Table of Content

28	Sustainable Internal Parasite Control for Small Ruminants (Langston University)
29	Goat Internet Website (Langston University)
30	Development of New Dairy Goat Products (Langston University)
31	Demonstration Clinic: Artificial Insemination for Goats (Langston University)
32	Fish Marketing (Aquaculture) (Langston University)
33	Meat Buck Performance Test (Langston University)
34	Goat Dairy Herd Improvement (DHI) Laboratory (Langston University)
35	Water, Weather, and Climate

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Crop Enterprises

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	18%	0%	5%	0%
133	Pollution Prevention and Mitigation	3%	0%	0%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	7%	0%	25%	0%
204	Plant Product Quality and Utility (Preharvest)	13%	0%	10%	0%
205	Plant Management Systems	26%	0%	25%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	6%	0%	10%	0%
212	Pathogens and Nematodes Affecting Plants	5%	0%	10%	0%
213	Weeds Affecting Plants	10%	0%	5%	0%
215	Biological Control of Pests Affecting Plants	3%	0%	0%	0%
216	Integrated Pest Management Systems	5%	0%	10%	0%
405	Drainage and Irrigation Systems and Facilities	4%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	0.0	10.0	0.0
Actual Paid	20.0	0.0	9.7	0.0
Actual Volunteer	2.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
693565	0	467720	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
693565	0	467720	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1527017	0	2430249	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Wheat cultivar performance testing and demonstration throughout Oklahoma
2. Wheat breeding, variety development, and introgression of new traits into elite germplasm
3. Publication of web sites, web-based updates, video presentations, and printed extension materials that disseminate research findings and address current and emerging issues in Oklahoma agriculture
4. Provide effective, non-classroom educational opportunities for industry professionals, Extension educators, farmers, and ranchers.
5. Conduct on-farm research and demonstration of nitrogen rich strips and use of hand-held sensors
6. Evaluate alternative irrigation methods and strategies that increase sustainability of irrigated cropping systems in the presence of changing climatic conditions and decreasing water resources.
7. Conduct on farm research and demonstration of soil health promoting practices such as no-till and reduced tillage systems that include diverse crop rotations, integrated with beef cattle production.

2. Brief description of the target audience

Wheat growers, dual-purpose wheat producers, millers, bakers, wheat importers, seed growers and dealers, wheat breeders, crop producers, canola, peanut, sunflower and other crop producers and nutraceutical producers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	28722	2277135	3200	310000

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	70	70

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Field Demonstrations, field days, and conferences

Year	Actual
2018	585

Output #2

Output Measure

- Regionally adapted wheat cultivars

Year	Actual
2018	4

Output #3

Output Measure

- Educational materials developed

Year	Actual
2018	36

Output #4

Output Measure

- Web-based educational materials such as web sites, videos, and social media applications

Year	Actual
2018	21

Output #5

Output Measure

- Locally-controlled evaluations and agronomic data for small grains crops

Year	Actual
2018	74

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of wheat varieties released to address agronomic and end-use quality needs of the hard red and hard white winter wheat industries.
2	Percentage of wheat acres sown to varieties with improved pest resistance, yield potential, and end-use quality.
3	Number of on-farm demonstrations of nitrogen rich strips and of hand-held sensors
4	Soil Testing is the Best Management Practice for Plant Nutrient Management
5	Establishing Cotton Production Decision-Making Tools for Northern Oklahoma

Outcome #1

1. Outcome Measures

Number of wheat varieties released to address agronomic and end-use quality needs of the hard red and hard white winter wheat industries.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Current wheat prices and costs of production often place wheat producers in a position of cutting costs where they perhaps should not (e.g., fertilizer inputs) instead of cutting costs if so justified (e.g, pesticide inputs). Though infrequent, some varieties may show insignificant response to a fungicide even when fungal diseases are present, because they possess highly effective levels of resistance to the responsible diseases. Packaging high levels of resistance to both leaf rust and stripe rust in the same variety may lead to this situation, and allow a cost-savings opportunity without sacrificing performance for either yield or quality. Through the recent OAES release of HRW wheat Green Hammer, grain and seed producers have this unique opportunity across a wide area of the southern Plains most prone to leaf rust and stripe rust development.

What has been done
Seed producers in Oklahoma, and those seed producers who have membership in OGI but operate outside of Oklahoma, have limited varietal choice from the OSU wheat improvement program to market a competitive seed product that, under the race composition that exists today in the southern Plains, requires no fungicide application to protect against the two primary rust diseases in Oklahoma, leaf rust and stripe rust. Varieties do exist in the market today with dual resistance such as ?Joe?, yet at an inferior level of end-use quality in a minor wheat class (HW). ?Gallagher? offers dual resistance, but its resistance to stripe rust is compromised when stripe rust infects the plant before heading, which is too often the case in Oklahoma. Dual rust resistance constitutes a challenging breeding target, because genes that confer effective and durable resistance to one disease do not usually confer resistance to the other, with the exception of a few adult-plant resistance genes conferring only partial resistance.

Results
The OAES released Green Hammer HRW wheat with a geographic reach across southwest, central, and north central Oklahoma, extending into the Blacklands and Rolling Plains regions of

Texas and as far north as Conway Springs, KS. Not since Billings, and to a lesser extent Gallagher and Smith?s Gold, has OAES featured a wheat variety with this geographic footprint in the heart of the Great Plains wheat belt, though Billings was not well adapted to far southwestern Oklahoma and it lacked grazeability. Variety trials featuring comparisons with or without a fungicide typically have shown no significant yield response for Green Hammer, including the 2017 KSU variety trials at McPherson and Conway Springs and the 2017 OSU variety trial at Lahoma. Disease resistance, and thus yield protection, are a mainstay of Green Hammer, with Hessian fly resistance for added protection. Green Hammer offers moderately high test weight but with large kernel size attractive to millers (1.7g greater than Gallagher). It also provides a wheat protein content of 0.9 percentage units above Gallagher, representing a protein deviation that would parallel Doublestop CL+. In summary, Green Hammer claims the best combination of yield potential, protein content, disease resistance, and test weight among all varieties released by OAES, along with a highly competitive yield record in the central wheat corridor of Oklahoma.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Percentage of wheat acres sown to varieties with improved pest resistance, yield potential, and end-use quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #3

1. Outcome Measures

Number of on-farm demonstrations of nitrogen rich strips and of hand-held sensors

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Soil Testing is the Best Management Practice for Plant Nutrient Management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soil testing has been proven to be one of the most effective Best Management Practices (BMP) to sustain agricultural production and minimize nutrient loss to water bodies from cropland and pastures. However, many producers and homeowners routinely fertilize their fields, lawns and gardens without testing their soils. It is likely to apply unneeded fertilizer if the nutrient status of the land is unknown. This not only costs money, but the additional nutrients may enter water supplies and result in environmental problems. On the other hand, applying inadequate fertilizer could reduce yields and decrease profits. One of the major reasons for farmers and homeowners

not performing soil tests is the lack of understanding of its importance. The sample turn around time sometimes is too long for farmers to make a timely fertilizer decision.

What has been done

In order to provide better services to the public, we have been striving to improve test accuracy and to reduce sample turnaround time. The lab had over 30,000 routine soil samples tested last year for thousands of farmers, ranchers, and homeowners. Test reports are now distributed through the Internet. Therefore, sample turn-around time is about 3 working days after the samples are received by the lab. Lab users can download test results from our website as soon as tests are completed. This reduced sample turnaround time by at least 3 to 5 days compared to the traditional method. Furthermore, a web-based interactive decision support program allows users to obtain soil test interpretations for all major crops grown in Oklahoma. Fertilizer or animal manure application rates can be calculated to meet nutrient needs online. The value of manure nutrients can be estimated based on commercial fertilizer prices. Land application rates can be calculated using soil test results. In addition, the importance of soil test based nutrient management has been integrated into Oklahoma Master Gardeners training program and other extension organized trainings. Hundreds of enthusiastic gardeners and farmers are training under those programs annually.

Results

Each year, we directly serve more than 10,000 urban and rural clientele and millions acres of land are impacted. The soil samples we analyzed represented 1.5 million acres assuming on average one sample representing 50 acres. There was on average 20 lbs of nitrate-N per acre in the soil. It would save farmers about $10 per acre in nitrogen fertilizer cost alone if they took credit of the residual N in the soil. Therefore, the savings for N alone could be as much as $15 mil. The recommendations from the lab have increased nutrient use efficiency; therefore, the yields of crop production for producers who use soil testing should be improved while the cost of fertilizer use decreases. The impact of agriculture on the environment as a non-point source should also be greatly reduced by following soil test recommendations and applying the right amount and type of nutrients at the right time and place.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #5

1. Outcome Measures

Establishing Cotton Production Decision-Making Tools for Northern Oklahoma

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cotton acreage in Oklahoma has increased from approximately 210,000 planted acres in 2015 to 760,000 acres in 2018. While this increase is due in part to additional acres in the traditional cotton areas of the state and counties neighboring these areas, there has also been a substantial amount of acres planted in areas of the state that have not recently produced the crop. One of these areas, and the one that likely needs to have specific focus, is the north central to northwest part of the state. In 2018, 15 counties in this region accounted for over 70,000 of the acres planted in the state, although there is little to no information available for producers that was generated in this region. If just 50% of these acres become part of even a two- or three-year rotation, providing decision-making tools to these producers from data generated in this environment would increase the stability of this crop as a rotation option and more importantly aid in profitability.

What has been done
For producers in northern Oklahoma, and even across the region, very little has been done that can be utilized by current producers. Currently, if producers in this area refer to data to make decisions regarding agronomic practices or inputs, they likely refer to data generated in parts of Oklahoma or other southwestern states that doesn?t reflect their production environment. While there are agricultural retailers and consultants that may provide recommendations, the data is either from sources from other production environments, non-statistically sound demonstrations, or observations. While many of the information that is needed and requested by these producers is fairly basic and readily available for more established growing regions, it is critical that this unique environment be represented and so that an informed decision can be made.

Results
Due to the lack of information available, the potential knowledge gained impact would likely be tremendous. While understanding practices that could maximize yield and/or profitability of production would be critical, even more importantly a knowledge of how to mitigate risks of cotton production in this environment would be the most important impact. As an example, if techniques were utilized to even slightly enhance maturity of a crop in this area, this would aid in mitigating yield loss and fiber quality penalties in seasons in which sub-optimal conditions prevail in the fall months. Just 0.2 increase in micronaire would result in a 1.8 cents per pound increase in fiber value at the standard loan rate schedule. Techniques to increase maturity generally also result in a lint yield increase, and at an increase of 20 pounds per acre this improvement would result in an $11.00 per acre increase. If this scenario was applied to 25% of the planted acres in 2018 in this

region alone, it would result in an increase in gross returns of $192,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Animal Enterprises

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources	9%	0%	15%	0%
302	Nutrient Utilization in Animals	12%	0%	20%	0%
303	Genetic Improvement of Animals	9%	0%	10%	0%
304	Animal Genome	0%	0%	10%	0%
305	Animal Physiological Processes	7%	0%	10%	0%
306	Environmental Stress in Animals	10%	0%	10%	0%
307	Animal Management Systems	20%	0%	10%	0%
308	Improved Animal Products (Before Harvest)	11%	0%	5%	0%
311	Animal Diseases	12%	0%	5%	0%
315	Animal Welfare/Well-Being and Protection	10%	0%	5%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	15.0	0.0
Actual Paid	17.0	0.0	8.9	0.0
Actual Volunteer	0.5	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
721302	0	427822	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
721302	0	427822	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1588086	0	2222941	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct fundamental and applied research
- Construct research facilities
- Write extramural and intramural grant proposals
- Conduct workshops and organize other educational and scientific meetings and conferences
- Provide in-service trainings
- Provide one-on-one consultation
- Develop and maintain numerous newsletters, web sites, press releases, Sun Up programs, and other mass/social media resources

2. Brief description of the target audience

Managers, owners and employees of farms, ranches and agribusinesses, research scientists, extension personnel, beef cattle producers, meat goat producers, consumers, and policy makers.

3. How was eXtension used?

Active participation in the Horse CoP. We are collaborating to develop an online curriculum for an introductory horse management university credit course through Michigan State University. The curriculum will be re-purposed as an e-course book for use by universities, community colleges and high schools and as the core content for a massively open online course (MOOC) targeting general horse enthusiasts.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	76837	2115444	5100	42000

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	25	65	90

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational meetings, class guest lectures, conferences organized, in-service trainings held, state and local educational presentations

Year	Actual
2018	1097

Output #2

Output Measure

- Number of fact sheets, proceedings publications, newsletters, popular press articles and other non-peer reviewed extension publications produced

Year	Actual
2018	107

Output #3

Output Measure

- Number of Animal Enterprise television and radio spots or segments produced

Year	Actual
2018	65

Output #4

Output Measure

- Number of web sites maintained

Year	Actual

2018	1

Output #5

Output Measure

- Number of decision making tools developed
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of peer reviewed manuscripts published
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of beef and pork quality assurance program participants

Year	Actual
2018	132

Output #8

Output Measure

- Number of blog and/or social media posts
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of cattle enrolled in value enhancement programs
2	Number of producers participating in beef cattle value enhancement programs
3	Number of participants gaining knowledge in methods to decrease the incidence and severity of bovine viral diarrhea virus and bovine respiratory disease
4	Number of producers gaining knowledge in pasture and rangeland management, forage use efficiency and pasture and rangeland recovery
5	Number of producers and educators with access to resources regarding adaptation solutions for climate change
6	Number of 'followers' or 'likes' on social media systems.

Outcome #1

1. Outcome Measures

Number of cattle enrolled in value enhancement programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	8574

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Past OSU research demonstrates that many Oklahoma cow-calf producers do not utilize management practices that are proven to add value to calves. Basic practices, including vaccinating, weaning periods over 30 days, and castration prior to marketing, are neglected by many producers. Oklahoma Quality Beef Network (OQBN) represents a unique opportunity for beef industry members to work together to improve cattle quality and enhance value and profitability in all segments of Oklahoma?s beef industry.

What has been done
The Oklahoma Quality Beef Network was relaunched in 2008 with the goal of helping producers add value to their calf crops through educational programming, calf health management certification, and value-added calf sales. A multidisciplinary team from Animal Science, Agricultural Economics, Vet Med, and Entomology developed a brand-neutral health management protocol, verify protocol use, and sponsor sales at Oklahoma livestock markets. The team promotes OQBN through Oklahoma Cooperative Extension Service programming throughout the calendar year and provides timely research to monitor the value of OQBN practices to Oklahoma cattle producers.

Results
Preliminary analysis estimates that approximately $895,000 in premiums were received by 2018 OQBN participants relative to non-preconditioned calves at Oklahoma Quality Beef Network sponsored feeder cattle auctions. The overall impact of OQBN is, however, much higher. The educational efforts of the OQBN team, including faculty, state staff, and county staff, have increased the use of value-added marketing practices substantially since the relaunch of the program in 2008. For example, a 2010 survey indicated that 72% of cow-calf producers castrate bull calves prior to marketing. Results from a recent 2018 survey indicate that 81% of the producers responding castrate their bull calves prior to marketing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection

Outcome #2

1. Outcome Measures

Number of producers participating in beef cattle value enhancement programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	132

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #3

1. Outcome Measures

Number of participants gaining knowledge in methods to decrease the incidence and severity of bovine viral diarrhea virus and bovine respiratory disease

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of producers gaining knowledge in pasture and rangeland management, forage use efficiency and pasture and rangeland recovery

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	11019

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
302	Nutrient Utilization in Animals
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #5

1. Outcome Measures

Number of producers and educators with access to resources regarding adaptation solutions for climate change

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	260

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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.

What has been done
In 2018, we conducted 3 grazing experiments at 3 different OSU research units. These experiments identified 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 that holds promise to make supplementation of grazing cattle easier, more cost effective, and more efficient. We also prepared and submitted a $10M grant proposal to the Sustainable Agriculture Systems program of USDA-NIFA. If funded, this proposal will spawn innovative, vital technology development and application for grazing systems world-wide.

Results
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.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
302	Nutrient Utilization in Animals
306	Environmental Stress in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #6

1. Outcome Measures

Number of 'followers' or 'likes' on social media systems.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Plant Biological Technologies

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
132	Weather and Climate	0%	0%	15%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	0%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	25%	0%
206	Basic Plant Biology	0%	0%	15%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	10%	0%
212	Pathogens and Nematodes Affecting Plants	0%	0%	25%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	10.0	0.0
Actual Paid	0.0	0.0	8.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	384559	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	384559	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	1998149	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Design and conduct research, including the development of methods and procedures
- Write and submit grant proposals to private, state and federal agencies
- Generate scientific publications - communicating scientific results to a wide range of scientists
- Training of professional scientists - graduate and undergraduate students, technicians and post docs in the scientific discipline
- File patents
- Provide research opportunities for students at OSU. Maintain a diverse environment in the lab and continue to support group members in their career development

2. Brief description of the target audience

- Scientists and scientific societies
- Governmental science organizations
- Educational institutions
- Applied researchers and extension specialists
- Students
- Private, federal, state, and industrial funding agencies
- Other stakeholders (producers, consumers, educators, public)

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	25	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals written and submitted

Year	Actual
2018	12

Output #2

Output Measure

- Peer-reviewed publications including journal articles

Year	Actual
2018	25

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Graduate students graduated
2	Genetic incorporation of leaf rust resistance genes in winter wheat
3	Epigenetic control of seed development and stress tolerance
4	Functional Analysis of HSBP genes in cotton
5	Establishing translational genomics for Oklahoma wheat improvement
6	Plant resistance to disease

Outcome #1

1. Outcome Measures

Graduate students graduated

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Genetic incorporation of leaf rust resistance genes in winter wheat

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wheat is the most important crop planted in Oklahoma and provides one of the most important economic resources at the farm gate and in associated industries in this state. The hard red winter wheat Jagger has been widely grown in the Great Plains region of the U.S. since its release in 1996. Jagger was highly resistant to leaf rust caused by Puccinia triticina Erikss. when initially released, however within a few years races of P. triticina with virulence to Lr17a increased rapidly and the resistance in Jagger was much less effective.

What has been done
Winter wheat cultivar Jagger has the alien chromosomal 2NS segment carrying the Lr37/Yr17/Sr38 cluster. Functions of Yr17 and Sr38 have been reported, but the effectiveness of Lr37 on the 2NS segment is not well known. In this study, we report that Lr37 conferred seedling resistance against two leaf rust races, THBJG and BBBDB. Lr37 was located in the genomic region, which was orthologous to Lr17 on the 2AS region in wheat. Therefore, it is impossible that Lr17a is pyramided with Lr37 into a single line. We also report additional three minor QTL in Jagger that had IT responses to the two leaf rust races.

Results

Our research article ?Mapping of leaf rust resistance genes and molecular characterization of the 2NS/2AS translocation in the wheat cultivar Jagger? has been published in G3 (Xue et al., 2018). Genetic incorporation of the Lr37 gene in the 2NS segment with other effective resistance genes, rather than Lr17a, can be used to improve resistance to rust diseases in wheat.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

Outcome #3

1. Outcome Measures

Epigenetic control of seed development and stress tolerance

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Understanding plant development is critical to the development of crop varieties with advantageous traits, such as improved stand establishment, flowering time, and seed production. This project is focused on discovering the regulatory mechanisms that control the developmental transition from seed maturation to seed germination and seedling growth and understanding its effects on plant productivity and stress responses.

What has been done
Using molecular genetic and biochemical approaches, we have discovered direct regulatory targets of a conserved transcriptional repressor protein called HSI2/VAL1. Along with other proteins, HSI1/VAL1 mediates the modification of the DNA packaging proteins known as histones, which affect the ability of genes to be expressed at appropriate times. HSI2/VAL1-induced repression of the expression of these specific genes is responsible for the down-regulation of downstream regulatory factors that control seed maturation and dormancy.

Results

This work helps to establish a basic understanding of seedling development and provides new insight into the role of chromatin-based epigenetic mechanisms in plant development. It also uncovers an evolutionarily conserved gene silencing regulatory mechanism that active in plants and critical for seedling development. These insights could provide new strategies for crop improvement to increase seedling establishment under stressful environmental conditions and can also be used to improve the efficiency of genetic modifications in crop plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

Outcome #4

1. Outcome Measures

Functional Analysis of HSBP genes in cotton

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Crop losses to heat and drought are a major impediment to production
in many areas of the U.S. and the world, with global crop losses to drought alone exceeding $10 billion annually. Therefore, development of sustainable agricultural systems capable of increased crop production in marginal environments is critical to meet the ever-expanding demand for food and fiber from ever-diminishing resources. Several reports and our experiments clearly show that HSBP1 is a negative regulator of heat stress and its suppression in transgenic plants can alter their ability to withstand stressful conditions

What has been done
We aim to develop transgenic cotton plants that express RNAi and artificial miRNA constructs targeting two cotton HSBP orthologues. These constructs will be expressed under control of constitutive and vegetative organ-specific promoters. We will also develop of cotton plants with

targeted mutations in two HSBP genes using CRISPR-CAS genome editing technology to obtain an allelic series with altered HSBP expression. Comparative physiological analysis of transgenic cotton lines will then be carried out to determine the stress tolerance phenotypes and evaluate the feasibility of using this approach to improve the performance of cotton varieties under conditions of limited water availability.

Results
This approach could produce cotton germplasm resources with increased ability to remain productive with less available water, thus increasing the sustainability of cotton production in the U.S. Our research benefits the state, the university and the department by enhancing our reputation for top-level plant science. This work directly benefits plant scientists and plant breeders world-wide who are involved in research directed at improvement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #5

1. Outcome Measures

Establishing translational genomics for Oklahoma wheat improvement

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Considering the practicality of applying genomic selection (GS) in the line development stage of a hard red winter (HRW) wheat variety development program (VDP), effectiveness of GS by prediction accuracy, as well as by the response to selection across field seasons, was evaluated, demonstrating challenges for crop improvement under significant climate variability

What has been done

GS for cross-year validation resulted into two groups of comparison/-forward prediction and backward prediction. Gluten quality as adjusted SDS sedimentation values (SDS Sedimentation Values), as well as wheat kernel hardness measured by near-infrared method (NIR) and single-kernel characterization system hardness index average (SKCS HI-AVG), provide the most stable prediction outcome across growing seasons. Overall, these three end-use quality characteristics achieved over 50 percent in prediction accuracy, compared to the 34 percent prediction accuracy for grain yield averaged across environmental variability.

Results
As for OSU?s wheat variety development program, accurate and stable selection of superior breeding lines over experimental trials could be still challenging with the presence of worsening drought condition. To ensure long-term response to selection, our results suggest that there are, however, cases where phenotypic selection would be still preferential or cases that retraining with updated phenotypes should be performed. When making selection decisions for trials under unexpected environmental stress, like the frequent drought in the southern Great Plains of USA, using GS trained in optimal growing conditions could very likely result in unreliable outcomes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #6

1. Outcome Measures

Plant resistance to disease

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wheat is the most valuable crop in Oklahoma. An increasing acreage of wheat in Oklahoma is grown using no-till cropping systems, which improves soil properties. Unfortunately, inoculum of

several fungal leaf spot diseases survives on the increased crop debris in no-till fields. The prevalence of the pathogens causing these diseases in Oklahoma is unclear, complicating accurate deployment of genetic resistance and cultural and chemical management practices by wheat producers.

What has been done

A two-year survey of Oklahoma no-till wheat fields found that of the three leaf spot diseases, tan spot (Pyrenophora tritici-repentis, Ptr), Septoria leaf blotch (Zymoseptoria tritici, Zt), and Stagonospora glume blotch (Parastagonospora nodorum, Pn), the tan spot fungus Ptr was the predominant the leaf-spotting fungus isolated (75% of 755 isolates). Resistance to races of Ptr is available in wheat and to better understand the race structure of Ptr populations of present in Oklahoma, Ptr isolates were characterized using molecular markers (microsatellite SSRs, toxin genes ToxA and ToxB) and symptoms produced on differential wheat varieties.

Results

Ptr populations in Oklahoma were found to genetically diverse with no dominant genotypes present, indicating frequent sexual recombination and movement of inoculum. Almost all Ptr populations in Oklahoma were found to carry the gene for host-specific toxin, Ptr ToxA, and none carried the gene for Ptr ToxB. Based on this information, wheat resistance to Ptr ToxA (recessive tsn1) should be incorporated into future wheat varieties for no-till cropping systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

N/A

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Our research benefits the state, university, and the department by enhancing our reputation in basic plant biology. The research specifically benefits plant breeders and crop

improvement.

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Commercial and Consumer Horticulture

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
124	Urban Forestry	3%	0%	10%	0%
202	Plant Genetic Resources	10%	0%	10%	0%
204	Plant Product Quality and Utility (Preharvest)	14%	0%	15%	0%
205	Plant Management Systems	38%	0%	40%	0%
502	New and Improved Food Products	15%	0%	20%	0%
901	Program and Project Design, and Statistics	7%	0%	5%	0%
903	Communication, Education, and Information Delivery	13%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	0.0	2.0	0.0
Actual Paid	14.0	0.0	2.5	0.0
Actual Volunteer	23.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
693739	0	122141	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
693739	0	122141	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1527400	0	634637	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Conduct research to evaluate cultivars of traditional and nontraditional horticultural crops and ornamental plants. •Conduct research to improve crop production in controlled environments. •Conduct research into crop cultural systems, particularly the feasibility of horticultural crops in rotation with agronomic crops. •Conduct research to develop "seed to market" production systems for high-value alternative horticultural crops like cilantro and herbs. •Conduct research to develop sustainable and/or organic production systems for commercial horticultural crops. •Provide demonstrations and education and disseminate information to support Oklahoma's commercial horticulture industry, with emphasis on electronic resources. •Develop cultural practices to reduce pecan alternate bearing and provide consistent nut quality. of research based information for clientele •Conduct "New Farmer" workshops and short courses for edible horticultural crops •Survey Oklahoma Consumers (Gardeners) at the county level to assess the needs and wants of the gardening public •Upgrade the web-based delivery •Review and revise annually or as needed Fact Sheets and other publications •Educational programs focused on Consumer Best Management Practices (BMP) for the conservation of energy, water resources, water pollution prevention, Integrated Pest Management (IPM), and urban landscape wildlife conservation •Educational programs are conducted based on public interest and County Educator requests •Participate and support eXtension Consumer Horticulture/Master Gardener Community of Practice •Conduct Master Gardener/Junior Master Gardener Training •Conduct pesticide training and education •Provide Education on Backyard Food Production •Assist in Youth at Risk - Obesity/School Gardens

2. Brief description of the target audience

Horticultural crop producers, commodity groups, food processors, landscape professionals, input suppliers such as seed and chemical companies, peer scientists, extension specialists and county professionals, horticultural dealers and merchants, greenhouses, Master Gardeners, home owners, communities, and youth.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	159168	7470550	13000	2000000

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	15	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- New Master Gardeners trained

Year	Actual
2018	172

Output #2

Output Measure

- Manuscripts submitted for consideration of publication in peer-reviewed journals
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Extension publications completed - fact sheets, newsletters, trial reports, web-based materials

Year	Actual
2018	105

Output #4

Output Measure

- Number of statewide "Oklahoma Gardening" shows produced

Year	Actual
2018	46

Output #5

Output Measure

- Number of Funded Grant Proposals

  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of potential fresh market growers of horticulture crops trained

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of horticultural crop producers newly certified as organic
2	Number of volunteer hours provided to community horticulture programs statewide
3	Number of home gardeners experiencing increased awareness and knowledge about environmental issues and IPM principles

Outcome #1

1. Outcome Measures

Number of horticultural crop producers newly certified as organic

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of volunteer hours provided to community horticulture programs statewide

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	70436

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There continues to be an increased interest in the environment and home gardening, which has prompted an ever-increasing number of garden and landscape inquiries, but there are too few Extension staff members to answer each question. Many of these questions are seasonal in nature and are relatively easy to answer assuming that one has horticulture training.

What has been done
Twelve counties provided training for new volunteers during 2018 with approximately 172 new EMGV?s trained. Currently 27 counties participate in the program with over 886 active EMG?s volunteering their time by providing educational programming contributing approximately 70,436 volunteer hours.

Results
The following data was provided by 19 of the 27 counties resulting in over 665,173 educational interventions with Oklahomans and as many as 1750 educational and community programs and activities being conducted in their communities in 2018. This translates to over $1,739,064.00 in service that was donated by volunteers (wage rate of $24.69/hour was used, which includes a 12% estimate of fringe benefits. This hourly rate is the assigned wage for non-management, non-agricultural workers in 2016 for the state of Oklahoma as published by The Independent Sector,

an organization that ?serves as a national forum to encourage giving, volunteering and not-for-profit initiative,?

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
205	Plant Management Systems
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Number of home gardeners experiencing increased awareness and knowledge about environmental issues and IPM principles

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Master gardeners are an important segment of cooperative extension services across the country. In Oklahoma, master gardener volunteers assist county extension personnel with questions from homeowners, land owners, and other citizens. This saves extension personnel countless hours in handling emails, phone calls, and in-person visits from the general public. However, master gardeners must be knowledgeable in a wide range of topics related to horticulture, including IPM. The basis of IPM is in correct identification of insects (and other pests) and plant damage related to pests. Thus, master gardeners must be trained in identification of insects and their relatives, insect biology, and diagnosing plant damage as it relates to insects and mites.

What has been done
Approximately 15 master gardener training sessions were conducted in various counties throughout Oklahoma. Master gardeners received training in identification of insects and their relatives, signs and symptoms associated with insects, and how to differentiate between pests and beneficial insects. In 2018, the impact of training was assessed sessions by polling master gardeners from four counties with identical questions using clickers. Questions were designed to evaluate retention of information presented during each workshop as well as changes in

knowledge and attitude about insects and their relatives.

Results

There was good retention of information presented during training. The percentage of master gardeners responding correctly to questions ranged between 58% and 98% (mean of 77%). Some questions are harder than others, but overall, the responses indicate that the audience learned basic entomological principles. Additionally, pre- and post-training evaluation shows master gardeners are gaining a greater appreciation for insects and other arthropods as well as increasing in knowledge about these creatures. Specifically, master gardeners gained in knowledge (52% increase in ?strongly agree? and ?agree? responses combined) and showed improved attitudes about insects and other arthropods (29% increase in ?strongly agree? and ?agree? responses combined). While the data presented represent a fraction of the master gardeners trained in 2018, results indicate a positive impact on these stakeholders through training workshops. This is important because master gardeners interact frequently with the general public, so they need to have ample knowledge about insects and exhibit a good appreciation for pollinators, natural enemies, and other beneficial insects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
205	Plant Management Systems
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Ecosystem and Environmental Quality and Management including Weather and Climate

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
104	Protect Soil from Harmful Effects of Natural Elements	5%	0%	10%	0%
111	Conservation and Efficient Use of Water	17%	0%	10%	0%
112	Watershed Protection and Management	13%	0%	10%	0%
121	Management of Range Resources	6%	0%	15%	0%
123	Management and Sustainability of Forest Resources	3%	0%	10%	0%
132	Weather and Climate	10%	0%	5%	0%
133	Pollution Prevention and Mitigation	5%	0%	5%	0%
134	Outdoor Recreation	4%	0%	5%	0%
135	Aquatic and Terrestrial Wildlife	5%	0%	5%	0%
136	Conservation of Biological Diversity	5%	0%	5%	0%
141	Air Resource Protection and Management	8%	0%	5%	0%
205	Plant Management Systems	8%	0%	5%	0%
403	Waste Disposal, Recycling, and Reuse	5%	0%	5%	0%
605	Natural Resource and Environmental Economics	6%	0%	5%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	10.0	0.0
Actual Paid	7.0	0.0	14.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
424295	0	682111	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
424295	0	682111	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
934167	0	3544217	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Submit grant proposals and conduct research that addresses priorities

Forge collaborative relationships that build on current strengths in research in management.

Partner with state and federal agencies to address pressing needs in conservation.

Produce scientific publications; disseminate information through other print and online media outlets.

Conduct workshops, field days, and other personal information exchanges to promote issues and alternatives in natural resource management.

Conduct Poultry Waste Management Education

Conduct research and develop weather-based plant biomass models as a tool in ecosystem, rangeland and pasture management adaptation to climate changes.

Conduct multi-disciplinary research on grassland fuel modeling as part of an awarded Joint Fire Science Program grant.

Provide agriculture and natural resource management technical expertise for weather and climate data and models maintained and operated by the Oklahoma Mesonet.

Create and deliver weather and climate education for the general public, agriculture and natural resource sectors through OSU SUNUP TV, online video/audio tutorials, fact sheets, email newsletters, educational programs, seminars and workshops.

Create factsheets, videos and webcontent to explain anaerobic digestion of animal manure to the layman and provide practicing engineers material to aid in design and operation.

2. Brief description of the target audience

Scientists, students, related agencies (Federal, State, private), land owners, farmers, ranchers,

communities, consumers, land developers, state legislators, commodity groups, community leaders, homeowners,

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5727	111887	1300	16500

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	93	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals written and submitted

Year	Actual
2018	111

Output #2

Output Measure

- Manuscripts submitted for consideration of peer-reviewed publication

Year	Actual
2018	93

Output #3

Output Measure

- Extension conferences, workshops and training sessions
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Research and Extension reports, fact sheets, and other media presentations
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of weather-based agricultural decision support tools

Year	Actual
2018	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of poultry producers and poultry litter applicators acquiring initial waste managment certification and number maintaining certification
2	Number of animal waste analyses conducted for land application of beef, dairy or swine waste.
3	Number of animal waste analyses conducted for poultry litter application
4	Number of users accessing website designed to deliver information about water policy, conservation and efficient use
5	Number of downloads of Extension fact sheets and related education materials
6	Number of enrollments in conservation-related land management programs
7	Land area restored in Oklahoma through invasive/encroaching species removal
8	Land area restored in Oklahoma through prescribed fire or other practices
9	Access by users of Oklahoma Mesonet computer and mobile device weather and climate data and tools
10	Alternative Manure Technologies Video Series
11	Managing shrublands for bobwhite and other imperiled species
12	Response of drought on loblolly pine plantation growth and carbon sequestration in Oklahoma

Outcome #1

1. **Outcome Measures**

   Number of poultry producers and poultry litter applicators acquiring initial waste managment certification and number maintaining certification

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Number of animal waste analyses conducted for land application of beef, dairy or swine waste.

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number of animal waste analyses conducted for poultry litter application

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of users accessing website designed to deliver information about water policy, conservation and efficient use

2. **Associated Institution Types**

   - 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	13744

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Number of downloads of Extension fact sheets and related education materials

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of enrollments in conservation-related land management programs

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Land area restored in Oklahoma through invasive/encroaching species removal

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Kudzu is a non-native vine that has been spreading rapidly since its introduction in the United States in 1876. Once restricted in U.S. South, research on the climate variability suggests that warmer weather conditions have fostered it to spread in the North. In addition, Kudzu releases carbon stored in the soil into the atmosphere and contributes to global climate change. Collectively, ecological and economic impacts coming from its invasion have made this vine a major threat to sustainable agro-ecosystems in the entire United States. With a lack of understanding on where kudzu could potentially spread and a lack economic foresight, there is limited ability to prepare appropriate management response.

What has been done

To determine the future expansion of kudzu, the species distribution model, Biodiversity Modeling (BIOMOD), was applied to southcentral states such as Nebraska, Kansas, Missouri, Arkansas, Oklahoma, and Texas. In addition, an input-output based economic analysis was completed to understand the direct, indirect, and induced economic impacts of Kudzu invasion within the state of Oklahoma.

Results

- From climate models and growth simulations, the expansion of kudzu has been estimated within the south-central region. 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.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
134	Outdoor Recreation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Land area restored in Oklahoma through prescribed fire or other practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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. Invasion of woody plants is the greatest current threat to continued agricultural production and wildlife management on these landscapes. The primary cause of this invasion is altered fire regimes associated with current land use and intentional or incidental fire suppression. Additionally, wildfires have been increasing in number and severity in Oklahoma and throughout the Great Plains. Prescribed fire is the most effective tool for maintaining these landscapes but its adoption is limited because of a perceived paradox between forage for livestock and fuel for prescribed fire.

What has been done
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. More recently we have focused on this issue in the context of socio-ecological systems since Oklahoma is largely a privately owned and public perceptions of the problem and potential solutions is critical to applying a solution. Surveys of land-owners and the public have indicated that invasion of woody plants and wildfires are viewed as a serious problem and often there is an understanding that prescribed fire and livestock management are essential to these landscapes. Our research has been integrated into government cost-share programs and led to the development of the Patch Burn Grazing working group that meets annually across 7 states. It has also contributed to the development of Prescribed Burn Associations where landowners cooperate to use fire across ownership boundaries. Recent ecological research has focused on the ability to use this approach to limit wildfire danger and indicated that integrating fire and grazing can be effective in limiting wildfire

and facilitating fire-fighting.

Results

Research and outreach from OSU has led in the integration of prescribed fire and livestock management on rangelands from Texas up through the Great Plains and beyond. Private ranch management throughout the world have adopted our heterogeneous-based management approach for livestock and wildlife. Some Oklahoma, national and international examples where research initiated at OSU have been integrated into management plans include some of the largest rangeland reserves and parks in the world including the Wichita Mountains National Wildlife Refuge (Oklahoma), Charles M. Russell National Wildlife Refuge (Montana), Muskwa-Kechika Management Area (British Columbia), and Kruger National Park (South Africa). An important impact of this research has also been the training of professionals that have carried the integration of fire and grazing to promote heterogeneity and maintain rangeland resilience throughout Oklahoma, the Great Plains and beyond.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
134	Outdoor Recreation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
205	Plant Management Systems
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Access by users of Oklahoma Mesonet computer and mobile device weather and climate data and tools

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With more than half its land consisting of wildlands, the importance of fire in Oklahoma, both natural and prescribed, becomes apparent. About 2 million acres of wildlands are typically burned in Oklahoma every year, 10% by wildfire and 90% by prescribed fire. During severe fire seasons, however, wildfires can consume many more acres, such as during the November 2005 through September 2006 period, when over 16,000 wildfires burned almost 1.5 million acres. Individual megafires (large wildfires, some lasting many weeks) are also becoming more common, such as occurred in April 2018, when almost 350,000 acres were burned in northwest Oklahoma by two large wildfires ? the ?Rhea? fire in Dewey County (286,742 acres) and the ?34 Complex? fire (62,481 acres) in Woodward County. To aid wildland fire managers in their activities, operational fire and smoke management systems, based on recent, current, and forecasted weather conditions, are critical. Such systems can aid in both wildfire preparation and suppression, as well as in planning and conducting prescribed burns.

What has been done

In 2005 federal funding from the Joint Fire Science Program was awarded to Oklahoma State University to develop a weather-based operational system for wildland fire management. The Oklahoma Mesonet, the state?s automated weather station network, is utilized for assessment of past and current fire weather, fire danger, and smoke dispersion conditions, while an 84-hour numerical forecast model, updated four times per day, provides a predictive component. The system, known as OK-FIRE, has been operational since 2006 and became fully available to the public in 2008. It features a stand-alone website module within the framework of the general Mesonet website (https://www.mesonet.org/index.php/okfire).

Results

OK-FIRE is used by large numbers of wildland fire managers in Oklahoma. Current user groups include a variety of federal agencies (US Forest Service, Bureau of Indian Affairs, US Fish & Wildlife Service, National Park Service, US Army Corps of Engineers, Natural Resources Conservation Service), state agencies (Oklahoma Forestry Services, Oklahoma Department of Wildlife Conservation), private organizations such as The Nature Conservancy, fire departments, emergency managers, cooperative extension educators, and private landowners. Since 2008 the OK-FIRE website has averaged 5,241 users (devices) per month, but in times of high wildfire activity, usage can skyrocket, such as in April 2018 with the large wildfires in northwest Oklahoma when over 21,000 users accessed the website.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate
134	Outdoor Recreation
205	Plant Management Systems

Outcome #10

1. Outcome Measures

Alternative Manure Technologies Video Series

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Producers are reluctant to adopt new technologies without firsthand experience with the technology. It is particularly difficult to get positive exposure for manure related issues in traditional media. Creative methods are needed to expose producers to useful technologies for handling and treating animal wastes.

What has been done
Fifteen videos highlighting innovative manure handling and treatment technologies were filmed, edited, and produced by the Oklahoma Cooperative Extension Service. Videos were uploaded onto the OSU Waste Management Channel on YouTube to maximize exposure of the technologies. Technologies were selected working with partners in Arkansas, Louisiana, Texas, Missouri, and Nebraska. Technologies filmed were: a subsurface poultry litter spreader; a large-scale, poultry litter bailing operation; a between flock, broiler litter windrowing system; a rotary drum composter for poultry carcass disposal; a ?weeping wall? solid-liquid separator for dairy manure; mechanically separated and composted dairy manure solids used as cow bedding; methane gas captured from a covered anaerobic lagoon used to incinerate swine carcasses; methane gas produced by a completely mixed swine manure digester used to generate electricity and power mobile equipment; a ?Biovator? style rotating drum swine carcass composter; lime enhanced precipitation of solids from alligator ranch wastewater; vegetative treatment systems for feedlot runoff, and technologies for removing sludge from manure storage basins and lagoons.

Results
In the nine years since creation of the YouTube channel, the videos have been downloaded more than 150,000 times with a total viewing time of 6,500 hours. Videos have been downloaded in all fifty states ? plus Guam, Puerto Rico, the US Virgin Islands, and American Samoa. In addition to the United States, the videos have been seen by viewers in over 200 countries on all continents. More than one third of all downloads were the result of online searches, which shows that the

exposure has been consumer driven. Producers are actively seeking examples of manure technology and downloading the videos. Another source of downloads was videos embedded on websites -- manufacturers of equipment added a link from their home website to our videos demonstrating equipment use on-farm.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #11

1. Outcome Measures

Managing shrublands for bobwhite and other imperiled species

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

- The decline of bobwhites has been a concern for the last two decades. This concern is even more relevant to a state like Oklahoma that has had a long history associated with bobwhite hunting. As such, private landowners (and Oklahoma Department of Wildlife Conservation) are particularly interested in maintaining and enhancing bobwhite populations on their lands. Economically, bobwhite hunting can contribute significantly to local economies. Moreover, as more land becomes purchased for recreation purposes, the interest on how to better manage (and restore) these lands for bobwhite and other economically important wildlife has increased. Development of management strategies for bobwhite will also provide added benefits to other non-consumptive species. As the state seeks to diversify its economy, research focused on how to better enhance recreational opportunities is becoming more important, especially as related to the economic opportunities generated by recreational activities.

What has been done

We have focused on the impacts of shrub encroachment on bobwhites and other wildlife in western Oklahoma with the goal of determining optimal thresholds of shrub cover for bobwhites. Additionally, we are evaluating the response of different shrub communities to different management techniques (e.g., prescribed fire, herbicide, grazing). We are using the latest GPS technology to monitor bobwhite movements and habitat use at four wildlife management areas in western Oklahoma to better understand how shrub cover affects bobwhites. To further evaluate the relationship between shrub cover and bobwhites and other wildlife, we have established survey points throughout each wildlife management area. We have also established treatment plots at each wildlife management area to evaluate how different management strategies may influence shrub cover.

Results

Our research results have been integrated into NRCS conservation programs and we expect that results from the current study will similarly play a role in improving rangelands for bobwhites and other imperiled species. In the past, we have been able to incorporate our results in extension fact sheets, field days, and presentations. We anticipate that these types of activities will be an important component of this work and be a major means of disseminating information to private landowners and agency personnel. The impact of this work is difficult to determine at the beginning of the study, but we anticipate that if private landowners and agency personnel adopt some of our practices we will be able to have considerable impact on land management in western Oklahoma and beyond.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #12

1. Outcome Measures

Response of drought on loblolly pine plantation growth and carbon sequestration in Oklahoma

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Forests in the southeastern US cover nearly 250 million acres with 19% of these acres in pine plantations. Oklahoma contains over 18 million acres of forest with over 1,000,000 acres of loblolly pine plantation. Recurrent drought in our region and the possible intensification of drought due to climate change may reduce the productivity and profitability of loblolly pine plantations in Oklahoma, especially since Oklahoma is at the drier, western fringe of the commercial range of pine plantations.

What has been done

In 2012, we established a trial near Broken Bow, OK and installed throughfall exclusion troughs to mimic a 30% reduction in precipitation. At the same time, we fertilized with an operational treatment of nitrogen and phosphorous. In the two years after fertilization, stem volume growth increased by 10-20%, but the effects dissipated after three years. We re-fertilized in 2017 which again caused increased growth. Throughfall reduction caused a 10-20% decrease in growth for years with below average precipitation. These results indicate that fertilization can help mitigate the effects of drought on productivity. Physiological research indicated that that fertilization increased water use efficiency. In addition to increasing stem volume growth and aboveground carbon sequestration, fertilization increased carbon stored in the soil. This has the benefit of sequestering additional carbon dioxide from the atmosphere.

Results

The 1,000,000 acres of loblolly pine plantation in Oklahoma support an industry that provides 3.1 billion dollars in direct benefits to Oklahoma. Maintaining productivity and profitability is essential in due to the potential for increasing drought severity. Our results reiterate the importance of nutrient management to maintain profitability at the western fringe of the commercial range of pine plantation. The additional benefit of increased carbon sequestration indicates that fertilization also provides an important ecosystem service beyond faster growth rates. Industrial forest landowners have been engaged and have been kept apprised of results through stakeholder meetings, field tours and formal presentations, and technical and nontechnical publications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
123	Management and Sustainability of Forest Resources
132	Weather and Climate

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

None

V(I). Planned Program (Evaluation Studies)

Evaluation Results

None

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Processing, Product Storage, and Food and Product Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
216	Integrated Pest Management Systems	10%	0%	5%	0%
401	Structures, Facilities, and General Purpose Farm Supplies	11%	0%	5%	0%
403	Waste Disposal, Recycling, and Reuse	5%	0%	5%	0%
501	New and Improved Food Processing Technologies	15%	0%	10%	0%
502	New and Improved Food Products	9%	0%	10%	0%
503	Quality Maintenance in Storing and Marketing Food Products	9%	0%	10%	0%
701	Nutrient Composition of Food	5%	0%	10%	0%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	3%	0%	10%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	11%	0%	25%	0%
723	Hazards to Human Health and Safety	22%	0%	10%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	4.0	0.0
Actual Paid	3.0	0.0	4.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
303068	0	204778	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
303068	0	204778	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
667263	0	1064014	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Food Safety:

- Conduct research on preventing contamination of foods with pathogenic microorganism during production, processing, storage, distribution, and/or consumer use.
- Conduct research on eliminating or reducing the numbers of potential pathogenic microorganisms in foods during production, processing, storage, distribution, and/or consumer use.
- Conduct research on detecting contamination of foods with pathogenic microorganisms.
- Conduct research on detecting microbial toxins in foods.
- Conduct research on detecting undeclared allergens in foods.
- Provide technical information and assistance to food industry and/or consumers to determine safe food production, food processing, and/or food handling procedures.
- Conduct food safety workshops designed to provide certification in recognized food safety systems such as Hazard Analysis Critical Control Points (HACCP).
- Conduct technical assistance projects designed to assist food production / food processing enterprises in developing comprehensive, written food safety programs and to pass third-party audits of comprehensive food safety programs.
- Disseminate food safety recommendations to industry and consumers via popular press, fact sheets, eXtension publications, web-based outreach, workshops, and/or peer-reviewed journal articles.

Food Processing:

- Conduct research on improving or maintaining the quality of processed foods.
- Conduct research on developing profitable new food products and food processing technology.
- Conduct research on maximizing the efficiency and sustainability of food processing operations.
- Conduct research on improving the healthfulness and nutritional value of processed food products.
- Conduct research on evaluating the economic feasibility of food processing activities.
- Provide technical information and assistance related to processing, analyzing the chemical and physical properties, and improving or maintaining the quality of processed food products.
- Provide technical information and assistance related to food product formulation and new food product development.
- Provide technical information and assistance related to selection and evaluation of processing technology
- Provide technical information and assistance related to food process evaluation.
- Provide technical information and assistance related to processed-food business economic planning and product marketing.

• Serve as a resource to help commercial food processors recognize and comply with applicable food product processing and labeling regulations.
• Disseminate recommendations for food processing industry best practices via popular press, fact sheets, eXtension publications, web-based outreach, workshops, and/or peer-reviewed journal articles.

Product Storage:

• Conduct research that evaluates agricultural product storage and handling technologies with the aim of improving quality, safety, and costs.
• Provide technical applications, demonstrations and education for grain and food storage providers and handlers.
• Provide continuing educational opportunities for professionals with fumigation certification
• Provide base level education for people desiring to take the fumigation certification test for Oklahoma, Missouri, and Texas.
• Conduct research in entomological challenges in the grain and ag product storage industry

2. Brief description of the target audience

Food processors; handlers, manufacturers, and marketers of grain, feed and food; food safety regulators

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	798	49001	250	5000

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	31	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of conferences and other extension outreach presentations

Year	Actual
2018	170

Output #2

Output Measure

- External funding obtained
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Workshops, symposia, short courses, and round tables conducted

Year	Actual
2018	68

Output #4

Output Measure

- Technical assistance projects completed
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Manuscripts submitted for publication in peer-reviewed journals
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Extension publications completed

Year	Actual
2018	11

Output #7

Output Measure

- Number of air quality monitors tested
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Grain storage, food or pest control entities adopting new process or product
2	Number of food industry personnel newly certified as HAACP trained
3	Number of food industry personnel newly certified as having attended food safety and processing workshops
4	Number of food industry jobs created
5	Number of new food businesses started
6	New or improved food processing, food safety and/or product storage adopted by industry
7	Number of emergency response teams available in Oklahoma
8	Number of food producing/food processing enterprises that implemented a comprehensive food safety plan with team assistance
9	Number of food producing/food processing enterprises that passed a third-party food safety program audit with team assistance
10	Development of Value-Added Products from Brewery Waste

Outcome #1

1. Outcome Measures

Grain storage, food or pest control entities adopting new process or product

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma grain and oilseed producers are faced with increasing pressure to provide to the market not only quantity of product but increased quality. Grain quality never improves after harvest. Therefore, the use of methods to maintain as much of harvested quality characteristics is essential. Detecting signs of grain deterioration in the early stages allows managers to respond and mitigate further damage to the crop. Mold is one of the evils causing quality deterioration and can be prevented with proper aeration system management. With large storage facilities the detection of mold is essential but very challenging until it is too late to seek a remedy.

What has been done
A lab version of an electronic nose that responds specifically to mold growing on canola seed has been developed. The sensor is 98% accurate in laboratory conditions. The next step is to package the sensor with air handling, communication ability and power management effectiveness so that the sensor can function in the grain storage environment. Testing needs to be conducted on mold in other kinds of seeds as well. While the original sensor development was done by a doctoral researcher, the subsequent research is being performed by undergraduate research scholars.

Results
Managers that have early detection capability for grain deterioration can limit economic impact that deterioration may have on their product. Compromised grain can be sold immediately, moved to another facility or aerated with high volume air handling equipment to remediate deterioration. In a bin that holds 250,000 bushels of product, at least $250,000 can be saved in dockage at the point of sales. Without mold clumping, the material in the bin will unload properly. This eliminates the need for workers to enter the bin and risk becoming entrapped. 60% of entrapments end in death. There is no accurate monetary estimate of the expense of the loss of

a life. Electronic noses in production at this time cost over $2000. The sensor developed in this project can be built for less than $500, making it viable for even small storage facilities to obtain.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems
401	Structures, Facilities, and General Purpose Farm Supplies
503	Quality Maintenance in Storing and Marketing Food Products
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Number of food industry personnel newly certified as HAACP trained

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of food industry personnel newly certified as having attended food safety and processing workshops

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of food industry jobs created

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of new food businesses started

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

New or improved food processing, food safety and/or product storage adopted by industry

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	63

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Since the 1970s, anyone producing canned foods has been required by the U.S. Food and Drug Administration to use a cook process that has been reviewed and approved as being safe and appropriate. Recently the Preventive Controls for Human Foods Rule, a portion of the federal Food Safety Modernization Act of 2011, has expanded the requirement to have documented safe and effective process controls to most types of processed foods regulated by the FDA. As more processors are required to comply with the provisions of the Preventive Controls for Human Foods Rule, the need for process evaluation and development will expand. This kind of process development and review is provided by Recognized Process Authorities.

What has been done
A group of four OSU personnel, two faculty and two professional staff, work together to provide Process Authority under the umbrella of the Robert M. Kerr Food and Agricultural Products Center. Participating faculty includes extension specialists in the Horticulture and Landscape Architecture and Food and Animal Sciences Departments. This program provides product testing as well as process evaluation, review, and recommendations for food processors in Oklahoma and throughout the United States.

Results
Process evaluations were conducted on 63 different products made by 12 companies in 2018. In addition to formal process evaluations, many companies received technical assistance in the form of process troubleshooting and process development recommendations. As a result of this program, Oklahoma food processors were able to successfully introduce new products into the market while complying with state and federal requirements for the safe and adequate processing of preserved foods. Most importantly, this program helps ensure that consumers can buy canned and other processed foods with confidence that those foods are safe and wholesome.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

Outcome #7

1. Outcome Measures

Number of emergency response teams available in Oklahoma

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of food producing/food processing enterprises that implemented a comprehensive food safety plan with team assistance

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Number of food producing/food processing enterprises that passed a third-party food safety program audit with team assistance

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Development of Value-Added Products from Brewery Waste

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food processing industries generate large amounts of waste that are not efficiently utilized. It is estimated that breweries around the world each year produce more than 38 million tons of brewer?s spent grain (BSG), the solid waste created during the brewing process. BSG is currently underutilized, and is typically used for animal feed. There is some nutritional value to the waste, including protein and fiber, and it could be converted into higher value products for the breweries. The goal of this project is to develop some artisan food products from the brewer?s spent grain waste.

What has been done
Iron Monk Brewery in Stillwater has provided samples of brewer?s spent grain, and they are excited to work with us on developing some potential products. A proximate analysis of some of the spent grain samples shows that the dry BSG is about 17% protein. Several different potential cracker and chip type product formulations have been developed and are currently being optimized. A pet treat is also being investigated.

Results
It is believed that an artisan snack chip made from the local brewery?s spent grain waste would be a desirable product, especially if available in their local tap room. The chip would be appealing based on it?s health benefits and the positive sustainability messaging regarding it being made from the brewery waste. Knowledge gained could also be useful for breweries around the world as a potential higher value product for their BSG waste.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

4-H Youth Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%	0%	100%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	80.0	0.0	0.0	0.0
Actual Paid	80.0	0.0	0.2	0.0
Actual Volunteer	61.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1885752	0	9614	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1885752	0	9614	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
4151848	0	49954	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Well-trained extension personnel support the recruitment, training and retention of a volunteer base necessary to sustain and manage local and county clubs and programming.
Youth involved in 4-H project work, project/community clubs and educational programs and activities will

develop an in-depth knowledge of career opportunities in through project work and educational activities and events.
Youth engaged in the Citizenship, Healthy Living and STEM programming will understand how social and physical sciences, technology, and culture all play an integral role in our personal lives, family life and society - school, community, country and world.
Youth, volunteers and educators will become good stewards of their personal and environmental resources by recognizing how the sound practices and actions of both the individual and society affect finances, energy, housing, food, and the environment.
Collaborate with other youth serving organizations and community leaders, sharing existing resources and training opportunities for youth and adult volunteers.

2. Brief description of the target audience

Youth, children, parents, teachers, youth and adult volunteers, middle to low income families; race and ethnicity will also be recognized as an identifier of audiences; caretakers, agencies and service providers, schools, policy makers

3. How was eXtension used?

- 662 volunteers reported having completed WWM training.
- 500 Volunteers reported having completed Title 7&9 Training
- 136 new volunteers reported receiving New Volunteer Orientation.
- 20 Counties reported one to seven continuing education credits for volunteers.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	100000	5000000	720227	6911655

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total

Actual	80	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of in-service training sessions for Extension educators

Year	Actual
2018	31

Output #2

Output Measure

- Number of educational trainings offered for volunteers, teen leaders and ambassadors

Year	Actual
2018	102

Output #3

Output Measure

- Number of educational events and contests conducted

Year	Actual
2018	101

Output #4

Output Measure

- Number of partnerships and collaborative efforts engaged in to accomplish 4-H Goals

Year	Actual
2018	19

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Adult volunteers will maintain or improve the skills necessary to provide appropriate leadership for 4-H club, camp, after-school and special interest programs.
2	Teen volunteers, officers and ambassadors will learn the leadership skills to become contributing partners with adult volunteers and Extension educators in the design and delivery of 4-H programs.
3	4-H youth will practice "contribution and caring" through citizenship and community service activities.
4	Youth will utilize agricultural and natural science programs to: improve the profitability of agricultural resources; enhance the sustainability of natural resources and improve their understanding of career and leisure activities related to these programs.
5	Youth will increase their ability to use STEM technologies and their awareness of career opportunities in science and technology.
6	Youth will develop an understanding of the relationship between diet/nutrition/exercise and physical, mental and emotional health and will demonstrate an increase in healthy lifestyle choices.

Outcome #1

1. Outcome Measures

Adult volunteers will maintain or improve the skills necessary to provide appropriate leadership for 4-H club, camp, after-school and special interest programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research conducted by the American Camping Association, suggests an appropriate youth to adult ratio, which helps to insure positive youth adult ratios and provides good risk management practices:

6?8 years: 1:6 for overnight, and 1:8 for day
9?14 years: 1:8 for overnight and 1:10 for day
15?18 years: 1:10 for overnight and 1:12 for day

Use of these ratios helps to insure positive youth adult ratios and provides good risk management practices.

Youth programs that intentionally plan for positive youth development have been shown to increase youth contributions to their communities, identify and make healthier choices, are increase participation in STEM activities out side of school hours.

What has been done
As a state we have increased efforts with county offices to insure an adequate number of adult volunteers are in place for charter clubs.

Provide ongoing training to State 4-H Ambassador Advisors to develop a growth mind-set, practice self-reflection and goal setting skills while working with State 4-H Ambassadors. The goal of training is to help youth succeed and thrive in leadership positions.

4-H Curriculum Workshops held at State 4-H Parent/Volunteer conference and District Volunteer conferences. Participants were instructed on the importance of utilizing 4-H curriculum with

members to enhance their project learning experience.

Results
542 club and cloverbud leaders for 729 chartered clubs with 15,222 members.

5042 certified volunteers of which 909 are teens and 4141 are adults serving as club, project, activity and general volunteers. The 4141 adult volunteers provide leadership to our 15,222 members resulting in a 1:4 ratio of adults to youth.

4-H volunteers utilize 4-H curriculum and learning products designed to provide the highest quality positive youth development experience. 4-H curriculum materials are filled with fun, engaging experiences that cultivate abilities youth need for everyday living as they progressively gain subject matter knowledge.

Multiple workshops were presented around the state to update volunteers on the new projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Teen volunteers, officers and ambassadors will learn the leadership skills to become contributing partners with adult volunteers and Extension educators in the design and delivery of 4-H programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research indicates youth involved with caring adults are better prepared to lead successful lives as contributing citizens within their community. Through leadership development, youth have the opportunity to develop life skills which will help them become contributing members of society.

4-H Camps provide an exciting venue for young people to develop important life skills. The quality of camp counselors and the training that they receive directly relates success and safety of our camps. To ensure Oklahoma 4-H camp counselors receive a consistent and quality training that provides 4-H members the best camp experience possible, it is imperative that counselors receive quality training.

What has been done

Through 4HOnline we can track the number of volunteers who received New Volunteer Orientation, WWM, Title IX, and continuing education opportunities at the county level.

The Oklahoma 4-H Leadership Council are members elected by their peers to serve in this leadership role in the Oklahoma 4-H program. These youth leaders participate in 4 meetings each year, develop program goals for Oklahoma 4-H, and work to ensure all 4-H members are contributing to the goals they set forth. These youth assume leadership responsibility for planning and conducting Oklahoma 4-H Roundup as well as Leadership Team Retreat. They are responsible for visiting each county in order to be a face of the Oklahoma 4-H program and a role model for other 4-H members.

4-H Ambassador Leadership Training ? Fall Meeting, Spring Meeting and Ambassador Retreat Leadership Team Retreat

4-H Healthy Living Ambassadors ? 2 trainings and attended 1 national training

Results

Volunteers who participate in continuing education are better prepared to meet the needs of the youth they work with and are better prepared to handle the mission and objectives of positive youth development. According to PARS more than 56,000 volunteer hours were reported.

The Oklahoma 4-H Leadership Council set a goal to raise $15,000 for the Oklahoma Children?s Hospital Foundation, conducted over 41 workshops, visited each of the 77 counties, assisted in planning and implementing of State 4-H Roundup, provided leadership for Oklahoma 4-H Day at the Capitol.

The State 4-H Leadership Council has 6 functioning committees with chairs for ease of implementing tasks, four training/meeting events, and many update meetings. As a result these youth have learned leadership, communication, team work and decision making skills along with many other valuable life skills that will take them far after their time in 4-H.

4-H Ambassadors sharpened their leadership skills and took on leadership roles in their clubs, communities, counties and across the state. State 4-H Ambassadors conducted events reaching over 6,000 people. Activities included corresponding with current donors, working exhibits and telling the 4-H story, advocating for 4-H youth and telling the impact that 4-H has on youth to state legislators and potential funders.

4. Associated Knowledge Areas

KA Code	Knowledge Area

806 Youth Development

Outcome #3

1. Outcome Measures

4-H youth will practice "contribution and caring" through citizenship and community service activities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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.

Community service teaches compassion and understanding. Caring and compassion are two of the traits identified as vital components to positive youth development

What has been done
Oklahoma 4-H participated in the ?National 4-H Day of Service? with over 15 service learning projects being reported. 4-H members and adults worked effectively to plan, implement and evaluate service learning projects all around the state.

The Oklahoma 4-H Leadership Council set a goal to raise $15,000 for the Children?s Hospital Foundation for research. The council also learned about a new opportunity to collect children?s books for children at the hospital so each child could read and take home a book from the hospital.

Results

The State Leadership Council raised $4,328 for the Children?s Hospital Foundation and delivered over 950 books for the hospital to divide between their clinics for the children. Youth also encouraged county participation and interaction with the Ronald McDonald House charity which resulted in 2,272 lbs of pop tabs being collected, which are turned in for cash by the Ronald McDonald House.

More than 600 demonstrations/conferences were conducted on Club Management.

During the yearlong effort to promote the positive benefits that the Children?s Hospital and Ronald McDonald House Charities provides to Oklahoma families, State council members developed skills related to empathy, citizenship, and leadership.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Youth will utilize agricultural and natural science programs to: improve the profitability of agricultural resources; enhance the sustainability of natural resources and improve their understanding of career and leisure activities related to these programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to learn acceptable animal husbandry practices, demonstrating knowledge about animal health, breeding, production, marketing and meat science while being conscientious about product quality assurance, animal welfare/well-being and protection and effects on the environment while having positive family experiences.

Ag illiteracy is a growing problem in the United States (and worldwide). People do not know where their food and fiber originate. In addition, increasing world population means we need to grow more food on less land; the knowledge and technology to do so is important. Unfortunately,

enrollment in plant and soil sciences is falling worldwide, leading to a shortage of scientists able to tackle this problem. Youth programs to increase ag literacy and motivate the next generation to find careers in plant and soil sciences are an important way to ensure that people understand the need to support agriculture and its developments while meeting future needs for our changing world.

What has been done

Camp TURF is a two-week residential summer academy for Oklahoma youth entering grades 9 and 10, specifically focused on exploring careers in horticulture science. In 2018, 20 youth from around the state participated in Camp TURF. Activities included grafting plants in the greenhouse, cloning plants in the lab, constructing pervious pavers, dissecting grasshoppers under a microscope, and other hands-on activities. A session of Grandparent University in 2018 gave 15 grandparent-grandchild pairs two days of hands-on instruction in horticulture at the botanic garden and in the teaching greenhouses at OSU. STEM technologies presented to youth at career fairs and schools included forensic palynology and DNA electrophoresis. Community STEM nights in two different parts of the state gave youth and their families an opportunity to learn about different fruits and vegetables. Trainings in vegetable judging and the Junior Master Gardener curriculum for Master Gardeners, teachers, and Extension educators gave educators tools for teaching youth about horticulture. Oklahoma Gardening segments on public television introduced youth and families to carnivorous plants, the pigments involved in photosynthesis, and plant-related arts and crafts. Growing Oklahoma segments on public television introduced people to hydroponics as well as houseplant maintenance.

Three (3) Shooting Sports certification workshops were hosted over 80 adult volunteers received certification as a shooting sports instructor.

Results

Over thirty-eight thousand (38,232) youth and volunteers participated in educational trainings, events and activities related to Agriculture and Natural Science project areas.

Over twenty thousand (>20,000) participated in agriculture literacy and Ag in the Classroom activities and trainings.

One thousand two hundred (1,217) youth participated in a state sponsored shooting sports event.

Thousands of Oklahoma youth (and their families) from across the state explored the science and technology involved in horticulture, participated in hands-on exploration of horticulture concepts and procedures, and had an introduction to the breadth of careers in horticulture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Youth will increase their ability to use STEM technologies and their awareness of career opportunities in science and technology.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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. Eighty percent of the fastest growing occupations in the U.S. require STEM adequacy, and science and technology jobs are projected to grow by 20.6 percent through 2018, more than doubling the 10.1 percent overall U.S. labor force?s projected growth.

What has been done
Eight STEM in-service trainings were held for 4-H OCES Educators. 123 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 approximately 600 youth and adults attended.

Eight STEM in-service trainings were held for 4-H OCES Educators. 123 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 approximately 600 youth and adults attended.

4-H STEM Quick Experiments (Videos and Lesson Plans)

STEM Coordinator and Marketing Coordinator created STEM videos for social media along with corresponding lesson plans. Four curriculum sets were developed: Carbon on the Move, Slime Time, Catapult Creation and Strawberry DNA. The project received the following award.

? Knight, K., Kinney, H., Branscum, H., and Sallee, J. (2018) Oklahoma 4-H STEM Quick Experiments. Bright Idea Achievement Award. Oklahoma College Public Relations Association.

The videos were released on social media and performed moderately well. We plan to continue developing this form of curriculum for use with 4-H clubs. The lessons are designed so anyone can present them; volunteers, educators, or teen leaders.

Robotics Lesson Study ? Volunteer Training Outreach
Lesson study may be an up and coming teaching method for training volunteers and educators in 4-H programming. Lesson Study is a collaborative effort to train Educators and volunteers in a specific curriculum followed by regular meetings which offer the participants an opportunity to share their teaching experiences and learn from one another. Lesson study is currently tied to the new Common Measures Evaluation System. I was approached by the National Common Measures team about implementing Lesson Study into Oklahoma 4-H programming. Robotics has been a long-standing project in 4-H, many of the teams and volunteers start the program but are unable to finish due to technical difficulties. I thought this might be a good project for Lesson Study. I was able to secure funding to support this program from the 4-H program fee. I offered County Educators a Lego Robotic kit if they would find a volunteer to participate in the lesson study sessions and bring a team to compete in the 4-H Robotics contest. After an initial Face to Face training, I held online Zoom meetings for the volunteers to discuss how their teams were doing, if the curriculum was working for them, and offered an opportunity to collaborate on the project as it was being implemented. The interesting part of the Zoom meeting was the volunteers often answered each other?s questions and share terrific ideas which helped them all succeed. I had excellent attendance during the online meetings with one except due to county fair conflicts. When the contest came, eight of the nine teams competed. The ninth team wasn?t able to attend due to a conflict with a required livestock event. Eight of nine followed through and competed, well above any past robotic training program. One of the volunteers told me she would have bailed in the beginning if it hadn?t been for the Zoom meetings to encourage her and help with her program. The whole process was a terrific success. We will be trying this with other project areas that need additional volunteer training. This was our second robotics contest, we increased from five teams in 2017 to 14 teams in 2018. Evaluations are in process, but I believe the Lesson Study process made the difference.

Results
STEMist ? Public Outreach
In an effort to further disseminate STEM during the summer and train future Extension Educators, I started a new program in 2017, the 4-H STEMist. The premise is simple, I train college students (mainly Collegiate 4-H members with a background in 4-H) to teach STEM lessons, then, I send them out into the state to teach STEM at 4-H camps, day-camps, libraries, and any venue that will allow them in to promote STEM. I have found the students are enthusiastic to learn and teach. The County Educators have been very receptive to allowing them to come present in their county. In our inaugural year, 2017, STEMist made 2039 contacts in 32 counties, at 49 events and taught 88 workshops. That number increased in 2018 to 3,451 contacts, 37 counties, 51 events and 222 workshops. This is a growing program that is reaching many youth. We are in the process of evaluating and designing a project that is sustainable and beneficial to all involved. This program

was selected for presentation at the 2018 NAE4 HA Conference.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Youth will develop an understanding of the relationship between diet/nutrition/exercise and physical, mental and emotional health and will demonstrate an increase in healthy lifestyle choices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma State of the State?s Health Report reveals ongoing challenges as well as signs of promise for improved health status. However, areas of continued challenges include:
? Oklahoma ranks 48th in death due to cardiovascular disease
? Oklahoma has the fourth highest rate of death due to stroke in the nation
? Oklahoma has the fourth highest rate of death due to diabetes in the nation contributing to our high mortality rates are
behavioral risk factors that disproportionately overburden Oklahomans and negatively affect our children?s future health,
academic achievement and our economy.
? Oklahoma has the next to the lowest rate of fruit consumption in the nation
? Oklahoma has the 44th lowest rate of vegetable consumption in the nation
? Oklahoma is the 41st least physically active state in the nation
? Oklahoma has the sixth highest rate of obesity in the nation

What has been done
State 4-H Healthy Living Ambassadors (9 teens) met regularly throughout the year to work on issues related to health. As a result of attending the National 4-H Healthy Living Summit, the Ambassadors created a back home action plan to launch a YouTube channel around health and

safety. Currently the channel hosts 31 Yoga for Kids Poses and 3 safety videos. Through a youth adult partnership, Cathy Allen and the Ambassadors taught a workshop at the 4-H National Healthy Living Summit on the Oklahoma curriculum, Get Fit 4 Life. While attending the summit Ambassadors learned about healthy living resources focusing on social, emotion and physical health. They brought ideas and information home to present in Oklahoma. Ambassadors had healthy living displays at Roundup, OYE and around the state. They also, participated in a statewide TSET meeting.

Oklahoma 4-H received the Walmart Foundation Healthy Habits grant. The grant funds allowed us to offer 23 mini-grants to counties around the state, focusing on creating healthy lifestyles. Also, as part of the grant, Oklahoma 4-H launched the Health Advocates Leading for Tomorrow (HALT) program, which is designed to increase health literacy and fulfill the healthy living mission mandate in children and teens ages 5 to 18. College students with an interest, or experience, in teaching healthy living activities were sought to lead as Health Advocates. Last year Health Advocates traveled more than 750 miles, reaching 320 youth and engaged 19 teen leaders in the delivery of healthy living programs.

Additionally, Oklahoma State University- College of Health Sciences has secured a $2.8 million endowment to benefit Oklahoma 4-H and FFA members through medical school scholarships benefitting rural Oklahoma youth. OSU-CHS is committed to combating the growing physician shortage in rural Oklahoma by developing a pipeline of new doctors eager to bring their skills back to their hometowns. With more than half of 4-H youth living in rural areas, Oklahoma 4-H wants to assist with this worthy endeavor. Through this partnership, Oklahoma 4-H Ambassadors were invited to attend the Cherokee Nation and OSU-CHS announcement of the nation?s first college of medicine to be located at a tribal facility in Oklahoma.

Results

More than 65,000 youth participated in a program related to foods and nutrition, health or personal safety.

Received $58,000 Youth Voice/Youth Choice Walmart Healthy Living grant was awarded through National 4-H Council. An additional $10,000 was granted to provide programming to native American youth.

Offered a statewide Healthy Living Curriculum and Resources inservice for educators.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Beginning in 2015, Oklahoma 4-H began using the National 4-H Common Measures instruments to Identify a common core of youth outcomes and indicators which can be used to improve programs. Common Measures is the first-ever effort by the national 4-H system to provide evaluation instruments for use across 4-H programs.

During 2018 State 4-H Roundup, youth were offered the opportunity to complete a Common Measures survey that focused on positive youth development gained from participation on 4-H.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Turfgrass Development and Management

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	19%	0%	10%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	5%	0%
202	Plant Genetic Resources	8%	0%	10%	0%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	8%	0%	10%	0%
204	Plant Product Quality and Utility (Preharvest)	8%	0%	5%	0%
205	Plant Management Systems	25%	0%	15%	0%
206	Basic Plant Biology	0%	0%	5%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	11%	0%	10%	0%
212	Pathogens and Nematodes Affecting Plants	11%	0%	10%	0%
216	Integrated Pest Management Systems	10%	0%	20%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	3.0	0.0
Actual Paid	5.0	0.0	2.5	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
242455	0	118252	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
242455	0	118252	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
533812	0	614431	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

New turf germplasm/varieties having improved abiotic and biotic stress resistance/tolerance will be generated by our program.
Research will identify the elite performing species and varieties from both our program and from industry.
We will identify and/or develop new or refined integrated management practices to achieve goals.
Research and extension activities will be conducted to improved efficiency of water application and to reduce runoff.
Educational materials will be developed featuring improved varieties and how to properly install and maintain them.
Highly effective educational programming and consultations will be conducted for professionals and consumers to help integrate this information into existing management programs.

2. Brief description of the target audience

Audiences include governmental, private industry and multiple end-user areas. Research audiences: basic and applied plant science/turf science researchers, including those from the CSSA, and ASHS. Funding agency audiences: USGA, GCSAA, USDA, OTRF and many private corporations. New cultivars developed as well as products such as trade articles, fact sheets, and educational programming will be provided to the target audiences characterized as the turfgrass production sector (sod and seed producers), service sector (landscape/lawncare and pest control operators) and turf managers (which include the golf course, parks & grounds, right of way managers and home consumers).

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	13	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of final stage experimental bermudagrasses sent to national testing phase in the NTEP bermudagrass trial once every 5 years

Year	Actual
2018	4

Output #2

Output Measure

- Number of fine turf program and roadside vegetation management workshops conducted and trade presentations presented each year.
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of new bermudagrasses developed by our program that are commercially released to the trade for production.

Year	Actual
2018	1

Output #4

Output Measure

- Number of cultivar evaluation trials; weed control trials; management factor trials; and physiological, morphological or other investigations conducted on turfgrass.

Year	Actual
2018	80

Output #5

Output Measure

- Number of scientific abstracts, posters or oral presentations presented to scientific audiences.
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of turfgrass managers trained in recognition and selection of improved varieties and implementation of integrated turfgrass management systems
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of email and news releases generated
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of consultation phone calls and emails completed
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of Extension reports and fact sheets generated
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of extension field days, workshops, short courses and conferences conducted
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of pesticide applicators receiving continuing education training (CEU workshops).
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Number of initial pesticide applicator certification schools conducted.
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of ODOT employees achieving certified pesticide applicator status following initial certification training.
2	Percentage of professional fine turf managers continuing adoption of improved BMPs and IPM practices when surveyed following educational events.
3	Percentage of ODOT roadside vegetation managers continuing adoption of improved BMPs and IPM practices
4	Number of licensed or sublicensed sod producers and seed producers producing OSU developed turfgrasses. Both new and retained production licenses each year.
5	Number of Oklahoma sod producers producing improved turfgrasses suggested for use by OSU Turfgrass Extension Program.
6	Turfgrass selection and management for sustainability in a multi-stress environment
7	ThinkWater: Saving Water in Urban Landscapes
8	Developing New Bermudagrass with Improved Turf Quality and Stress Resistance

Outcome #1

1. **Outcome Measures**

Percentage of ODOT employees achieving certified pesticide applicator status following initial certification training.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Percentage of professional fine turf managers continuing adoption of improved BMPs and IPM practices when surveyed following educational events.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Percentage of ODOT roadside vegetation managers continuing adoption of improved BMPs and IPM practices

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
ODOT manages over 800,000 acres of roadside right-of-way. Around 140,000 acres of this are mowed roadsides managed with three to four mowings per year. Between 90,000 and 110,000 acres of mowed state roadside are also treated by ODOT with herbicides each year as a part of the integrated program. Without the integrated program, at least one more mowing would need to be performed simply to reduce the height of several taller weed species which are not killed but are suppressed or lowered in height by mowing.

What has been done

The OSU RVM Program trains over 750 ODOT employees each year in effective, reduced risk pesticide selection and use. Between 75 and 100 new right of way applicators receive initial certification training and sprayer calibration training each year to improve their skills in roadside vegetation management.

Results

The comprehensive contracted research and extension training services provided by the OSU Dept of Horticulture & Landscape Architecture Roadside Vegetation Management Program (OSU RVM) saves the Oklahoma Department of Transportation (ODOT) a conservative $500,000 per year and possibly up to $3.0 million per year in operating expenses. This is achieved by ODOT following a research-based integrated mowing and herbicide program for weed control as opposed to a mowing only program on Oklahoma roadsides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Number of licensed or sublicensed sod producers and seed producers producing OSU developed turfgrasses. Both new and retained production licenses each year.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of Oklahoma sod producers producing improved turfgrasses suggested for use by OSU Turfgrass Extension Program.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	39

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #6

1. Outcome Measures

Turfgrass selection and management for sustainability in a multi-stress environment

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma is located near the 100th meridian and within a transition zone climate. As such, turfgrasses in the state can be subjected to significant heat, cold, and drought stresses. Additional stress is commonly supplied by shade and root competition associated with trees. Managing turfgrasses under constant environmental limitations is a challenge requiring highly trained professionals.

What has been done
Development of new turfgrass cultivars with improved drought, cold, and shade resistance traits can reduce inputs needed to sustain fine turf. Research and education that leads to evidence-

based turf management will improve the long-term sustainability of the industry.

Results
The new cultivar (Tahoma 31) has both excellent cold hardiness and drought resistance., with the potential to improve turfgrass performance in the transition zone with reduced risk of injury during typical temperature extremes. Screening of bermudagrass cultivars has also led to a number of plants showing promise for improved shade tolerance. The use of a shade tolerant bermudagrass could reduce water requirements in some cases by over 50% resulting in a savings of 32,000 gallons per year for an average-sized yard.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
202	Plant Genetic Resources

Outcome #7

1. Outcome Measures

ThinkWater: Saving Water in Urban Landscapes

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Responsible, sustainable use of water resources and water conservation efforts are critical to the future of Oklahoma. It is important that the Oklahoma municipalities continue to meet the water needs of the citizens and it is equally important that Oklahoma municipalities, and its citizens, make efforts to extend the life of water resources through responsible, efficient, and sustainable use of water resources. Development and implementation of water conservation programming can help municipalities to establish overall water use or reduction goals, prolong or defer investment in facility expansion and capital costs, and can reduce or maintain operating costs over time.

What has been done
ThinkWater hosts an average of ten workshops and outreach events each year to educate Oklahoma homeowners and irrigation contractors. During the past seven years, we have shared water conservation information, resources, and techniques with over 50,000 individuals. We have reached all water utility account holders (over 250,000) in Oklahoma City and Edmond, OK through billing inserts and water conservation articles.

Results
Our television segments on Oklahoma City Fox 25 reach 12,000 viewers weekly and our Oklahoma Gardening segments have reached 170,000 viewers each weekend with an additional 50,000 views on the Oklahoma Gardening YouTube channel. We have trained more than 500 green industry professionals and Master Gardeners on water conservation in the lawn and landscape and proper irrigation design and practices. We have performed over 50 homeowner landscape and lawn irrigation checkups and have saved homeowners on average 1,500 gallons of water use per month during the growing season. Based on our post-workshop and post-seminar participant survey results, 89% of respondents were able to list ways to save water outdoors including watering less often, use of rain sensors, watering in the early morning, using drip irrigation, using drought tolerant plants, using mulch, and improving the soil. On a system wide basis in Oklahoma City, water conservation programming and outdoor watering reduction have resulted in an average savings of 65,000,000 gallons during peak use summer months, which equates to $182,000 in water utility customer savings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems

Outcome #8

1. Outcome Measures

Developing New Bermudagrass with Improved Turf Quality and Stress Resistance

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bermudagrass is the most widely used turfgrass in the southern USA and throughout tropical and warmer temperate regions of the world. Turf bermudagrass has been planted on approximately15-18 million acres in this country. However, over much of the southern USA turfgrass managers and users desire new bermudagrass varieties with greater cold tolerance, enhanced turf quality, improved drought resistance, increased host plant disease resistance [i.e., spring dead spot (SDS) and leaf spot disease], reduced requirements for mowing and fertilization, better shade tolerance, and faster divot recovery rate.

What has been done

OSU developed seed- and vegetatively-propagated turf bermudagrass experimental varieties with improved turf quality and increased stress resistance. Our breeding methods included recurrent selection to improve plant populations and inter-specific hybridizations of selected plants in common bermudagrass and African bermudagrass to produce F1 hybrid progeny. Our evaluation system consisted of the breeder?s screening and selection; in-house comprehensive evaluation for turf quality, cold hardiness, drought resistance, sod tensile strength, traffic tolerance, and disease resistance by turf scientists; regional trials to test adaptation and turf performance, and to characterize important traits at various locations, and further testing in the National Turfgrass Evaluation Program.

Results

Bermudagrass varieties improved in turf performance traits and resistance/tolerance to stresses (i.e., drought, cold and diseases) will benefit the turf industry by improving turf playability on sports fields and golf courses, enhancing aesthetic beauty of residential lawns, conserving limited natural resources such as water, and reducing turf management risk and cost. Use of cold hardy bermudagrass varieties would reduce the winter kill risk in the US transition zone. Potential exists for the development of bermudagrasses with improved sod-tensile strength, water-use efficiency, shade tolerance, and/or tolerance to spring dead spot and leaf spot diseases.

Drought resistant bermudagrass cultivars, such as ?Tahoma 31? could reduce 20-40% water use as compared to cool-season turfgrass and older bermudagrass cultivars. The development of new seeded varieties will produce significant, positive economic impact to turfgrass seed companies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

None

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Adoption of new cultivars and educational practices are informally assessed during one-on-one consultations by phone, email and site visits. Formal post-educational session adoption of new varieties and management techniques is regularly assessed at the OSU Turf TIP Team's premier educational event, the Oklahoma Turfgrass Conference and Trade Show as well as in one-on-one consultations following the annual Turfgrass Short Course, at Turfgrass Field Day and during the time of end-user site visits. Eight one-half day round table discussions are held around Oklahoma in September to respond to concerns and questions posed by Oklahoma Department of Transportation field yard managers. This round table discussion yields insights following the preliminary annual survey of ODOT roadside programs and allows our team insight into the changes undertaken by ODOT during the current season and those planned in the upcoming year.

Key Items of Evaluation

Perceived quality and value of education offered, perceived quality and value of education offered by trade show vendors, was education valuable enough that you would participate in educational sessions in the future, increase in knowledge, increase in management effectiveness, use of new or improved varieties, use of scouting techniques, pest id prior to pesticide selection and use, and planned changes to management programs in the next calendar year.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Community Resource and Economic Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	100%	0%	100%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	1.0	0.0
Actual Paid	11.0	0.0	0.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
533399	0	38456	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
533399	0	38456	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1174381	0	199815	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Strategic planning training and strategic planning for communities, infrastructure planning, community service plans, training of county elected officials, engineering and manufacturing consulting, solid waste

management training and education, community economic development studies, community leadership and agricultural leadership development, and entrepreneurship training and development.

2. Brief description of the target audience

The target audience includes community leaders (volunteer and elected), agricultural leadership participants and alums, and business owners/prospective owners, hospitals, schools, chambers of commerce, entrepreneurs, other agencies

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30777	1098794	4500	35000

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of community services plans completed
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of education modules (written curricula) completed
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of county officer training courses conducted

Year	Actual
2018	52

Output #4

Output Measure

- Number of manufacturing firms receiving applications engineering assistance

Year	Actual
2018	16

Output #5

Output Measure

- Number of county officials completing an educational certificate of achievement

Year	Actual
2018	83

Output #6

Output Measure

- Number of solid waste-related trainings completed
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number improving business skills
2	Number of manufacturing jobs created or retained
3	Number of communities where capacity was increased
4	Number of participants that plan to open/expand a business
5	Number of communities that build plans for growth and/or improvement
6	Number of leadership class graduates actively participating in community or industry
7	Number improving public infrastructure management skills
8	Local Food Systems
9	Rural Library Hotspot Lending Pilot Program in Oklahoma

Outcome #1

1. Outcome Measures

Number improving business skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Although county governments account for funds in similar ways, names and numbering systems vary according to each county?s independent decisions. The State Auditor and Inspector contracted with OCES to perform this project. The motivation is elimination of adverse audit findings, compliance with federal funds reporting requirements, and preparation of proper financial statements, all of which benefit the citizens by making better use of taxpayer dollars and leveraging those dollars with federal funds and grants.

What has been done
The project was designed in partnership with county governments, the State Auditor & Inspector, software companies, accounting firms working for county governments, and Oklahoma Cooperative Extension Service. The beginnings of a uniform chart of accounts was ?resurrected? from 1984 and expanded upon. A series of meetings over several months was held with State Auditor staff, software vendors, local official advisory boards, and principal accounting firms. After the groundwork was laid, fund and accounts names and numbering system established, discussion turned to a small number of counties to be test cases. It was important to have both county treasurer (collector/banker) and county clerk (purchaser/payer) to both be willing testers. July 1, 2017, five counties began use of the chart of accounts. Mid-way through the fiscal year, it became clear that the transition would be a success. The five ?beta? counties provided testimony to other counties on their experience. Another twenty counties were identified to begin use of the new chart of accounts on July 1, 2018. After many questions, the conversion is working. July 1, 2019 the fifty-two remaining counties will make the transition. All software vendors have made the needed changes and have deployed the needed software packages.

Results
To date, twenty-five counties have made the transition to the new chart of accounts and the fifty-two remaining counties will transition July 1, 2019. Those already using the new chart of

accounts report surprisingly high levels of satisfaction after the initial pains of making a change. Very positive testimonials from the five initial counties provided strong motivation for the next twenty counties to make the change. The State Auditor (who funded the project) is pleased with the progress. An additional benefit has been the development of Standard Operating Procedures with respect to situations and cases that have been problematic. Now several step-by-step flowchart have been developed to make sure that funds in these unique situations are properly tracked.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Number of manufacturing jobs created or retained

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	87

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Of the nearly 3000+ small and mid-sized manufacturers in Oklahoma, over one-third are located in rural areas and are extremely important to their local economies. The majority of such manufacturers are in the Oklahoma City and Tulsa metropolitan areas. The loss or downsizing of even one of these companies (especially in rural areas) can yield devastating consequences. With agriculture and energy industries fluctuating in their labor force needs, rural manufacturers supply much needed jobs in their communities. These manufacturers face particular difficulty in getting relevant and usable information and technical assistance that will keep them abreast of the rapid changes in manufacturing technology. Engineering design expertise is invariably lacking for these companies.

What has been done
The year 2018 included a continuing evolution of change, especially the reductions associated with oil- and gas-related manufacturing. We are now down one Application Engineer (as Don Lake retired), with two of our application engineers still fairly new to the program (Ben Alexander

and Micah Robinson). The year 2018 included a full year of a newly implemented ?pay-for-service? model for services that were historically provided free. The pay-for-service model is coordinated completely through the OMA, but has heavy reliance on the Manufacturing Extension Agents to bring potential for-pay projects to the AEs.

Results

They year 2018 also included two major projects outside of Oklahoma (Arkansas and Massachusetts) as tied to industries that maintain facilities within and outside the state. These projects were requested based on the expertise and capability of the Application Engineers. We worked with the local MEPs to ensure the impacts were captured nationwide and within those states. However, we did not expect to ?double-count? those impacts. These projects were tied to the ?pay-for-service? model where direct funds for the Application Engineer time on the projects was returned to the OMA. In 2018, the Applications Engineers client projects had the following economic impacts, which also included an additional 14 Jobs created and 73 Jobs Retained and a total 972 hours directly logged for the pay-for-service program with the OMA for projects closed in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

Number of communities where capacity was increased

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants that plan to open/expand a business

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of communities that build plans for growth and/or improvement

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Number of leadership class graduates actively participating in community or industry

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Number improving public infrastructure management skills

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Local Food Systems

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2018	0

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

Issue (Who cares and Why)
Local Food Systems is a joint project between the OK Small Business Development Center (SBDC) and Extension to cultivate and support new businesses to produce, process and distribute agricultural products marketed as local or regional. Such businesses exploit unique marketing strategies (e.g., relationship-based sales, farmers markets and other direct to consumer methods, promotion of alternative/sustainable production practices) to meet growing consumer interest in small scale, localized and environmentally sensitive products. Furthermore, recent research funded by USDA NIFA demonstrates that these approaches can be profitable, have economic impact in the communities they operate, and pay more on average than other retail enterprises. Thus, this niche has the potential to generate new income for rural residents,

supplement incomes of existing farmers by diversifying products and markets, and it could lead to potential health outcomes in regions with low access to fresh produce.

What has been done

This year?s program outputs included:
?Deployment of a web-based Local Food Impact Calculator that has been used 247 times to estimate the economic impact of a local food project; 38 reports have generated using these estimates
?Farmers Market Manager Training: 13 market managers participated and completed the 6 week program
?2 Agritourism Field days (co-sponsored by Oklahoma Agritourism): 64 participants
?Start a Food Business Workshop: 12 participants
?Presentations delivered at 2 state-wide conferences: OK Farmers Market & Agritourism Conference, Women in Agriculture and Small Business Conference
?Grantwriting for Local Foods Workshop: 40 participants

Results

The outcomes associated with these efforts are still under evaluation. However, 19 agri-businesses sought consulting services and received more than $63,000 in capital investment for their operations (not all firms reported capital investment). Program advisors also advised non-agricultural businesses; in total, they supported 94 clients, 4 of which were new business starts, who created 8 new jobs and realized at total of $1.5 million in capital investments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #9

1. Outcome Measures

Rural Library Hotspot Lending Pilot Program in Oklahoma

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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 2015 indicates that only 44% of households with annual incomes of $25,000 or less have a home broadband connection, which is less than half of the rate for households making $100,000 or more (91%).

What has been done

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 May 2018, a 1-year pilot project concluded with participating libraries in 4 rural locations: Perkins, Seminole, Elgin, and Haskell (median population 2,700). Each of these libraries was able to continue the program on their own after the first year of funding. In June 2018, 4 additional 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. Each library was provided with 4 hotspot devices with unlimited data to loan out, and each developed their own lending policies. 11 total rural libraries are currently participating in this program across the state.

Results

The hotspot devices were loaned out over 500 times in the first 12 months they were available at our first 4 pilot sites. Our 7 new libraries have already reached 350 loans in the short time 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 9.5 / 10. The survey results suggest the program is reaching its target demographic (68% have incomes < $25,000; 55% have a high school degree or less) and that the hotspot is being used with a variety of devices (smartphones, tablets, laptops; 65% 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, 70% of users have children at home, suggesting that this program is helping to address the ?homework gap.? 30% of respondents said that their Internet skills increased after using the device.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Integrated Pest Management

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation	6%	0%	10%	0%
202	Plant Genetic Resources	5%	0%	5%	0%
205	Plant Management Systems	9%	0%	10%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	16%	0%	20%	0%
212	Pathogens and Nematodes Affecting Plants	10%	0%	20%	0%
213	Weeds Affecting Plants	17%	0%	5%	0%
215	Biological Control of Pests Affecting Plants	11%	0%	5%	0%
216	Integrated Pest Management Systems	20%	0%	20%	0%
601	Economics of Agricultural Production and Farm Management	4%	0%	5%	0%
901	Program and Project Design, and Statistics	2%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	4.0	0.0
Actual Paid	5.0	0.0	3.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
267128	0	153343	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
267128	0	153343	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
588134	0	796762	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Fulfill the specific Inputs and Activities outlined in the "Oklahoma State University Coordination Program for IPM Oklahoma!" (as made to USDA-NIFA "Extension Integrated Pest Management Coordination and Support Program (EIPM-CS)") , including the identification of new program priorities for future funding.

Provide information on IPM upon request to stakeholder groups, and attend stakeholder sponsored meetings as invited.

Conduct targeted research on pest status, suppression and IPM approaches for crop, animal, and urban systems in Oklahoma.

Develop and deliver extension IPM programs to stakeholders, in the form of workshops, field demonstrations and meetings.

Develop pesticide applicator education and pesticide information through printed media, fact sheets and current reports.

Assess impact of educational activities on stakeholder IPM

2. Brief description of the target audience

Agricultural Producers, Agricultural Groups, Commercial Growers, Retailers, Agricultural Professionals (private, commercial and non-commercial), and landowners, nurseries, individual stakeholders, storers and handlers of grain

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4561	103075	230	6000

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	60	60

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Stakeholder assessment

Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Pesticide applicator education schools and workshops

Year	Actual
2018	23

Output #3

Output Measure

- County-based variety field tours of row-crops and small grains for Oklahoma growers

Year	Actual
2018	23

Output #4

Output Measure

- Extension publications will be created or revised

Year	Actual
2018	28

Output #5

Output Measure

- News releases on the subject of IPM horticulture crops, livestock, agronomic crops and urban systems (Public Housing).
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- A summarized annual report will be developed for distribution to involved stakeholders demonstrating the impact of IPM programs to Oklahoma citizens.
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased use of pest management approaches for targeted cropping system acres
2	Number of trained certified pesticide applicators
3	Increase in percent of growers with knowledge and adoption of iWheat program for winter wheat.
4	Home gardeners will gain knowledge about IPM practices for their home gardens.
5	People will gain knowledge about IPM programs by visiting the IPM Oklahoma! booth at various meetings, including the Oklahoma Ag Expo and the Oklahoma School Plant Managers Association.
6	Participants will understand connections between pest management of bed bugs, the near environment, housing, health, and well-being resulting in an increase in the number of Oklahoman's practicing bed bug risk reduction.
7	Stakeholders will increase awareness of invasive species in Oklahoma (such as saltcedar, brown marmorated stink bug, emerald ash borer, etc) and how they might be managed.

Outcome #1

1. Outcome Measures

Increased use of pest management approaches for targeted cropping system acres

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Individuals and groups that care about the work done in this project include all involved with wheat, including producers (both those that use wheat for grain, grazing or both), millers, bakers, exporters, as well as chemical companies that develop and market foliar fungicides. Providing wheat varieties with genetic resistance to multiple diseases allows producers to minimize inputs while still managing disease losses. Providing information related to the efficacy of fungicides to control multiple foliar diseases also helps producers, extension personnel, and companies select and use fungicides as a final resort to help minimize losses. Both approaches add to the quantity and quality of wheat produced in Oklahoma.

What has been done
Winter wheat varieties adapted for production in Oklahoma and the southern Great Plains have been developed by the Wheat Improvement Team at Oklahoma State University and released by the Oklahoma Argricultural Experiment Stateion. In 2018, four winter wheat varieties were released including Showdown, Baker?s Ann, Skydance, and Green Hammer that at the time of their release, incorporated superior genetics for multiple traits including resistance to key foliar diseases such as wheat leaf rust. Testing of over decades has demonstrated that fungicides typically are economically beneficial in the presence of foliar fungal diseases, and will increase not only the quantity of yield but also yield quality.

Results
Since 1982, 37 wheat varieties have been develop by the Oklahoma State Wheat Breeding Program and released by the Oklahoma Agricultural Experiment Station. Twenty-seven of these have been released since 2000. In 2018, four such winter wheat varieties were released including Showdown, Baker?s Ann, Skydance, and Green Hammer. At the time of release, these four varieties incorporated superior genetics for multiple traits including resistance to key foliar

diseases such as wheat leaf rust. With the multitude of varieties available for producers to select from, OSU released varieties have consistently been planted on more than 40% of the acres in Oklahoma since 2010.
Fungicide testing on wheat has been conducted since the 1980s or earlier, but has expanded from less than eight or so treatments in the early 2000s to up to 25 treatments recently. This information is especially useful (and supported) by the chemical companies developing the products, but also is used and relayed to wheat producers and extension educators to help them in choosing and applying fungicides to manage foliar fungal diseases when resistant varieties were not selected for planting or a fungal pathogen has adapted to and overcome the genetic resistance in a variety.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Number of trained certified pesticide applicators

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	9831

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Oklahoma has over 2,800 licensed companies, 14,600 certified applicators, 3,000 service technicians, 8,900 private applicators for a total of 26,500 applicators working for 2,600 companies. Each of these applicators make pesticide applications to the insides of homes, businesses, schools, daycares, hotels, to yards, gardens, farms, research facilities, timber, pasture and waters of the US. Education is crucial for the application of pesticides designed to kill something.

What has been done

Pesticide safety, teaching, and training programs were provided to a total of 9,831 Private Pesticide Applicators, Master Gardeners, New Extension Agent training, control product suppliers, Oklahoma Pest Management Association (OPMA), Oklahoma Vegetation Management Association (OKVMA), Oklahoma Agricultural Aviation Association (OAAA), and independent commercial and non-commercial applicators. This participation number is now stable during each year and training practical classes and hands-on training will continue into the foreseeable future. Structural pest control training programs and activities resulted in a 90% reduction of OK citizen complaints to ODAFF concerning problems with pest management company termite services and successful pest control operations. New commercial applicators continuing their certifications or applicators who re-certified, that received training manuals or in-class training numbered 9,050. 7,745 training manuals distributed to private and commercial applicators.

Results

During 2018, 9,000-10,000 personnel to include pest management professionals, private and commercial certified pesticide applicators, Master Gardeners, Tribal members, ODAFF regulatory personnel, and interested citizens received information on wood-destroying insect control and pesticide safety by attending OSU Pesticide Safety Education and Training programs. Oklahoma citizens received termite information from the Oklahoma Gardening termite segment, on-line Fact Sheets and Pest e-Alerts, scientific and extension conferences and meetings. These scientific and outreach activities (22,342 contact hours) led to safer pesticide use and an improved knowledgeable public that received beneficial information about protecting their homes and buildings, and farm wooden structures from wood-destroying insects and helped ensure proper use of pesticides. By protecting their wooden homes and structures from wood-destroying insect damage, millions of dollars in repair and replacement costs are avoided.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
901	Program and Project Design, and Statistics

Outcome #3

1. Outcome Measures

Increase in percent of growers with knowledge and adoption of iWheat program for winter wheat.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Home gardeners will gain knowledge about IPM practices for their home gardens.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	453

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Tomatoes are the most popular vegetable crop grown in commercial vegetable farms and residential gardens in the U.S. In Oklahoma and the surrounding region, diseases are a major factor limiting successful tomato production. Extension educators, extension specialists, commercial producers, and gardeners are often unsure about the cause of disease problems and effective management strategies that help ensure successful tomato production. Unfortunately, relatively few samples are submitted to the OSU Plant Disease and Insect Diagnostic laboratory and misdiagnoses are common. This can be problematic in managing diseases. For example foliar disease are often lumped as ?early blight?- a fungal disease. However, bacterial diseases are common in the region and are not controlled by most fungicides used for early blight. Additionally, spider mite damage is also misdiagnosed and a disease or visa versa. There is a need for better information, particularly aimed at extension educators and residential gardeners on disease identification and effective disease management strategies.

What has been done
Educational programs have been expanded over the last 7 years to educate growers, extension educators, and residential gardeners on basic disease biology and management that include extension sponsored grower meetings (n=5), extension in-service trainings (n=7), and appearances on Oklahoma Gardening that have been recorded on YouTube. Educational

programs have been supported by updated tomato disease fact sheets (n=3) and pesticide recommendations and application instructions tailored for gardeners in the OSU Extension Agent?s Handbook of Insect, Plant Disease, and Weed Control. Emphasis was placed on cultural controls including rotation of vegetable crop groups, utilizing disease resistant varieties, and preventive spray programs that include copper fungicides for bacterial disease control.

Results

Impacts of educational program have been twofold. The first increased capacity to manage diseases in small acreage vegetable crop production through knowledge gained and which improves decision-making. YouTube videos on tomato diseases have been widely viewed (466K total views), and two of the tomato disease fact sheets are in the top 30 OCES fact-sheet downloads. Information from this program is clearly in demand. The second impact has been reduced environmental impact through the use of environmentally friendly disease control strategies such as disease resistant varieties, crop rotation, and use of organically (OMRI) approved fungicide such as copper sulfate and copper soap. Given a conservative 10% adoption rate, an estimated 46K gardens and small farms have applied recommendations that improve tomato disease control and increase productivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

People will gain knowledge about IPM programs by visiting the IPM Oklahoma! booth at various meetings, including the Oklahoma Ag Expo and the Oklahoma School Plant Managers Association.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Participants will understand connections between pest management of bed bugs, the near environment, housing, health, and well-being resulting in an increase in the number of Oklahoman's practicing bed bug risk reduction.

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Stakeholders will increase awareness of invasive species in Oklahoma (such as saltcedar, brown marmorated stink bug, emerald ash borer, etc) and how they might be managed.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Food Safety - Agricultural Biosecurity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	5%	0%
212	Pathogens and Nematodes Affecting Plants	0%	0%	50%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%	0%	35%	0%
903	Communication, Education, and Information Delivery	0%	0%	10%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	3.0	0.0
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	153343	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	153343	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	796762	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Maintain and expand, as appropriate, the OSU National Institute for Microbial Forensics & Food and Agricultural Biosecurity, a multi-disciplinary unit to support and address issues of crop and food safety and biosecurity, and their impacts.
2. Conduct scientific research targeted specifically towards plant pathogen forensics, produce safety, sociological impacts of terrorism and other areas of agricultural biosecurity.
3. Continue to offer targeted coursework for students seeking M.S. or Ph.D. degrees in established programs such as Plant Pathology, Biochemistry, Plant Sciences or Forensic Sciences, who seek plant pathogen forensics. Consider establishing an academic "track"leading to a certificate or Minor in this area.
4. Work with other members of the Entomology & Plant Pathology Department to revise and enhance the Bioforensics Option within the undergraduate Entomology Degree Program.
5. Increase visibility and impact of NIMFFAB through education and outreach (an interactive website, student internships, field exercises, hosting meetings).
6. Participate on/in local and national grant panels, advisory boards, review committees, expert bodies and other activities, as appropriate, to maintain visibility of OSU and NIMFFAB in the national biosecurity, homeland security, microbial forensics, and food safety communities.

2. Brief description of the target audience

Key members of National and Oklahoma homeland security community (DHS, FBI, CIA, etc)
Key members of National and Oklahoma agricultural leaders and representatives
Oklahoma extension personnel
Master gardeners
Oklahoma producers and crop consultants
OSU students and faculty
Professional/scientific societies
Key industries
The public

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	26	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of peer reviewed publications

Year	Actual
2018	26

Output #2

Output Measure

- Number of outside-OSU researchers, agencies and entities sponsoring, collaborating with or benefiting from NIMFFAB activities.
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of grant/contract proposals submitted in agricultural microbial forensics and biosecurity, and food safety.

Year	Actual
2018	21

Output #4

Output Measure

- Number of grants/contracts awarded in those areas.

Year	Actual
2018	12

Output #5

Output Measure

- Number of journal articles submitted with emphasis on agricultural microbial forensics and biosecurity.

Year	Actual
2018	26

Output #6

Output Measure

- Number of students taking classes or seminars developed as part of the OSU Agricultural Biosecurity initiative.
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of invitations to agricultural biosecurity team members for participation in initiatives, programs, presentations, and consultations related to agricultural biosecurity and microbial forensics
2	Number of team-associated individuals who a. Performed a project related internship b. Were hired into a professional position in the biosecurity or food safety field c. Served on agricultural biosecurity or food safety review committees or panels
3	Graduate students who will populate laboratories whose testing is related to the protection of human, animal, and plant health from infection by pathogenic organisms
4	Number of students enrolled in courses that contain a significant portion of material on agro-terrorism, bio-terrorism, or food safety
5	Next Generation Sequencing becoming the gold standard in diagnostics for plants and animals.
6	New technology development for improving produce safety
7	Leafhopper Genomes and Transcriptomes

Outcome #1

1. Outcome Measures

Number of invitations to agricultural biosecurity team members for participation in initiatives, programs, presentations, and consultations related to agricultural biosecurity and microbial forensics

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of team-associated individuals who a. Performed a project related internship b. Were hired into a professional position in the biosecurity or food safety field c. Served on agricultural biosecurity or food safety review committees or panels

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Graduate students who will populate laboratories whose testing is related to the protection of human, animal, and plant health from infection by pathogenic organisms

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of students enrolled in courses that contain a significant portion of material on agro-terrorism, bio-terrorism, or food safety

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Next Generation Sequencing becoming the gold standard in diagnostics for plants and animals.

2. **Associated Institution Types**

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rapid and accurate pathogen diagnostics in plants and animals are critical to food security as well as public health. Often, detection is performed using the gold standard PCR or immunostrips. The mentioned techniques allow a maximum of five simultaneous pathogen detection. Therefore, causing a delay in control and management of potential disease outbreaks. Whole genome sequencing can significantly contribute to improve the time to detection.

What has been done
E-probe Diagnostic Nucleic Acid Analysis (EDNA) is a cyberinformatic gateway that concatenates

a series of bioinformatics and analytical tools for diagnostic assay developers and clinical diagnostician users. We have presented our work worldwide including Asia and nationwide in various agricultural states, allowing us to create partnerships with other institutions nationwide. The collaborations have allowed to develop MiFi-citrus, MiFi-blueberry and MiFi-Rose.

Results

Microbial pathogens evolve continuously and previously unrecognized pathogens continue to emerge, threatening food security and public health. It is therefore crucial to improve pathogen detection methods to adapt to these changes. We have created Microbe Finder (Mi-Fi) a platform that allows rapid diagnosis of multiple pathogens within minutes after sample processing. MiFi technology allows the user to access databases of various plant and animal pathogens through their browser and select the ones that interest them to find in their sample. The user receives an e-mail within minutes with a report of pathogens found in the sample. Using MiFi and current sequencing technologies is allowing multiple diagnostic clinics (NPDN) and regulatory entities (USDA PPQ) to rapidly discard or keep samples based on the results.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

New technology development for improving produce safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With increasing numbers of foodborne illness and outbreaks associated with the consumption of produce in recent years, the presence of foodborne pathogen on produce, such as fresh vegetables, fruits, and tree nuts, is a worldwide food safety & human health concern. Decontamination of produce during processing is a critical step in reducing such risk. However, current technologies are primarily based on chemical sanitizers (such as chlorine) that often show

a limited efficiency in eliminating/reducing such risk. The food industry is constantly on the look for new decontamination technology.

What has been done

Cold atmospheric plasma (CAP), also known as atmospheric low temperature plasma, has gained increasing attention as an alternative nonthermal technology for elimination of microorganisms (spoilage as well as pathogens) from contaminated objects, such as medical devices and food surfaces. We?ve conducted several studies to evaluate the efficacy of cold plasma (device with improved design) to inactivate foodborne pathogen (Salmonella enterica) on tree nuts (in-shell pecans) and spice (black peppers), with a long term goal to develop a viable new technology for the food industry.

Results

Salmonella populations decreased with increasing exposure time. On in-shell pecans, an average of 0.75 log CFU reduction of Salmonella was achieved by 2 minute cold plasma exposure. An average of 4.04 log CFU reduction was observed at all distances when treatment time increased to 10 minutes. Similarly, an average of 1.1 log CFU reduction was achieved on black pepper when treated for 2 minutes at 1 cm. A higher reduction (2.34 log CFU) was reached at 5 minutes at 1 cm. Population reduction increased to 3.63 log CFU for10 minutes of exposure at all distances.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Leafhopper Genomes and Transcriptomes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Vector entomologists have long lamented the paucity of vector genomes, particularly for the auchennorhyncha, for which there are less than 10 genomes published. Our research partners at University of Illinois will greatly benefit from the genomic information as they work to resolve the phylogeny of deltocephaline leafhoppers.

What has been done

Six genomes and transcriptomes were generated using the Illumina platform: Macrosteles quadrilineatus, Balclutha rubrostriata, B. neglecta, Graminella nigrifrons, Dalbulus maidis and Exitianus exitiosus. Analysis of the transcriptomes revealed differences in gene clusters and endosymbionts between vector species and non-vector species.

Results

Obtaining the genomes and transcriptomes of six leafhopper species has enabled deeper comparisons between vector and non-vector leafhoppers. What this means is that we may be able to identify specific genes or pathways that are critical to the transmission of propagative plant pathogens. These putative genes/pathways may then be targeted to disrupt virus/bacterial transmission to plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Other (exotic pathogens, terrorism)

Brief Explanation

BSL2+ laboratory was remodeled and had air flow issues which had to be resolved. The lab is fully operational now.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

None

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Farm and Agribusiness Systems Economics

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	25%	0%	60%	0%
602	Business Management, Finance, and Taxation	28%	0%	10%	0%
603	Market Economics	30%	0%	10%	0%
607	Consumer Economics	7%	0%	10%	0%
610	Domestic Policy Analysis	10%	0%	10%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	4.0	0.0
Actual Paid	8.0	0.0	1.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
380088	0	48070	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
380088	0	48070	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
836837	0	249746	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Develop and communicate research based information that farm and agribusiness managers can use to improve decisions.
Develop decision aids developed that assist farm and agribusiness managers in improved decisions.
Conduct educational programs that improve the management skills of farm and agribusiness managers.
Develop and support innovative information delivery and education systems including Communities of Practice on eXtension, webinars and social media.

2. Brief description of the target audience

Managers, owners, and employees of farms and agribusinesses; policy makers; agency leadership, lenders, cooperative boards

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15446	679788	1650	72000

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	43	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of board members of farmer-owned cooperatives receiving credentialed director training for board goverence
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of software decision analysis aids developed
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of manuscripts submitted to refereed journals
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of farm income tax managment schools conducted

Year	Actual
2018	9

Output #5

Output Measure

- Number of participatory experiential learning workshops conducted
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of extension fact sheets, current reports, department staff papers, newsletter articles and other reports developed.

Year	Actual
2018	81

Output #7

Output Measure

- Number of Extension educational meetings and workshops conducted

Year	Actual
2018	160

Output #8

Output Measure

- Number of website posts and other electronic media deliveries
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of tax preparers using information from OCES tax schools
2	Number of credentialed board members serving on agricultural cooperative boards (cumulative)
3	Number of beef producers applying some level of financial management decision skills learned through Master Cattleman certification
4	Number of producers and agribusiness managers using OSU developed decision aids
5	Number of producers, agribusiness managers, or lenders gaining an improved understanding of risk management through participatory experiential learning experiences
6	Number of stakeholder downloads of information from websites and other electronic media
7	Analyzing the Impact of Tax Reform on Agricultural Cooperatives
8	Cattle Market Outlook and Marketing Education

Outcome #1

1. Outcome Measures

Number of tax preparers using information from OCES tax schools

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1450

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Income tax preparers have a need for relevant and current tax law education that helps them prepare for the upcoming filing season. Tax law changes are often complex and create a challenge for preparers who must apply the law to their client?s personal and business income tax situations. In addition, taxpayers want to be able to go to their preparers to get up to date tax planning information.

What has been done
Beginning in 1961, the OSU agricultural economics department and the OCES has conducted the Farm and Business Tax Institutes to provide income tax education for farmers, ranchers, CPA?s, IRS enrolled agents and other income tax preparers. These schools were originally 8 hours in length and have evolved into 16 hours of continuing professional education over a 2-day period. In 2018 attendance in the fall OSU tax schools reached 1,450 individuals. According to the evaluation summary the participants completed about 362,400 federal tax returns and nearly 59,000 farm returns (note that there are approximately 78,100 farms in Oklahoma).

Results
Several participants at each location were asked to place a subjective value on the education received which they then use to assist their clients with tax planning advice to reduce Federal and Oklahoma income taxes, to increase return filing accuracy, to provide retirement planning assistance, and/or to educate their clients of important income tax and estate tax planning tools. The average value they provided was near $15.00 per return for 2018. These preparers indicated that the education they received significantly reduced the amount of time needed to complete a return. Using the $15 per return and 362,400 returns filed, the value is just over $5.4 million.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

Outcome #2

1. **Outcome Measures**

Number of credentialed board members serving on agricultural cooperative boards (cumulative)

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of beef producers applying some level of financial management decision skills learned through Master Cattleman certification

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of producers and agribusiness managers using OSU developed decision aids

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Number of producers, agribusiness managers, or lenders gaining an improved understanding of risk management through participatory experiential learning experiences

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Number of stakeholder downloads of information from websites and other electronic media

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Analyzing the Impact of Tax Reform on Agricultural Cooperatives

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Tax Cuts and Jobs Act of 2017 significantly reduced the top corporate income tax rate and also included special provisions impacting agricultural cooperatives and their members. This raised the possibility that agricultural cooperatives should change their profit distribution structure. The tax reform act also created a complex structure of tax deductions and tax deduction offsets which are shared across the cooperative and members. The tax reform act therefore created numerous important questions for cooperative boards of directors.

What has been done
In cooperation with the National Council of Farmer Cooperatives, I help lead of team of academic cooperative specialists to address the issues rated by the tax reform act. Through the use of my simulation program and the creation of representative cooperative firms we were able to create educational material showing the optimal profit distribution structure and the level of tax deduction that cooperative need to pass on to members to keep they equivalent with producers to delivering to non-cooperative firms. The information was delivered via a national webinar with over 100 attendees in 25 states, fact sheets published simultaneously by Oklahoma State University and Kansas State University, by a refereed article in the Journal of Cooperatives and in presentations at the Western Agricultural Association Annual Meeting and NCERA-210 Cooperative Research Committee meeting in Minneapolis MN.

Results
Cooperative boards of directors and CEOs have a much better understanding of the impact of tax reform on their profit distribution choices and the issues to consider when retaining or passing on the cooperative level tax deduction. On a national level approximately 20% of marketing cooperative have transitioned from qualified to nonqualified equity, as recommended by the research. The simulation results indicated that change increases the member?s return from the

cooperative by approximately 30%.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

Outcome #8

1. Outcome Measures

Cattle Market Outlook and Marketing Education

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cattle production is the largest agricultural industry in Oklahoma and is the largest user of land resources in the state. Cattle producers face a myriad of production and resource management challenges that are affected by dynamic domestic and international market conditions. The U.S. cattle and beef industry is, arguably, the most complex set of markets on the planet. Growth in food markets, international trade and other trends means that markets are getting ever more complex. Producers need continuous access to market information to assist in cattle production and marketing decisions. Cattle producers must incorporate market information into management plans and actions that utilize, protect, and preserve the resources they control for short and long-term success.

What has been done
A continuous flow of market analysis and information about market conditions is maintained through a weekly newsletter, SUNUP, and a variety of other media including radio, television and print outlets. The Cow-Calf Corner newsletter is emailed weekly to about 1200 emails. Numerous primary recipients of the newsletter are media sources, which subsequently republish the articles. Economic production and marketing education programs are supported by collaborative applied research to understand and assess business structure, conditions and needs.

Results
Several impacts are attributable to these efforts:
-Increased producer awareness of dynamic domestic and international cattle and beef market conditions and implications with enhanced production and marketing decision-making.
-Increased producer knowledge of marketing and risk management tools.
-Increased producer knowledge of ranch business management principles
-Increased profitability and sustainability of the cattle industry with improved resource management and business practices

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
603	Market Economics
610	Domestic Policy Analysis

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

none

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Integrated Bioenergy and BioBased Products Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
511	New and Improved Non-Food Products and Processes	0%	0%	100%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	3.0	0.0
Actual Paid	0.0	0.0	3.5	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	169206	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	169206	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	879186	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Developing partnerships with universities, industry, and federal laboratories.
- Developing project proposals
- Preparing and presenting technical papers
- Submitting papers for journal articles
- Developing licenses and patents
- Taking new and/or improved products to pre-commercialization
- Developing educational materials
- Disseminate research findings through meetings and workshops

2. Brief description of the target audience

Other scientists, industry, agricultural producers, commercial developers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2018
Actual:	2

Patents listed

Atiyeh, H. K., R. S. Lewis, J. R. Phillips and R. L. Huhnke. Method Improving Producer Gas Fermentation. US Patent No. US 10,053,711 B2. Date of patent: 8/21/2018.

Atiyeh, H. K., J. R. Phillips and R. L. Huhnke. System and Method for Feedback Control of Gas Supply for Ethanol Production via Syngas Fermentation Using pH as a Key Control Indicator. US Patent No. US 10,017,789. Date of patent: 7/10/2018.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	8	16	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Technical papers and presentations

Year	Actual
2018	13

Output #2

Output Measure

- New processes or products developed

  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Technology demonstrations conducted

Year	Actual
2018	0

Output #4

Output Measure

- Educational Publications

Year	Actual
2018	1

Output #5

Output Measure

- Extension programs developed

  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Release and commercialization of new feedstocks varieties
2	Best management practices identified for sustainable feedstock production
3	Fundamental knowledge of engineering or science gained in developing biobased products
4	Number of students graduated (masters and doctoral)
5	New processes or products developed
6	Products/processes taken to pre-commercialization

Outcome #1

1. Outcome Measures

Release and commercialization of new feedstocks varieties

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Best management practices identified for sustainable feedstock production

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Fundamental knowledge of engineering or science gained in developing biobased products

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fast pyrolysis is promising technology that produces liquid fuels (known as bio-oil) through thermal decomposition of biomass or municipal solid wastes in absence of oxygen. Bio-oil can be used an intermediate for producing liquid fuels and chemicals. However, because of its unwanted properties, bio-oil cannot be used directly without energy-intensive and expensive upgrade using hydrogen. Our hypothesis is that methane available in natural gas and flare gas can serve the purpose of providing hydrogen but the catalyst and reaction conditions to promote these reactions are underexplored. Hence, this project focusses on development and demonstration of the novel natural Gas and Biomass To Liquids (GBTL) technology that will directly produce hydrocarbon fuels and chemicals compatible with existing infrastructure.

What has been done
We developed several promising zeolite-based catalysts and evaluated their performance in a micro-scale reactor to produce hydrocarbons from biomass components (cellulose, hemicellulose and lignin) and methane. In a follow-up study, we focused on upscaling the micro-level reactor results to a bench-scale. The best catalysts and reactor conditions were used in the bench-scale reactor tests, and then upscaled to fixed bed reactor and Pyroprobe reactors.

Results
Maximum yield of bio-oil (about 53.4% on a weight basis) was achieved under methane over MoZn/HZSM-5 at 650℃. Highest energy content and yield of about 10.2 MJ/kg and 29.9%, respectively were both achieved under methane and same temperature of 650℃. Incorporation of methane in pyrolysis using a fixed bed improved yield of aromatics hydrocarbons to the maximum of about 56.8% (peak area) at temperature of 750℃ over MoZn/HZSM-5. The lowest yield (%) of oxygenated compound groups of acids (not detected), aldehydes (not detected), ketone (3.0%), and phenols (25.2%) were achieved when MoZn/HZSM-5 used under methane at 750℃. This demonstrated that MoZn/HZSM-5 was more effective in reducing

oxygenated compounds compared to HZSM-5 only.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of students graduated (masters and doctoral)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

New processes or products developed

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Products/processes taken to pre-commercialization

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is an increasing demand for low cost, small-scale (50-100 kWe), portable electricity generation units that utilize diverse carbonaceous materials, including wastes. These units could be deployed in remote and/or energy deficit regions domestically and internationally. Utilizing municipal solid waste (MSW), small municipalities could supplement power needs while simultaneously reducing landfills. Areas devastated by natural disasters could use these units as stand-alone or supplemental electricity sources. Unlike

What has been done
This unit serves as a proof-of-concept and an integral component to a proposed mobile electricity generation unit having a 50-100 kWe nameplate output. In addition to the unique reactor design, the gasifier is capable of utilizing low bulk density carbonaceous materials, which can be problematic to any gasification system. Research continues, focusing on developing syngas cleaning technologies. Developing a low-cost, low-maintenance cleaning system is an important factor for widespread deployment of the mobile electricity generation units.

Results
The Gasifier Team is working with the OSU New Product Development Center, Technology Development Center, and Research Foundation to secure a company to develop a beta version of the mobile electricity generation system that could utilize a wide range of carbonaceous materials, including municipal solid wastes (MSW). Ultimately, a power generation unit will be marketed for dispatchable, distributed electricity generation that is grid-tied via net metering. OSU?s patented downdraft gasifier has been scaled-up. We are seeking investors to develop a beta version of a mobile 50-100 kWe electricity generation unit. Ultimately, our desire is to have an Oklahoma-based company market this technology around the world.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 14

1. Name of the Planned Program

Childhood Obesity - Hunger / Health / Risky Behaviors / Resilience Issue Teams

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	40%	0%	0%	0%
724	Healthy Lifestyle	18%	0%	0%	0%
802	Human Development and Family Well-Being	19%	0%	0%	0%
806	Youth Development	23%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	24.0	0.0	0.8	0.0
Actual Paid	19.0	0.0	0.0	0.0
Actual Volunteer	5.2	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
666749	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
666749	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1467977	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Development and introduction of new curricula
• Outreach to families, schools, child care providers, direct assistance, demonstrations, and educational opportunities to food, healthy eating, exercise, diet, etc.
• Development of evaluation tools
• Delivery through classes, one-on-one, news releases/TV/radio, social media, participation in events, displays
• Providing training and other staff development opportunities to county educators

2. Brief description of the target audience

Youth, children; parents; teachers; adult volunteers; middle to low income families; race and ethnicity will also be recognized as an identifier of audiences; caretakers, agencies & service providers, schools, policy makers.

3. How was eXtension used?

eXtension is provided as an educator resource

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	283874	1940685	40459	309891

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of OSU Facts published

Year	Actual
2018	5

Output #2

Output Measure

- Number of other publications including but not limited to Bulletins, Technical Manuals, Reports as well as PowerPoint presentations and curricula, and core competency modules distributed for use by others.

Year	Actual
2018	23

Output #3

Output Measure

- Number of in-service training sessions

Year	Actual
2018	46

Output #4

Output Measure

- Number of certification training sessions

Year	Actual
2018	2

Output #5

Output Measure

- Number of other training sessions, workshops, etc. conducted

Year	Actual
2018	20

Output #6

Output Measure

- Number of presentations at Extension organized meetings

Year	Actual
2018	27

Output #7

Output Measure

- Number of presentations at other meetings and events (professional meetings, invitations to speak to community groups, stakeholder groups, etc.)

Year	Actual
2018	27

Output #8

Output Measure

- Number of workshops, conferences, etc. organized

Year	Actual
2018	13

Output #9

Output Measure

- Number of posters, displays, exhibits, or models

Year	Actual
2018	5

Output #10

Output Measure

- Number of demonstrations

Year	Actual
2018	0

Output #11

Output Measure

- Number of newsletters

Year	Actual
2018	5

Output #12

Output Measure

- Number of web pages created or updated

Year	Actual
2018	5

Output #13

Output Measure

- Number of radio and television presentations

Year	Actual
2018	12

Output #14

Output Measure

- Number of newspaper, and magazine articles written

Year	Actual
2018	152

Output #15

Output Measure

- Average number of phone calls and/or email requests responded to on a weekly basis
  Not reporting on this Output for this Annual Report

Output #16

Output Measure

- Number of webcasts or guest appearances on webinars

Year	Actual
2018	1

Output #17

Output Measure

- Number of OSU Fact Sheets revised

Year	Actual
2018	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of participants increasing consumption of fruits
2	Percentage of participants increasing consumption of vegetables
3	Percentage of participants increasing consumption of whole grains
4	Percentage of participants increasing consumption of low-fat dairy and other calcium-rich foods
5	Percentage of participants decreasing consumption of foods high in fat, sugar and salt
6	Percentage of participants decreasing consumption of sugar-sweetened beverages
7	Percentage of participants increasing physical activity
8	Percentage of participants increasing safe food handling practices
9	Percentage of participants increasing positive parenting skills
10	Percentage of participants increasing positive youth peer involvement
11	Percentage of participants increasing parenting competence
12	Percentage of participants increasing child competent behaviors
13	Percentage of participants with increased access to affordable, healthy foods
14	Percentage of participants decreasing child problematic behaviors
15	Percentage of participants decreasing disengaged or hostile parenting

Outcome #1

1. Outcome Measures

Percentage of participants increasing consumption of fruits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	83

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fifteen percent of Oklahoma adolescents are considered overweight and an additional 12% are considered obese. Oklahoma has the fifth highest rate of obesity for youth ages 10 to 17. Among adults, 35% are considered overweight, and an additional 33% are considered obese. The state has poor fruit and vegetable consumption. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. This ranking reflects the state?s high density of fast food establishments and low fruit consumption. Half of all the state?s adults reported consuming fruit less than once daily and 25% consumed vegetables less than once a day. Among Oklahoma youth, 48% reported consuming fruit less than one time daily and 44% reported a similar low consumption of vegetables.

What has been done
Oklahoma Cooperative Extension Service programs are committed to the physical, mental and emotional health of our nation?s youth so they may lead healthy and productive lives into and throughout adulthood. In order to advance the socio-economic development of the state, and have an impact on issues that address childhood obesity, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life related to the critical areas of food, nutrition, and health.

Results
2018 programs highlights include:

?OrganWise Guys (OWG) program targets Pre-K through 5th grade students in low-income schools and teaches the healthy eating and physical activity habits of maintaining a low-fat diet, consuming high-fiber foods, drinking plenty of water, and engaging in regular physical activity. OWG served approximately 4,148 youth in over 150 Pre-K through 5th grade classrooms.

?Growing Strong Bodies and Minds aims to promote the development of healthful food preferences, physically active lifestyles and literacy skills in young children. Specific goals include: use of pre-reading and reading strategies to teach nutrition and health messages; promote consumption of whole grains, fruits, vegetables, low-fat dairy foods, and increase time spent in active play; and support parents of young children in offering economical, nutrient dense foods to their children and increasing time spent in active play. 1,238 youth across the state participated in this program. In addition to increasing their knowledge of healthy foods, the students are trying new foods.

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4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Percentage of participants increasing consumption of vegetables

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	81

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fifteen percent of Oklahoma adolescents are considered overweight and an additional 12% are considered obese. Oklahoma has the fifth highest rate of obesity for youth ages 10 to 17. Among

adults, 35% are considered overweight, and an additional 33% are considered obese. The state has poor fruit and vegetable consumption. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. This ranking reflects the state?s high density of fast food establishments and low fruit consumption. Half of all the state?s adults reported consuming fruit less than once daily and 25% consumed vegetables less than once a day. Among Oklahoma youth, 48% reported consuming fruit less than one time daily and 44% reported a similar low consumption of vegetables.

What has been done

Oklahoma Cooperative Extension Service programs are committed to the physical, mental and emotional health of our nation?s youth so they may lead healthy and productive lives into and throughout adulthood. In order to advance the socio-economic development of the state, and have an impact on issues that address childhood obesity, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life related to the critical areas of food, nutrition, and health.

Results

2018 programs highlights include:

?OrganWise Guys (OWG) program targets Pre-K through 5th grade students in low-income schools and teaches the healthy eating and physical activity habits of maintaining a low-fat diet, consuming high-fiber foods, drinking plenty of water, and engaging in regular physical activity. OWG served approximately 4,148 youth in over 150 Pre-K through 5th grade classrooms.

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4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Percentage of participants increasing consumption of whole grains

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	81

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fifteen percent of Oklahoma adolescents are considered overweight and an additional 12% are considered obese. Oklahoma has the fifth highest rate of obesity for youth ages 10 to 17. Among adults, 35% are considered overweight, and an additional 33% are considered obese. The state has poor fruit and vegetable consumption. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. This ranking reflects the state?s high density of fast food establishments and low fruit consumption. Half of all the state?s adults reported consuming fruit less than once daily and 25% consumed vegetables less than once a day. Among Oklahoma youth, 48% reported consuming fruit less than one time daily and 44% reported a similar low consumption of vegetables.

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4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Percentage of participants increasing consumption of low-fat dairy and other calcium-rich foods

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	74

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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adults, 35% are considered overweight, and an additional 33% are considered obese. The state has poor fruit and vegetable consumption. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. This ranking reflects the state?s high density of fast food establishments and low fruit consumption. Half of all the state?s adults reported consuming fruit less than once daily and 25% consumed vegetables less than once a day. Among Oklahoma youth, 48% reported consuming fruit less than one time daily and 44% reported a similar low consumption of vegetables.

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4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Percentage of participants decreasing consumption of foods high in fat, sugar and salt

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	72

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Percentage of participants decreasing consumption of sugar-sweetened beverages

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	72

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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adults, 35% are considered overweight, and an additional 33% are considered obese. The state has poor fruit and vegetable consumption. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. This ranking reflects the state?s high density of fast food establishments and low fruit consumption. Half of all the state?s adults reported consuming fruit less than once daily and 25% consumed vegetables less than once a day. Among Oklahoma youth, 48% reported consuming fruit less than one time daily and 44% reported a similar low consumption of vegetables.

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4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Percentage of participants increasing physical activity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	75

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fifteen percent of Oklahoma adolescents are considered overweight and an additional 12% are considered obese. Oklahoma has the fifth highest rate of obesity for youth ages 10 to 17. Among adults, 35% are considered overweight, and an additional 33% are considered obese. For adults, Oklahoma ranks as 47th nationally for overall health and 48th for obesity. Thirty-four percent of the state?s adults report engaging in no leisure-time physical activity and 38% of adolescents reported being physically active at least 60 minutes per day.

What has been done

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Results
In 2018, Family and Consumer Sciences programs focused on physical activity were presented to 881 Oklahoma youth and 3,856 adult participants. Programs presented include:

?1,510 Oklahomans participated in Tai Chi for Better Balance, the purpose of which is to reduce risk of fall among older adults. Participants are taught to perform a series of exercises, in a community setting, over a period of eight weeks.

?The Arthritis Foundation Exercise Program (AFEP) had 1,301 participants in 2018. Its purpose is

to reduce symptoms of arthritis and arthritis-related diseases among participants. The program features a variety of exercises, gradually increasing in intensity and taught in a community setting over a period of time, ranging from eight weeks to an ongoing basis.

?The Walk with Ease program had 1,044 participants. The Arthritis Foundation Walk With Ease program is a six-week program designed to help participants make physical activity part of their everyday life.

?1,048 Oklahoma youth participated in 4-H Yoga for Kids in 2018. The purpose of this program is to increase fitness, decrease stress, and improve mental focus in noncompetitive manner.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #8

1. Outcome Measures

Percentage of participants increasing safe food handling practices

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Percentage of participants increasing positive parenting skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	78

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Obesity has many social and emotional impacts on youth. While obese teens engage in high-risk behaviors at the same rate as their healthy weight peers, they do so in more dangerous ways, and often at an earlier onset. Obese girls are also at increased risk of earlier onset of sex, having more sexual partners, and less consistent use of contraception. In 2018 there were 4,246 births to Oklahoma 15-19 year old teens. Six percent of 12-17 year olds reported using marijuana at least once during a 30 day period in 2014, and 6% of 12-17 year olds reported binge drinking at least once during a 30 day period in 2014. Oklahoma ranks among the top 5 in all states 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.

What has been done

Oklahoma Cooperative Extension Service programs are committed to the physical, mental and emotional health of our nation's youth so they may lead healthy and productive lives into and throughout adulthood. In order to advance the socio-economic development of the state, and have an impact on issues that address the critical areas of risky behaviors of youth and family resilience, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results

?133 Oklahoma parents participated in resilience programs including curricula such as Active Parenting Now/Active Parenting Now in 3, Active Parenting for Teens, and Conscious Discipline. These curricula are part of the parenting skills and parent-child relationship program for Oklahoma families.

?Programs such as Character Critters, Character Counts, and Take a Stand against Bullying provided lessons on topics such as respect, fairness, and responsibility to 995 Oklahoma youth

?Oklahoma Cooperative Extension conducted the award-winning Co-Parenting for Resilience classes in 52 counties to over 2,549 parents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #10

1. Outcome Measures

Percentage of participants increasing positive youth peer involvement

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

   Percentage of participants increasing parenting competence

   Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

   Percentage of participants increasing child competent behaviors

   Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

   Percentage of participants with increased access to affordable, healthy foods

   Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

   Percentage of participants decreasing child problematic behaviors

   Not Reporting on this Outcome Measure

Outcome #15

1. **Outcome Measures**

   Percentage of participants decreasing disengaged or hostile parenting

2. **Associated Institution Types**

   - 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	51

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Obesity has many social and emotional impacts on youth. While obese teens engage in high-risk behaviors at the same rate as their healthy weight peers, they do so in more dangerous ways, and often at an earlier onset. Obese girls are also at increased risk of earlier onset of sex, having more sexual partners, and less consistent use of contraception. In 2018 there were 4,246 births to Oklahoma 15-19 year old teens. Six percent of 12-17 year olds reported using marijuana at least once during a 30 day period in 2014, and 6% of 12-17 year olds reported binge drinking at least once during a 30 day period in 2014. Oklahoma ranks among the top 5 in all states 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.

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4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
802	Human Development and Family Well-Being

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes

Brief Explanation

Statewide issue team format has changed educator focus and, coupled with county vacancies, has reduced activity in some planned programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue team evaluation items for the above outcomes include:
203 youth respondents to health issue team evaluations reported the following planned behavior changes after participating in the program:
83% of youth became more likely to eat a serving of fruit 2 or more times each day
84% of youth became more likely to eat a serving of vegetables 3 or more times each day
75% of youth became less likely to eat snack foods (chips, cookies, candy, etc.) 1 or more times a day
70% of youth became more likely to be physically active at least 60 minutes throughout the day
Evaluations for the CNEP program Food and Fun for Everyone show 73% of youth participants improved their abilities to choose healthy foods
Evaluations for the CNEP program OrganWise Guys show 75% of youth participants improved their abilities to choose healthy foods
253 adult respondents to health issue team evaluations reported the following planned behavior changes after participating in the program:
87% of adults became more likely to eat more than 1 kind of fruit a day
84% of adults became more likely to eat a serving of vegetables 3 or more times each day
85% of adults became more likely to eat whole grain foods
81% of adults became less likely to eat snack foods (chips, cookies, candy, etc.) 1 or more times a day
87% of adults became more likely to be physically active at least 30 minutes throughout the day
126 adult respondents to physical activity evaluations reported the following after participating in the program:
91% find being part of a regular exercise program made it easy for them to increase physical activity
94% have increased their physical activity due to exercising in a group
100 adult respondents to family resilience issue team evaluations reported the following changes after participating in the programs:
77% of parents showed improvements in parenting knowledge
82% of parents showed improvements in parenting attitudes
77% of parents showed improvements in parenting behaviors and practices

2,305 adult respondents to Co-Parenting for Resilience program evaluations reported the following changes after participating in the program:
79% of divorced or separated parents became more likely to search for the positive in their child's other parent and actively point it out to their child
74% of divorced or separated parents became more likely to discuss important decisions regarding their child with their co-parent
77% of divorced or separated parents became more likely to treat their child's other parent like a valued member of a team

Key Items of Evaluation

In 2018, Issue Team-specific Evaluation Questionnaires were collected after planned program curriculum delivery. These questions utilized either a retrospective or pre-post approach. Evaluation participation was completely voluntary and does not include all program participants.

V(A). Planned Program (Summary)

Program # 15

1. Name of the Planned Program

Structure and Function of Macromolecules

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	5%	0%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	5%	0%
206	Basic Plant Biology	0%	0%	20%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	5%	0%
212	Pathogens and Nematodes Affecting Plants	0%	0%	5%	0%
304	Animal Genome	0%	0%	5%	0%
305	Animal Physiological Processes	0%	0%	45%	0%
311	Animal Diseases	0%	0%	5%	0%
312	External Parasites and Pests of Animals	0%	0%	5%	0%
	Total	0%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	8.0	0.0
Actual Paid	0.0	0.0	6.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	303802	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	303802	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	1578538	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Basic research will be conducted that will make fundamental discoveries which will enhance our understanding of molecular mechanisms involved in the regulation of physiological processes in plant and animal systems.

New faculty and staff will be recruited to build, foster and maintain a cohesive critical mass of research faculty with a diverse set of expertise that focuses on the study of structural biology.

Grant proposals will be written to acquire and maintain state of the art equipment to enhance the research capabilities relating to protein structure/ function/ interactions on the OSU campus.

Funds will be solicited from national, state and university sources to acquire, and maintain support for "Core" facilities that are critical to the research mission of DASNR and Oklahoma State University.

Experimental paradigms will be designed and basic research will be conducted to fill critical gaps in scientific knowledge that will address needs, issues and problems that ultimately can be translated into an improvement in plant and animal health.

Develop new research methods and procedures.

Train undergraduate and graduate students, and postdoctoral associates.

Publish scientific articles.

Write and submit grant proposals.

Attend and present scientific findings at professional conferences.

File patents for protection of intellectual property and negotiate licensing agreements for technology transfer.

Interact with other researchers both on and off the OSU campus.

2. Brief description of the target audience

Departments and department heads
OSU administrators
Other faculty and other scientific researchers in DASNR, at OSU & the scientific community
Students and post-docs
Federal, state, and private funding agencies
Scientific journal editors, readers & the scientific community
Candidates for open faculty and staff positions.
Patent officers
Agricultural, environmental, life, and human science industries
General public and elected officials

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	28	28

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Research discoveries, procedural and technological advances, and dissemination of results of research efforts.

Year	Actual
2018	0

Output #2

Output Measure

- Filing patents for protection of intellectual property and negotiation of licensing agreements for technology transfer.

Year	Actual
2018	0

Output #3

Output Measure

- Training of students and post-docs.

Year	Actual
2018	0

Output #4

Output Measure

- Research discoveries, procedural and technological advances, and solicitation of support for research efforts.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of manuscripts published from research efforts.
2	Number of licensing agreements negotiated for transfer patented technology to industry.
3	Numbers of graduate students graduated and postdoctoral associates mentored with training in structural biology and placed/hired into appropriate professional level positions.
4	Number of new extramural grants funded.
5	Number of invitations that faculty members received to present research findings at universities and colleges, and to national and international meetings.
6	Number of trainees attending workshops designed to train individuals in aspects of structural biology, proteomics, and bioinformatics.
7	Number of Instrumentation Grants Funded
8	Metabolism of Glycerides in insect
9	Structure function studies on key viral proteins in host immune evasion
10	Development of new natural products and their derivatives as chemotherapeutics for the treatment of cancer

Outcome #1

1. Outcome Measures

Number of manuscripts published from research efforts.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
304	Animal Genome
305	Animal Physiological Processes

Outcome #2

1. Outcome Measures

Number of licensing agreements negotiated for transfer patented technology to industry.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
304	Animal Genome
305	Animal Physiological Processes

Outcome #3

1. Outcome Measures

Numbers of graduate students graduated and postdoctoral associates mentored with training in structural biology and placed/hired into appropriate professional level positions.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of new extramural grants funded.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
304	Animal Genome
305	Animal Physiological Processes

Outcome #5

1. Outcome Measures

Number of invitations that faculty members received to present research findings at universities and colleges, and to national and international meetings.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of trainees attending workshops designed to train individuals in aspects of structural biology, proteomics, and bioinformatics.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of Instrumentation Grants Funded

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
304	Animal Genome
305	Animal Physiological Processes
311	Animal Diseases

Outcome #8

1. Outcome Measures

Metabolism of Glycerides in insect

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lipids (fat) play an essential role as reserve of metabolic energy in all animals, including insects. Triacylglycerols (TG) represent the main chemical form in which fatty acids (FA) are stored in the adipose tissue of animals. It is well-known that imbalances in the metabolism of fat are associated with the development of obesity, fatty liver and diabetes (among several pathologies) in humans. On the other hand, it is also well-known that for a successful reproductive cycle, female insects need to accumulate lipids in the fat body first and later in ovaries. These key processes of fat accumulation and transference to ovaries have a major impact in the reproductive ability of insects.

What has been done
We have identified and/or characterized several proteins that play major direct roles in the transport of fatty acids, in the synthesis and degradation of triglycerides and also in the regulation of these processes in insects. This project focus in the fat body lipases, TGL, ATGL and HSL, the acylglyceroltransferases, MGAT and DGAT, two of the LD-associated proteins, PLIN1 and PLIN2, and the lipid transport protein, LTP. The studies will enhance our understanding the basic mechanisms of triglyceride degradation and synthesis, the regulation of these two processes, and also the transport of FA in insects.

Results
the transport of fat from the place of storage (fat body) to the ovaries is severely limited if the transporter is not properly synthesized in the fat body. The apolipophorin gene was successfully silenced using dsRNA as RNA interference agent. This silencing leads to lipid and protein accumulation in fat body and to a decrease in the lipid content of hemolymph and ovaries. For a successful vitellogenesis, the process of ovary maturation and the formation of viable eggs, Aedes aegypti female mosquitoes must first take a blood meal. Demonstrating a major role of the main lipoprotein of mosquito in ovary maturation and reproduction, apolipophorin silencing

affected the size and shape of the ovaries, which remained undeveloped after blood feeding. This result showed that apolipophorin gene expression is essential to the reproduction of Aedes aegypti mosquitoes. Silencing of apolipophorin gene also promoted changes affecting the expression of other lipid transport related genes at the mRNA and/or protein levels.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
305	Animal Physiological Processes

Outcome #9

1. Outcome Measures

Structure function studies on key viral proteins in host immune evasion

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
: Our research on poxvirus immune evasion mechanism opens new windows for developing therapeutics against inflammatory diseases and poxvirus infection. The outcome will benefit not only human but also stock animal health. Our research on anti-cancer drug development targeting Hsp90 will lead to novel therapeutics for treatment of human and animal cancer.

What has been done
We have successfully determined four crystal structures of human Hsp90 isoform beta specific inhibitors in complex with Hsp90 (Nature Communications 2018). We recently determined the crystal structures of A6 from VACV, revealing a novel mechanism by which a viral protein stabilizes broken-ended membrane bilayer during viral maturation.

Results
The Hsp90 family of molecular chaperones is required for the maturation, activation, and/or stability of diverse proteins that play central roles in malignant progress. As a result of this diversity, Hsp90 inhibitors antagonize a wide variety of oncogenic pathways and processes. Thus, Hsp90 inhibitors are highly toxic to cancer cells, but they are much less toxic to normal

tissues, and they are widely envisioned to have great potential as anti-cancer drugs. The structures of Hsp90 and its inhibitors paved the way for developing next generation of anti-cancer drugs. Poxviruses include some dangerous emerging or re-emerging pathogens as well as some promising vaccine vectors for infectious diseases and cancers. Poxviruses encode a number of proteins including A6, collectively termed viral membrane assembly proteins (VMAPs), which are conserved in all vertebrate poxviruses and essential for the biogenesis of crescent membranes. The structure of A6 provides much-needed insights into poxvirus membrane biogenesis as well as cell biology in general.

4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology

Outcome #10

1. Outcome Measures

Development of new natural products and their derivatives as chemotherapeutics for the treatment of cancer

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Millions of people die of cancer every year and new more effective therapeutic treatments need to be developed. Hsp90 has emerged as an exciting new target for the development of new cancer therapies, but results from clinical trials have been disappointing. New, more potent, specific and efficacious Hsp90 inhibitors need to be discovered and developed. While the alpha and mitochondrial (TRAP1) isoforms of Hsp90 are more commonly overexpressed in cancer cells, inhibition of Hsp90alpha activity leads to the induction of the pro-survival heat shock response (HSR) in cancer cells. Inhibition of the beta and mitochondrial isoforms of Hsp90 do not induce the HSR. Thus, the development of compounds that selectively inhibit Hsp90beta or TRAP1 may lead to more effective therapies for cancer patients.

What has been done
We have crystalized compounds that show selectivity for inhibiting the alpha- and beta- and mitochondrial isoforms of Hsp90.

Results

The co-crystal structures have given us the insight into how these drugs selectively bind to each isoform. With this information, new derivatives can be synthesized to develop more selective inhibitors with higher binding affinity. Ultimately, this work should lead to the development of more efficacious treatments of cancer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

None

V(I). Planned Program (Evaluation Studies)

Evaluation Results

None

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 16

1. Name of the Planned Program

Environmental and Safety Issues: Family and Youth

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	5%	0%	0%	0%
111	Conservation and Efficient Use of Water	6%	0%	0%	0%
121	Management of Range Resources	13%	0%	0%	0%
133	Pollution Prevention and Mitigation	13%	0%	0%	0%
134	Outdoor Recreation	18%	0%	0%	0%
141	Air Resource Protection and Management	5%	0%	0%	0%
723	Hazards to Human Health and Safety	25%	0%	0%	0%
805	Community Institutions, Health, and Social Services	15%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	12.0	0.0	0.0	0.0
Actual Paid	6.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
519546	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
519546	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1143881	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research that addresses chronic issues in Oklahoma
- Evaluate programs to determine effectiveness and impacts
- Leverage resources via grant writing and development activities
- Delivery through classes, One-on-Ones, News Releases/TV/Radio, Social Media, Participation in Events, Displays
- Conduct FCS education through 4-H youth development projects and activities
- Provide training and other staff development opportunities to county educators

2. Brief description of the target audience

Youth, homeowners, families, children, teachers, communities, community leaders

3. How was eXtension used?

eXtension is provided as an educator resource

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	22098	2427468	3764	7400

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	3	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of OSU Fact s published

Year	Actual
2018	0

Output #2

Output Measure

- Number of other publications including but not limited to Bulletins, Technical Manuals, Reports as well as digital resources such as PowerPoint presentations, curricula, and core competency modules distributed for use by others

Year	Actual
2018	1

Output #3

Output Measure

- Number of in-service training sessions

Year	Actual
2018	10

Output #4

Output Measure

- Number of certification training sessions

Year	Actual
2018	0

Output #5

Output Measure

- Number of other training sessions, workshops, etc. conducted

Year	Actual
2018	4

Output #6

Output Measure

- Number of presentations at Extension organized meetings

Year	Actual
2018	11

Output #7

Output Measure

- Number of presentations at other meetings and events (professional meetings, invitations to speak to community and stakeholder groups, etc.)

Year	Actual
2018	4

Output #8

Output Measure

- Number of workshops, conferences, etc. organized

Year	Actual
2018	0

Output #9

Output Measure

- Number of demonstrations

Year	Actual
2018	0

Output #10

Output Measure

- Number of displays, exhibits, and models

Year	Actual

2018	0

Output #11

Output Measure

- Number of newsletters

Year	Actual
2018	0

Output #12

Output Measure

- Number of radio and television presentations

Year	Actual
2018	0

Output #13

Output Measure

- Number of newspaper, and magazine articles written

Year	Actual
2018	19

Output #14

Output Measure

- Number of OSU Fact Sheets revised

Year	Actual
2018	0

Output #15

Output Measure

- Number of webpages created or updated

Year	Actual
2018	1

Output #16

Output Measure

- Average number of phone calls and/or email requests responded to on a weekly basis
  Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Number of webcasts or guest appearances on webinars

Year	Actual
2018	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of participants increasing selection and home preservation of home, locally and regionally produced foods
2	Percentage of participants increasing composting, donation of goods for others to use, repurposing, and recycling of items
3	Percentage of participants increasing maintenance, conservation, and protection of natural resources (air, land, water)
4	Number of participants who are prepared for emergencies
5	Percentage of participants increasing proper home thermostat management
6	Percentage of participants managing safety hazards in the home
7	Number of participants who are using assistive technology as necessary
8	Number of participants using available assistance for injury/disability
9	Number of participants increasing practice of safety and injury/secondary injury prevention.
10	Percentage of participants increasing participation in maintaining, conserving and protecting natural resources (air, land, water)

Outcome #1

1. **Outcome Measures**

Percentage of participants increasing selection and home preservation of home, locally and regionally produced foods

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Percentage of participants increasing composting, donation of goods for others to use, repurposing, and recycling of items

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Percentage of participants increasing maintenance, conservation, and protection of natural resources (air, land, water)

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of participants who are prepared for emergencies

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	335

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma is vulnerable to many natural disasters each year such as tornadoes, ice storms, floods and wildfires. According to FEMA, Oklahoma ranks third in the nation for the number of Federally declared disasters. These disasters can cause significant financial loss by destroying homes and businesses. Many Oklahomans lack information about how to maintain their health, well-being, and safety as it relates to their homes and the near environment. The CDC ranks Oklahoma as 11th in the number of deaths due to unintentional injury, including fires or burns, falls, and poisoning.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address safety, educational programs have been created and implemented to educate Oklahomans on how to improve their quality of life.

Results
In 2018, 880 adults and youth participated in programs that taught them how to avoid hazards and stay safe in their homes. An additional 3,855 Oklahoma adults participated in the Walk with Ease, Arthritis Foundation Land Exercise, and Tai Chi: Moving for Better Balance programs which are a series of low-impact exercises to increase balance and mobility.

A total of 1,592 youth attended Youth Safety Days across Oklahoma and learned how to keep safe at home, at play, and during severe weather.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
805	Community Institutions, Health, and Social Services

Outcome #5

1. Outcome Measures

Percentage of participants increasing proper home thermostat management

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Percentage of participants managing safety hazards in the home

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	84

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma is vulnerable to many natural disasters each year such as tornadoes, ice storms, floods and wildfires. According to FEMA, Oklahoma ranks third in the nation for the number of Federally declared disasters. These disasters can cause significant financial loss by destroying homes and businesses. Many Oklahomans lack information about how to maintain their health, well-being, and safety as it relates to their homes and the near environment. The CDC ranks Oklahoma as 11th in the number of deaths due to unintentional injury, including fires or burns, falls, and poisoning.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address safety, educational programs have been created and implemented to educate Oklahomans on how to improve their quality of life.

Results
In 2018, 880 adults and youth participated in programs that taught them how to avoid hazards and stay safe in their homes. An additional 3,855 Oklahoma adults participated in the Walk with Ease, Arthritis Foundation Land Exercise, and Tai Chi: Moving for Better Balance programs which are a series of low-impact exercises to increase balance and mobility.

A total of 1,592 youth attended Youth Safety Days across Oklahoma and learned how to keep safe at home, at play, and during severe weather.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #7

1. **Outcome Measures**

Number of participants who are using assistive technology as necessary

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Number of participants using available assistance for injury/disability

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Number of participants increasing practice of safety and injury/secondary injury prevention.

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2018	90

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

Issue (Who cares and Why)
Oklahoma is vulnerable to many natural disasters each year such as tornadoes, ice storms, floods and wildfires. According to FEMA, Oklahoma ranks third in the nation for the number of Federally declared disasters. These disasters can cause significant financial loss by destroying homes and businesses. Many Oklahomans lack information about how to maintain their health, well-being, and safety as it relates to their homes and the near environment. The CDC ranks Oklahoma as 11th in the number of deaths due to unintentional injury, including fires or burns, falls, and poisoning.

What has been done

In order to advance the socio-economic development of the state, and have an impact on issues that address safety, educational programs have been created and implemented to educate Oklahomans on how to improve their quality of life.

Results

In 2018, 880 adults and youth participated in programs that taught them how to avoid hazards and stay safe in their homes. An additional 3,855 Oklahoma adults participated in the Walk with Ease, Arthritis Foundation Land Exercise, and Tai Chi: Moving for Better Balance programs which are a series of low-impact exercises to increase balance and mobility.

A total of 1,592 youth attended Youth Safety Days across Oklahoma and learned how to keep safe at home, at play, and during severe weather.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #10

1. Outcome Measures

Percentage of participants increasing participation in maintaining, conserving and protecting natural resources (air, land, water)

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Statewide issue team format has changed educator focus and, coupled with county vacancies, has reduced activity in some planned programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

479 youth respondents to Safety Day evaluations reported the following:
96% identified the correct way to stay safe during a thunderstorm
99% identified the correct way to stay safe during a tornado
62% have a designated location to meet their family in the event of an emergency

77% have a smoke detector in their home

126 adult respondents to physical activity program evaluations reported the following behavior changes after participating in the program:

85% of Arthritis Foundation Exercise Program participants reported better function during daily activities

88% of Tai Chi participants reported being less afraid of falling because of the program

96% of Tai Chi participants reported having improved balance because of the program

Key Items of Evaluation

In 2018, Issue Team-specific Evaluation Questionnaires were collected after planned program curriculum delivery. These questions utilized either a retrospective or post-program approach. Evaluation participation was completely voluntary and does not include all program participants.

V(A). Planned Program (Summary)

Program # 17

1. Name of the Planned Program

Food Safety - Hunger, Health and Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	30%	0%	0%	0%
723	Hazards to Human Health and Safety	40%	0%	0%	0%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	5%	0%	0%	0%
805	Community Institutions, Health, and Social Services	25%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	12.0	0.0	0.0	0.0
Actual Paid	14.0	0.0	0.0	0.0
Actual Volunteer	5.2	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
565726	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
565726	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1245555	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Delivery through classes, one-on-one sessions, news releases/TV/radio, social media, participation in events, displays
- Conduct FCS education through 4-H youth development projects and activities.
- Evaluate programs to determine effectiveness and impacts.
- Conduct research that addresses chronic issues in Oklahoma.
- Leverage resources via grant writing and development activities
- Provide training and other staff development opportunities to county educators

2. Brief description of the target audience

Families, youth, restaurant employees, food handlers, children, communities, community leaders

3. How was eXtension used?

eXtension is provided as an educator resource

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	586	62751	413	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of OSU Fact Sheets Newly Developed

Year	Actual
2018	3

Output #2

Output Measure

- Number of other publications including but not limited to Bulletins, Technical Manuals, Reports as well as digital resources such as PowerPoint presentations, curricula, core competency modules, etc. distributed for use by others

Year	Actual
2018	11

Output #3

Output Measure

- Number of in-service training sessions

Year	Actual
2018	6

Output #4

Output Measure

- Number of certification Training sessions

Year	Actual
2018	0

Output #5

Output Measure

- Number of other training sessions, workshops, etc. conducted

Year	Actual
2018	10

Output #6

Output Measure

- Number of presentations at Extension organized meetings

Year	Actual
2018	6

Output #7

Output Measure

- Number of presentations at other meetings and events (professional meetings, invitations to speak to community groups, stakeholder groups, etc.)

Year	Actual
2018	5

Output #8

Output Measure

- Number of workshops, conferences, etc. organized

Year	Actual
2018	1

Output #9

Output Measure

- Number of posters or displays, exhibits, and models

Year	Actual
2018	1

Output #10

Output Measure

- Number of other demonstrations

Year	Actual
2018	0

Output #11

Output Measure

- Number of newsletters

Year	Actual
2018	0

Output #12

Output Measure

- Number of radio and television presentations

Year	Actual
2018	18

Output #13

Output Measure

- Number of newspaper, and magazine articles written

Year	Actual
2018	3

Output #14

Output Measure

- Number of OSU Fact Sheets revised

Year	Actual
2018	0

Output #15

Output Measure

- Number of webpages created or updated

Year	Actual
2018	0

Output #16

Output Measure

- Number of website hits

Year	Actual
2018	12534

Output #17

Output Measure

- Average number of phone calls and/or email requests responded to on a weekly basis

Year	Actual
2018	0

Output #18

Output Measure

- Number of webcasts or guest appearances on webinars

Year	Actual
2018	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of participants increasing meal preparation at home
2	Percentage of participants increasing food cooking skills
3	Percentage of participants increasing safe food handling practices
4	Percentage participants increasing safe and effective food preservation practices
5	Percentage of participants increasing practice of safety and injury/secondary injury prevention

Outcome #1

1. Outcome Measures

Percentage of participants increasing meal preparation at home

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nine percent of Oklahomans have limited access to healthy food. In the United States. Oklahoma ranks sixth in the nation for restaurant food waste; $100 billion dollars is spent each year transporting perishable foods to landfills.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address maintaining or improving health through safe food choices, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 284 youth and adult participants across Oklahomans learned safe food handling and food preparation practices through programs such as Cooking for 1 or 2, Teen Cuisine, and Food Showdown. An additional 728 adults and youth participated in home food preservation workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #2

1. Outcome Measures

Percentage of participants increasing food cooking skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	69

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nine percent of Oklahomans have limited access to healthy food. In the United States. Oklahoma ranks sixth in the nation for restaurant food waste; $100 billion dollars is spent each year transporting perishable foods to landfills.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address maintaining or improving health through safe food choices, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 284 youth and adult participants across Oklahomans learned safe food handling and food preparation practices through programs such as Cooking for 1 or 2, Teen Cuisine, and Food Showdown. An additional 728 adults and youth participated in home food preservation workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #3

1. Outcome Measures

Percentage of participants increasing safe food handling practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	59

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nine percent of Oklahomans have limited access to healthy food. In the United States. Oklahoma ranks sixth in the nation for restaurant food waste; $100 billion dollars is spent each year transporting perishable foods to landfills.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address maintaining or improving health through safe food choices, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 284 youth and adult participants across Oklahomans learned safe food handling and food preparation practices through programs such as Cooking for 1 or 2, Teen Cuisine, and Food Showdown. An additional 728 adults and youth participated in home food preservation workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Percentage participants increasing safe and effective food preservation practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nine percent of Oklahomans have limited access to healthy food. In the United States. Oklahoma ranks sixth in the nation for restaurant food waste; $100 billion dollars is spent each year transporting perishable foods to landfills.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address maintaining or improving health through safe food choices, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 284 youth and adult participants across Oklahomans learned safe food handling and food preparation practices through programs such as Cooking for 1 or 2, Teen Cuisine, and Food Showdown. An additional 728 adults and youth participated in home food preservation workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
723	Hazards to Human Health and Safety

Outcome #5

1. **Outcome Measures**

Percentage of participants increasing practice of safety and injury/secondary injury prevention

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Statewide issue team format has changed educator focus and, coupled with county vacancies, has reduced activity in some planned activities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue team evaluation items for the above outcomes include:
131 adult respondents attending food preparation programs reported the following planned behavior changes:
86% became more likely to use basic skills needed for cooking at home
83% became more likely to look for ways to make cooking easier
75% became more likely to cook foods to the recommended internal temperature
88% became more likely separate raw and ready-to-eat foods in the refrigerator
83% became more likely to store foods safely to keep them nutritious
133 adult respondents attending Home Food Preservation programs reported the following planned behavior changes:
100% became more likely to use safe and effective food preservation practices
96% became more likely to use reliable recipes
93% became more likely to carefully follow recipe instructions
68 youth respondents attending food preparation programs reported the following planned behavior changes:
75% became more likely to keep surfaces that touch food clean
100% became more likely to cook foods to the recommended internal temperature
88% became less likely to let meat sit out for more than 2 hours
100% became more likely separate raw and ready-to-eat foods in the refrigerator
130 youth respondents attending Home Food Preservation programs reported the following planned behavior changes:
91% became more likely to use safe and effective food preservation practices
89% became more likely to use reliable recipes
89% became more likely to carefully follow recipe instructions

Key Items of Evaluation

In 2018, Issue Team-specific Evaluation Questionnaires were collected after planned program curriculum delivery. These questions utilized a retrospective approach. Evaluation participation was completely voluntary and does not include all program participants

V(A). Planned Program (Summary)

Program # 18

1. Name of the Planned Program

Global Food Security and Hunger - Families and Youth

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
604	Marketing and Distribution Practices	5%	0%	0%	0%
607	Consumer Economics	17%	0%	0%	0%
608	Community Resource Planning and Development	3%	0%	0%	0%
703	Nutrition Education and Behavior	20%	0%	0%	0%
704	Nutrition and Hunger in the Population	10%	0%	0%	0%
724	Healthy Lifestyle	10%	0%	0%	0%
801	Individual and Family Resource Management	8%	0%	0%	0%
802	Human Development and Family Well-Being	7%	0%	0%	0%
805	Community Institutions, Health, and Social Services	10%	0%	0%	0%
806	Youth Development	10%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	14.0	0.0	0.0	0.0
Actual Paid	21.0	0.0	0.0	0.0
Actual Volunteer	6.8	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
636442	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
636442	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1401250	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research that addresses chronic issues in Oklahoma
- Leverage resources via grant writing and development activities
- Establish appropriate partnerships with other youth serving agencies and commodity groups
- Develop, test and use evaluation tools to determine effectiveness and impacts
- Conduct FCS education through 4-H youth development projects and activities
- Development and introduction of new curricula
- Delivery through classes, one-on-one sessions, news releases/TV/radio, social media, participation in events, displays
- Providing training and other staff development opportunities to county educators

2. Brief description of the target audience

Families, communities, youth, children, parents, community leaders, teachers, job seekers, businesses

3. How was eXtension used?

eXtension is provided as an educator resource

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10397	1241581	6485	9729

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	1	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of OSU Fact sheets revised

Year	Actual
2018	0

Output #2

Output Measure

- Number of other publications including but not limited to Bulletins, Technical Manuals, Reports as well as digital resources such as PowerPoint presentations, curricula, core competency modules, etc. distributed for use by others

Year	Actual
2018	19

Output #3

Output Measure

- Number of in-service training sessions

Year	Actual
2018	22

Output #4

Output Measure

- Number of certification training sessions

Year	Actual
2018	0

Output #5

Output Measure

- Number of other training sessions, workshops, etc. conducted

Year	Actual
2018	11

Output #6

Output Measure

- Number of presentations at Extension organized meetings

Year	Actual
2018	24

Output #7

Output Measure

- Number of presentations at other meetings and events (professional meetings, invitations to speak to community groups, stakeholder groups, etc.)

Year	Actual
2018	17

Output #8

Output Measure

- Number of workshops, conferences, etc. organized

Year	Actual
2018	1

Output #9

Output Measure

- Number of posters or displays, exhibits, and models

Year	Actual
2018	1

Output #10

Output Measure

- Number of other demonstrations

Year	Actual

2018	0

Output #11

Output Measure

- Number of newsletters

Year	Actual
2018	2

Output #12

Output Measure

- Number of radio and television presentations

Year	Actual
2018	0

Output #13

Output Measure

- Number of newspaper, and magazine articles written

Year	Actual
2018	0

Output #14

Output Measure

- Number of OSU Fact Sheets revised

Year	Actual
2018	0

Output #15

Output Measure

- Number of webpages created or updated

Year	Actual
2018	1

Output #16

Output Measure

- Number of webcasts or guest appearances on webinars

Year	Actual
2018	2

Output #17

Output Measure

- Average number of phone calls and/or email requests responded to on a weekly basis

Year	Actual
2018	104

Output #18

Output Measure

- Number of website hits

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of participants increasing money saving meal planning or food shopping practices
2	Percentage of participants increasing food money management practices
3	Percentage of participants increasing growth, production, hunting, or fishing for some food
4	Percentage of participants decreasing likelihood of using high-risk negative financial practices such as overusing credit, failing to save money or planning for the future
5	Percentage of participants decreasing risk of default on loans, credit card debt, unpaid bills, mortgage foreclosure, and identity theft
6	Percentage of participants increasing financial planning practices across the life cycle and skills to manage financial risk
7	Percentage of participants increasing readiness for employment opportunities
8	Percentage of participants increasing readiness for life changes
9	Percentage of participants increasing life skills for personal competence
10	Percentage of participants increasing ability to manage personal and family finances
11	Percentage of participants increasing child competent behaviors
12	Percentage of participants decreasing child problematic behaviors
13	Percentage of participants increasing positive parenting attitudes and behaviors
14	Percentage of participants decreasing disengaged or hostile parenting

Outcome #1

1. Outcome Measures

Percentage of participants increasing money saving meal planning or food shopping practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	64

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma has the 7th highest poverty rate and 4th highest hunger and food insecurity rates in the nation. Seventeen percent of Oklahomans are food insecure. Hunger leads to low birth-weight and delayed development. Food insecure children are more likely to have lower reading and math scores and a lower graduation rate.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address food insecurity & hunger, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 1,996 Oklahomans participated in programs such as Eat Right When Money is Tight, CNEP Fresh Start, and MyPlate for My Family that focused on reducing hunger and helped family provide nutritious meals on a budget.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
704	Nutrition and Hunger in the Population
801	Individual and Family Resource Management

Outcome #2

1. **Outcome Measures**

Percentage of participants increasing food money management practices

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Percentage of participants increasing growth, production, hunting, or fishing for some food

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Percentage of participants decreasing likelihood of using high-risk negative financial practices such as overusing credit, failing to save money or planning for the future

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	91

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2018, Oklahoma ranked 43rd in the nation in unbanked and 37th in underbanked households. Thirty percent of Oklahomans work low-wage jobs and the state is 47th in number of uninsured. The number of Oklahomans working after the age of 65 has doubled since 2001. Nationally, 10% of 16-34 year-olds are not hired because of inappropriate social media activities.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address financial management and planning skills, jobs and employment, and families, educational programs have been created and implemented to educate Oklahomans on how to

attain a better quality of life.

Results
In 2018, programs using various curricula were presented to 3,395 adults and youth across Oklahoma. Programs presented include:

?Check and Balance classes are offered as an alternative to having bogus check charges filed in district court.
?Dollar Decisions and Money Habitudes help participants talk about money and understand their money personality type.

?Welcome to the Real World and Reality Check provide youth with opportunities to learn life skills like budgeting and check writing

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management
806	Youth Development

Outcome #5

1. Outcome Measures

Percentage of participants decreasing risk of default on loans, credit card debt, unpaid bills, mortgage foreclosure, and identity theft

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2018, Oklahoma ranked 43rd in the nation in unbanked and 37th in underbanked households. Thirty percent of Oklahomans work low-wage jobs and the state is 47th in number of uninsured. The number of Oklahomans working after the age of 65 has doubled since 2001. Nationally, 10%

of 16-34 year-olds are not hired because of inappropriate social media activities.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address financial management and planning skills, jobs and employment, and families, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, programs using various curricula were presented to 3,395 adults and youth across Oklahoma. Programs presented include:

?Check and Balance classes are offered as an alternative to having bogus check charges filed in district court.
?Dollar Decisions and Money Habitudes help participants talk about money and understand their money personality type.

?Welcome to the Real World and Reality Check provide youth with opportunities to learn life skills like budgeting and check writing

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management
806	Youth Development

Outcome #6

1. Outcome Measures

Percentage of participants increasing financial planning practices across the life cycle and skills to manage financial risk

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	84

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2018, Oklahoma ranked 43rd in the nation in unbanked and 37th in underbanked households. Thirty percent of Oklahomans work low-wage jobs and the state is 47th in number of uninsured. The number of Oklahomans working after the age of 65 has doubled since 2001. Nationally, 10% of 16-34 year-olds are not hired because of inappropriate social media activities.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address financial management and planning skills, jobs and employment, and families, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, programs using various curricula were presented to 3,395 adults and youth across Oklahoma. Programs presented include:

?Check and Balance classes are offered as an alternative to having bogus check charges filed in district court.
?Dollar Decisions and Money Habitudes help participants talk about money and understand their money personality type.

?Welcome to the Real World and Reality Check provide youth with opportunities to learn life skills like budgeting and check writing

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management
806	Youth Development

Outcome #7

1. Outcome Measures

Percentage of participants increasing readiness for employment opportunities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	77

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma has the 7th highest poverty rate and 4th highest hunger and food insecurity rates in the nation. Seventeen percent of Oklahomans are food insecure. Hunger leads to low birth-weight and delayed development. Food insecure children are more likely to have lower reading and math scores and a lower graduation rate.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address food insecurity & hunger, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 577 participants attended programs such as:

?Overcoming Obstacles which teaches important life skills such as communication, decision making and goal setting. High school students participating in the program also focus on planning of continuing education and career readiness, as well how to excel on the job and develop financial responsibility.

?PRIDE (Producing Resourceful Informed Dedicated Employees) is a customer service program designed to enhance rural and community development. Frontline employees learn quality customer service techniques and helps employees learn about highlights and tourist attractions in their community, county, region and state.

?The Pathways to Success program provided Oklahoma adults with basic living skills to help them succeed in gaining employment and managing their finances.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #8

1. Outcome Measures

Percentage of participants increasing readiness for life changes

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	78

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Oklahoma has the 7th highest poverty rate and 4th highest hunger and food insecurity rates in the nation. Seventeen percent of Oklahomans are food insecure. Hunger leads to low birth-weight and delayed development. Food insecure children are more likely to have lower reading and math scores and a lower graduation rate.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address food insecurity & hunger, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, 577 participants attended programs such as:

?Overcoming Obstacles which teaches important life skills such as communication, decision making and goal setting. High school students participating in the program also focus on planning of continuing education and career readiness, as well how to excel on the job and develop financial responsibility.

?PRIDE (Producing Resourceful Informed Dedicated Employees) is a customer service program designed to enhance rural and community development. Frontline employees learn quality customer service techniques and helps employees learn about highlights and tourist attractions in their community, county, region and state.

?The Pathways to Success program provided Oklahoma adults with basic living skills to help them succeed in gaining employment and managing their finances.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #9

1. Outcome Measures

Percentage of participants increasing life skills for personal competence

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	83

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2018, Oklahoma ranked 43rd in the nation in unbanked and 37th in underbanked households. Thirty percent of Oklahomans work low-wage jobs and the state is 47th in number of uninsured. The number of Oklahomans working after the age of 65 has doubled since 2001. Nationally, 10% of 16-34 year-olds are not hired because of inappropriate social media activities.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address financial management and planning skills, jobs and employment, and families, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, programs using various curricula were presented to 3,395 adults and youth across Oklahoma. Programs presented include:

?Check and Balance classes are offered as an alternative to having bogus check charges filed in district court.
?Dollar Decisions and Money Habitudes help participants talk about money and understand their

money personality type.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development

Outcome #10

1. Outcome Measures

Percentage of participants increasing ability to manage personal and family finances

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2018, Oklahoma ranked 43rd in the nation in unbanked and 37th in underbanked households. Thirty percent of Oklahomans work low-wage jobs and the state is 47th in number of uninsured. The number of Oklahomans working after the age of 65 has doubled since 2001. Nationally, 10% of 16-34 year-olds are not hired because of inappropriate social media activities.

What has been done
In order to advance the socio-economic development of the state, and have an impact on issues that address financial management and planning skills, jobs and employment, and families, educational programs have been created and implemented to educate Oklahomans on how to attain a better quality of life.

Results
In 2018, programs using various curricula were presented to 3,395 adults and youth across Oklahoma. Programs presented include:

?Check and Balance classes are offered as an alternative to having bogus check charges filed in district court.
?Dollar Decisions and Money Habitudes help participants talk about money and understand their money personality type.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management
806	Youth Development

Outcome #11

1. Outcome Measures

Percentage of participants increasing child competent behaviors

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Percentage of participants decreasing child problematic behaviors

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Percentage of participants increasing positive parenting attitudes and behaviors

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Percentage of participants decreasing disengaged or hostile parenting

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Statewide issue team format has changed educator focus and, coupled with county vacancies, has reduced activity in some planned activities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue team evaluation items for the above outcomes include:
94% of adult participants in the CNEP Fresh Start improved in one or more dietary quality areas
62 adult respondents to hunger issue team evaluations reported the following planned behavior changes after participating in the program:
75% became more likely to shop with a grocery list
67% became more likely to buy groceries only when they are needed
126 adult respondents to finance issue team evaluations reported the following planned behavior changes after participating in the program
94% became more likely to pay bills on time
86% became more likely to have an emergency savings
90% became more likely to regularly write down financial goals
94% became more likely to be confident about their financial future
1,186 youth respondents to finance issue team evaluations reported the following planned behavior changes after participating in the program
88% of youth became more likely to put money in the bank
89% of youth became more likely to be careful about how they spend their money
94% of youth understand it costs money to make money
118 adult respondents to the jobs & employment issue team evaluations reported the following planned behavior changes after participating in the program
80% became more likely to be confident in their ability to keep a job
75% became more likely to understand how the choices they make affect their lifestyle and ability to work
100% are more likely to know how to proper conduct and interaction during a job interview

Key Items of Evaluation

In 2018, Issue Team-specific Evaluation Questionnaires were collected after planned program curriculum delivery. These questions utilized a retrospective approach. Evaluation participation was completely voluntary and does not include all program participants.

V(A). Planned Program (Summary)

Program # 19

1. Name of the Planned Program

Enhanced Goat Production in the South - Central United States (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
302	Nutrient Utilization in Animals	0%	30%	0%	30%
307	Animal Management Systems	0%	30%	0%	30%
313	Internal Parasites in Animals	0%	20%	0%	20%
502	New and Improved Food Products	0%	20%	0%	20%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.5	0.0	1.3
Actual Paid	0.0	2.2	0.0	6.6
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	68632	0	254606
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	23166
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	257583

V(D). Planned Program (Activity)

1. Brief description of the Activity

We will publish scientific articles, present research papers at scientific meetings, write newsletters and present workshops and demonstrations.

2. Brief description of the target audience

All present/potential goat producers in Oklahoma and surrounding states.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	200	100	200	25

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research projects completed on Enhanced Goat Products

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning new goat production techniques.
2	Number of goat producers using new goat production techniques.
3	Goat producers who have improved production efficiency by using the learned control techniques.

Outcome #1

1. Outcome Measures

Number of goat producers learning new goat production techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Goat enterprises are important components of many farms and farming systems in the United State; particularly among small and resource-poor units. There is a growing number of farms where sales of goats or goat products proved the majority of their income. Many large operations have diversified by adding goats to more conventional production systems to benefit from the unique feeding habits of goats. Therefore, this project can lead to improvements in goat management practices, production systems, and use of goat products for increased levels and efficiencies of goat productivity and economic returns. This program is important to a large number of goat industry producers and consumers in Oklahoma, other parts of the United States and numerous countries worldwide. Goat production is very important to food security and economic security in many developing countries.

What has been done
A number of experiments were conducted in 2018. Principal outputs of the project have been disseminated via abstracts, associated poster presentations at scientific meetings. Scientific manuscripts (5) and an abstract (1) were published. Presentations were given at scientific venues. Information gained has been disseminated through the website of the American Institute for Goat Research and Extension activities such as the Annual Goat Field Day and various workshops held throughout the year.

Results
The resources employed and activities undertaken by this project are contributing to a better understanding of goat production, management and utilization of goat products. Both small and large diversified farming operations that utilize goats have been able to use the technology and information resulting from this project to increase their goat production levels, reduce losses in their herds and increase production efficiency. These changes in knowledge and improvements in

production methods have helped producers increase their economic returns in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Number of goat producers using new goat production techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Goat enterprises are important components of many farms and farming systems in the United States; particularly among small and resource-poor units. There is a growing number of farms where sales of goats or goat products provide the majority of their income. Many larger operations have diversified by adding goats to more convention production systems to benefit from the unique feeding habits of goats. Therefore, this project can lead to improvements in goat management practices, production systems, and use of goat products for increased levels and efficiencies of goat productivity and economic returns. This program is important to a large number of goat industry producers and consumers in Oklahoma, other parts of the United States and numerous countries worldwide. Goat production is very important to food security and economic security in many developing countries.

What has been done
A number of experiments were conducted in 2018. Principal outputs of the project have been disseminated via abstracts, associated poster presentations at scientific meetings. Scientific manuscripts (5) and an abstract (1) were published. Presentations were given at scientific venues. Information gained has been disseminated through the website of the American Institute for Goat Research and Extension activities such as the Annual Goat Field Day and various

workshops held throughout the year.

Results

The resources employed and activities undertaken by this project are contributing to a better understanding of goat production, management and utilization of goat products. Both small and large diversified farming operations that utilize goats have been able to use the technology and information resulting from this project to increase their goat production levels, reduce losses in their herds and increase production efficiency. These changes in knowledge and improvements in production methods have helped producers increase their economic returns in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

Outcome #3

1. Outcome Measures

Goat producers who have improved production efficiency by using the learned control techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Goat enterprises are important components of many farms and farming systems in the United States; particularly among small and resource-poor units. There is a growing number of farms where sales of goats or goat products provide the majority of their income. Many larger operations have diversified by adding goats to more convention production systems to benefit from the unique feeding habits of goats. Therefore, this project can lead to improvements in goat management practices, production systems, and use of goat products for increased levels and efficiencies of goat productivity and economic returns. This program is important to a large number of goat industry producers and consumers in Oklahoma, other parts of the United States and numerous countries worldwide. Goat production is very important to food security and economic security in many developing countries.

What has been done

A number of experiments were conducted in 2018. Principal outputs of the project have been disseminated via abstracts, associated poster presentations at scientific meetings. Scientific manuscripts (5) and an abstract (1) were published. Presentations were given at scientific venues. Information gained has been disseminated through the website of the American Institute for Goat Research and Extension activities such as the Annual Goat Field Day and various workshops held throughout the year.

Results

The resources employed and activities undertaken by this project are contributing to a better understanding of goat production, management and utilization of goat products. Both small and large diversified farming operations that utilize goats have been able to use the technology and information resulting from this project to increase their goat production levels, reduce losses in their herds and increase production efficiency. These changes in knowledge and improvements in production methods have helped producers increase their economic returns in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Other ((Disease))

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

An advisory council evaluated the scientific merit and usefulness of this project. It was deemed acceptable and on-track in its efforts.

Key Items of Evaluation

The project was examined for its scientific merit to establish if it could produce useable results.

V(A). Planned Program (Summary)

Program # 20

1. Name of the Planned Program

4-H Clubs (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	2.0	0.0	0.0
Actual Paid	0.0	1.2	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	67742	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The 4-H program will conduct meetings, training sessions, classes and use other learning vehicles to help youth develop life skills.

2. Brief description of the target audience

Youth in Oklahoma who qualify for the program.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40	20	900	200

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of of Research Projects completed in the 4-H Club Program.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth learning new information from the 4-H Club Program.
2	Number of youth using information learned in the 4-H Club program.
3	Youth who develop life skill.

Outcome #1

1. Outcome Measures

Number of youth learning new information from the 4-H Club Program.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for 4-H Clubs in Oklahoma counties was identified as an issue by concerned parents and community leaders. Most Oklahoma communities offer limited youth education programs after school for young people (especially in the areas of science, mathematics, and technology). Consequently, there is an unacceptably high number of students who are more susceptible to the lure and negative effects of drugs, alcohol, teen pregnancy, peer pressure, gang violence and school drop out. Inactivity among youth has also led to another health challenge for youth in the form of obesity.

What has been done
Clubs conducted meetings during 2018 and presented talored curriculum to youth. Club members work on 4-H projects including gardening, woodworking, goats, fabrics and fashion, computer graphics, photography, visual arts, plasticulture, entrepreneurship, money management, public speaking, science, natural resources and robotics. Activities were also conducted to get youth to move and exercise.

Results
During 2018, over 900 youth were reached on a regular basis through Langston University 4-H Club efforts. Many, if not all, of these youth improved their skills in leadership, public speaking and proper human interaction. Youth were challenged to increase their science IQs in hopes of developing a population of future scientists and engineers. Materials were presented and sessions conducted that will potentially result in more youth choosing to stay away from gangs and drug involvement and become high school graduates.

4. Associated Knowledge Areas

KA Code	Knowledge Area

806 Youth Development

Outcome #2

1. Outcome Measures

Number of youth using information learned in the 4-H Club program.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for 4-H Clubs in Oklahoma counties was identified as an issue by concerned parents and community leaders. Most Oklahoma communities offer limited youth education programs after school for young people (especially in the areas of science, mathematics and technology). Consequently, there is an unacceptably high number students who are more susceptible to the lure of negative effects of drugs, alcohol, teen pregnancy, peer pressure, gang violence and school drop out. Inactivity among youth has led to another health challenge for youth in the form of obesity.

What has been done
Clubs conducted meetings during 2018 and presented tailored curriculum to youth. Club members worked on 4-H projects including gardening, woodworking, goats, fabrics and fashion, computer graphics, photography, visual arts, plasticulture, entrepreneurship, money management, public speaking, science, natural resources and robotics. Activities were also conducted to get youth to move and exercise.

Results
During 2018, over 900 youth were reached on a regular basis through Langston University 4-H Club efforts. Many, if not all, of these youth improved their skills in leadership, public speaking and proper human interaction. Youth were challenged to increase their science IQs in hopes of developing a population of future scientists and engineers. Materials were presented and sessions conducted that will potentially result in more youth choosing to stay away from gangs and drug involvement and become high school graduates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Youth who develop life skill.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for 4-H Clubs in Oklahoma counties was identified as an issue by concerned parents and community leaders. Most Oklahoma communities offer limited youth education programs after school for young people (especially in the areas of science, mathematics and technology). Consequently, there is an unacceptably high number students who are more susceptible to the lure of negative effects of drugs, alcohol, teen pregnancy, peer pressure, gang violence and school drop out. Inactivity among youth has led to another health challenge for youth in the form of obesity.

What has been done
Clubs conducted meetings during 2018 and presented tailored curriculum to youth. Club members worked on 4-H projects including gardening, woodworking, goats, fabrics and fashion, computer graphics, photography, visual arts, plasticulture, entrepreneurship, money management, public speaking, science, natural resources and robotics. Activities were also conducted to get youth to move and exercise.

Results
During 2018, over 900 youth were reached on a regular basis through Langston University 4-H Club efforts. Many, if not all, of these youth improved their skills in leadership, public speaking and proper human interaction. Youth were challenged to increase their science IQs in hopes of developing a population of future scientists and engineers. Materials were presented and sessions conducted that will potentially result in more youth choosing to stay away from gangs and drug involvement and become high school graduates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Competing Public priorities

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre and post evaluations of activities showed them to be effective.

Key Items of Evaluation

- Build self-confidence
- Improved math skills
- Improved reading skills

V(A). Planned Program (Summary)

Program # 21

1. Name of the Planned Program

Extended Education (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	0%	100%	0%	0%
	Total	0%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

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

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	54688	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will conduct classes and mini camps in reading, math and science for youth in Oklahoma.

2. Brief description of the target audience

Youth in Oklahoma

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	80	40	240	100

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects competed on Extended Education.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth taught extended education techniques.
2	Number of youth grasping and using extended education techniques.
3	Number of youth who improve their academic performance and catch up in the classroom.

Outcome #1

1. Outcome Measures

Number of youth taught extended education techniques.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for a summer literacy program in Logan County was identified as an issue by concerned parents and community leaders. Logan County offers limited youth education programs for young people after school during the summer months. Consequently, there is an unacceptably high number of latchkey students. Students who do not participate in skills building and recreation programs during their summer vacations are more likely to experience a diminishment in their reading and math capabilities and health and physical fitness over the summer. Students who do not have something constructive to do are more susceptible to becoming engaged in destructive activities. There is a national effort through 4-H to increase the number of youths involved in programs in science, technology, engineering and mathematics (STEM). We addressed that challenge in 2018 through our summer literacy program, a 4-H STEM Saturday Academy and a 4-H STEM Summer Camp.

What has been done
Langston University Cooperative Extension staff planned and conducted an annual Literacy in Action Summer Reading Program designed to help Oklahoma Logan County youth (grades pre-kindergarten through fifth) learn development concepts that help maintain their academic capabilities and strengthen their overall well-being. A setting was created that motivated life skill development during the months of June through July. Fifty-two students received group and individualized instructions and hands-on practice in math, reading and writing. They participated in nutrition education workshops and performed physical fitness exercises daily. With the child obesity epidemic presently facing our country, physical fitness and proper nutrition were essential daily components of the program. During 2018, we also taught a curriculum that was age-specific in science, technology, engineering, and mathematics (STEM). This was part of a program launched during the summer and fall of 2008. The 4-H STEM Curriculum was taught during the summer, on weekends and during a summer camp. College support students, volunteers and

university faculty and staff helped deliver this program. Participants built and launched rockets, engaged in SAT prep vocabulary training, learned about distracted driving via fatal goggles simulations, received reptile, amphibian and ichthyology education and engaged in science-related field trips.

Results

The fifty-two students who participated in our 4-H Literacy Program received reinforcement over the summer to help maintain or strengthen their skills in reading and mathematics. Post testing showed the success of the reading and mathematics components of the program. At the conclusion of the program 100% of youth participants demonstrated improvement in reading comprehension. One hundred percent showed improvement in understanding mathematical concepts. Instructors at a school in Logan County stated that students who participated in this summer program were more school-ready in the fall. All parents indicated that the 4-H Literacy Program improved their children's reading and mathematics skills. Students who participated in the 4-H STEM Summer Program received age-specific training in food science, computer technology, aquaculture, robotics and other areas to create within them a thirst for science, engineering and technology. Three (3) of our former 4-H STEM Program students have graduated from high school and enrolled in universities in Oklahoma majoring in science-related fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Number of youth grasping and using extended education techniques.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The need for a summer literacy program in Logan County was identified as an issue by concerned parents and community leaders. Logan County offers limited youth education programs for young people after school during the summer months. Consequently, there is an unacceptably high number of latchkey students. Students who do not participate in skills building and recreation programs during their summer vacations are more likely to experience a diminishment in their reading and math capabilities and health and physical fitness over the summer. Students who do not have something constructive to do are more susceptible to becoming engaged in destructive activities. There is a national effort through 4-H to increase the number of youths involved in programs in science, technology, engineering and mathematics (STEM). We addressed that challenge in 2018 through our summer literacy program, a 4-H STEM Saturday Academy and a 4-H STEM Summer Camp.

What has been done

Langston University Cooperative Extension staff planned and conducted an annual Literacy in Action Summer Reading Program designed to help Oklahoma Logan County youth (grades pre-kindergarten through fifth) learn development concepts that help maintain their academic capabilities and strengthen their overall well-being. A setting was created that motivated life skill development during the months of June through July. Fifty-two students received group and individualized instructions and hands-on practice in math, reading and writing. They participated in nutrition education workshops and performed physical fitness exercises daily. With the child obesity epidemic presently facing our country, physical fitness and proper nutrition were essential daily components of the program. During 2018, we also taught a curriculum that was age-specific in science, technology, engineering and mathematics (STEM). This was part of a program launched during the summer and fall of 2008. The 4-H STEM Curriculum was taught during the summer, on weekends and during a summer camp. College support students, volunteers and university faculty and staff helped deliver this program. Participants built and launched rockets, engaged in SAT prep vocabulary training, learned about distracted driving via fatal goggles simulations, received reptile, amphibian and ichthyology education and engaged in science-related field trips.

Results

The fifty-two students who participated in our 4-H Literacy Program received reinforcement over the summer to help maintain or strengthen their skills in reading and mathematics. Post testing showed the success of the reading and mathematics components of the program. At the conclusion of the program 100% of youth participants demonstrated improvement in reading comprehension. One hundred percent showed improvement in understanding mathematical concepts. Instructors at a school in Logan County stated that students who participated in this summer program were more school-ready in the fall. All parents indicated that the 4-H Literacy Program improved their children's reading and mathematics skills. Students who participated in the 4-H STEM Summer Program received age-specific training in food science, computer technology, aquaculture, robotics and other areas to create within them a thirst for science, engineering and technology. Three (3) of our former 4-H STEM Program students have graduated from high school and enrolled in universities in Oklahoma majoring in science-related fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Number of youth who improve their academic performance and catch up in the classroom.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need for a summer literacy program in Logan County was identified as an issue by concerned parents and community leaders. Logan County offers limited youth education programs for young people after school during the summer months. Consequently, there is an unacceptably high number of latchkey students. Students who do not participate in skills building and recreation programs during their summer vacations are more likely to experience a diminishment in their reading and math capabilities and health and physical fitness over the summer. Students who do not have something constructive to do are more susceptible to becoming engaged in destructive activities. There is a national effort through 4-H to increase the number of youths involved in programs in science, technology, engineering and mathematics (STEM). We addressed that challenge in 2018 through our summer literacy program, a 4-H STEM Saturday Academy and a 4-H STEM Summer Camp.

What has been done
Langston University Cooperative Extension staff planned and conducted an annual Literacy in Action Summer Reading Program designed to help Oklahoma Logan County youth (grades pre-kindergarten through fifth) learn development concepts that help maintain their academic capabilities and strengthen their overall well-being. A setting was created that motivated life skill development during the months of June through July. Fifty-two students received group and individualized instructions and hands-on practice in math, reading and writing. They participated in nutrition education workshops and performed physical fitness exercises daily. With the child obesity epidemic presently facing our country, physical fitness and proper nutrition were essential daily components of the program. During 2018, we also taught a curriculum that was age-specific in science, technology, engineering and mathematics (STEM). This was part of a program launched during the summer and fall of 2008. The 4-H STEM Curriculum was taught during the summer, on weekends and during a summer camp. College support students, volunteers and university faculty and staff helped deliver this program. Participants built and launched rockets,

engaged in SAT prep vocabulary training, learned about distracted driving via fatal goggles simulations, received reptile, amphibian and ichthyology education and engaged in science-related field trips.

Results

The fifty-two students who participated in our 4-H Literacy Program received reinforcement over the summer to help maintain or strengthen their skills in reading and mathematics. Post testing showed the success of the reading and mathematics components of the program. At the conclusion of the program 100% of youth participants demonstrated improvement in reading comprehension. One hundred percent showed improvement in understanding mathematical concepts. Instructors at a school in Logan County stated that students who participated in this summer program were more school-ready in the fall. All parents indicated that the 4-H Literacy Program improved their children's reading and mathematics skills. Students who participated in the 4-H STEM Summer Program received age-specific training in food science, computer technology, aquaculture, robotics and other areas to create within them a thirst for science, engineering and technology. Three (3) of our former 4-H STEM Program students have graduated from high school and enrolled in universities in Oklahoma majoring in science-related fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The fifty-two students who participated in our 4-H Literacy Program received reinforcement over the summer to help maintain or strengthen their skills in reading and mathematics. Post testing showed the success of the reading and mathematics component of this program. A the conclusion of the program 100% of the youth participants demonstrated improvement in reading comprehension and 100% showed improvement in understanding mathematical concepts.

Key Items of Evaluation

- Build self-confidence
- Improved math skills
- Improved reading skills

V(A). Planned Program (Summary)

Program # 22

1. Name of the Planned Program

Family and Consumer Sciences (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.3	0.0	0.0
Actual Paid	0.0	0.3	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	19756	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will conduct classes, seminars, workshops and forums to share Family and Consumer Sciences resources.

2. Brief description of the target audience

Citizens of Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	100	50	400	100

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Family and Consumer Sciences

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who learned about Family and Consumer Sciences.
2	Number of participants who used Family and Consumer Sciences resources.
3	Number of families that improved their quality of life at least in part from this program.

Outcome #1

1. Outcome Measures

Number of participants who learned about Family and Consumer Sciences.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Public officials continue to sound the alarm about America's mounting obesity epidemic; which is no respecter of age, gender, race, or socioeconomic status. Over half a million people in Oklahoma live in households that are food insecure. With the continued sluggishness of the economy, many Oklahomans are facing issues in stretching food, housing and medical dollars. The Family Consumer Sciences Program at Langston University assists clientele in combating these challenges.

What has been done
During 2018, meetings were conducted, and demonstrations carried out on healthy food selection, good nutrition, My plate and tailoring diets. Exercise type and intensity were taught during demonstrations. Sessions were conducted on food and nutrition principles (including food safety selection and storage), childhood development and money management. Targeted audiences were primarily in Logan, Oklahoma and Tulsa Counties.

Results
Program participants reported that they were more selective in their food choices; choosing more healthy foods. Some participants introduced more fruits and vegetables into their meals. These adopted changes in food choices have resulted in weight lost and put some participants on the road to healthy living at least in part because of their diets. Program participants also stated that they have experienced reductions in food cost and food borne illnesses, improved food selections and storage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Number of participants who used Family and Consumer Sciences resources.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Public officials continue to sound the alarm about America's mounting obesity epidemic; which is no respecter of age, gender, race, or socioeconomic status. Over half a million people in Oklahoma live in households that are food insecure. With the continued sluggishness of the economy, many Oklahomans are facing issues in stretching food, housing and medical dollars. The Family Consumer Sciences Program at Langston University assists clientele in combating these challenges.

What has been done
During 2018, meetings were conducted, and demonstrations carried out on healthy food selection, good nutrition, My plate and tailoring diets. Exercise type and intensity were taught during demonstrations. Sessions were conducted on food and nutrition principles (including food safety selection and storage), childhood development and money management. Targeted audiences were primarily in Logan, Oklahoma and Tulsa Counties.

Results
Program participants reported that they were more selective in their food choices; choosing more healthy foods. Some participants introduced more fruits and vegetables into their meals. These adopted changes in food choices have resulted in weight lost and put some participants on the road to healthy living at least in part because of their diets. Program participants also stated that they have experienced reductions in food cost and food borne illnesses, improved food selections and storage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #3

1. Outcome Measures

Number of families that improved their quality of life at least in part from this program.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Public officials continue to sound the alarm about America's mounting obesity epidemic; which is no respecter of age, gender, race, or socioeconomic status. Over half a million people in Oklahoma live in households that are food insecure. With the continued sluggishness of the economy, many Oklahomans are facing issues in stretching food, housing and medical dollars. The Family Consumer Sciences Program at Langston University assists clientele in combating these challenges.

What has been done
During 2018, meetings were conducted, and demonstrations carried out on healthy food selection, good nutrition, My plate and tailoring diets. Exercise type and intensity were taught during demonstrations. Sessions were conducted on food and nutrition principles (including food safety selection and storage), childhood development and money management. Targeted audiences were primarily in Logan, Oklahoma and Tulsa Counties.

Results
Program participants reported that they were more selective in their food choices; choosing more healthy foods. Some participants introduced more fruits and vegetables into their meals. These adopted changes in food choices have resulted in weight lost and put some participants on the road to healthy living at least in part because of their diets. Program participants also stated that they have experienced reductions in food cost and food borne illnesses, improved food selections and storage.

4. Associated Knowledge Areas

KA Code	Knowledge Area

801 Individual and Family Resource Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

- Improved food selection
- Improved food preparation and storage skills

Key Items of Evaluation

- Obesity
- Food Security
- Nutrition Principle
- Childhood

V(A). Planned Program (Summary)

Program # 23

1. Name of the Planned Program

Food and Nutrition (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
504	Home and Commercial Food Service	0%	100%	0%	0%
	Total	0%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.3	0.0	0.0
Actual Paid	0.0	0.3	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	19756	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will conduct classes, seminars, workshops and hold community forums to teach healthy food and nutrition concepts.

2. Brief description of the target audience

Citizens of Oklahoma

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	250	50	2500	100

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects competed on Food and Nutrition.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who learned about food and nutrition.
2	Number of participants who used knowledge/guidelines presented during food and nutrition sessions.
3	Number of participants who improve their lifestyles by following food and nutrition guidelines.

Outcome #1

1. Outcome Measures

Number of participants who learned about food and nutrition.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food and nutrition practices play a key role in the health of a nation. Many common diseases or conditions leading to diseases such as diabetes, hypertension and heart disease are linked to poor food and nutrition choices. This is especially true within minority populations. Oklahoma, especially rural Oklahoma, ranks high among the states when it comes to overweight and obesity.

What has been done
Food and nutrition sessions were conducted with both adult and youth audiences. Sessions consisted of lessons on menu planning, health wellness, diet, exercise, food storage, food preparation and etiquette.

Results
Participants have indicated that this program was a factor in improving their health and the health of their families through better nutrition practices. They have also been able to reduce food costs by reducing food loss (via better food storage methods). Families have started practicing better food safety methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #2

1. Outcome Measures

Number of participants who used knowledge/guidelines presented during food and nutrition sessions.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food and nutrition practices play a key role in the health of a nation. Many common diseases or conditions leading to diseases such as diabetes, hypertension and heart disease are linked to poor food and nutrition choices. This is especially true within minority populations. Oklahoma, especially rural Oklahoma, ranks high among the states when it comes to overweight and obesity.

What has been done
Food and nutrition sessions were conducted with both adult and youth audiences. Sessions consisted of lessons on menu planning, health wellness, diet, exercise, food storage, food preparation and etiquette.

Results
Participants have indicated that this program was a factor in improving their health and the health of their families through better nutrition practices. They have also been able to reduce food costs by reducing food loss (via better food storage methods). Families have started practicing better food safety methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #3

1. Outcome Measures

Number of participants who improve their lifestyles by following food and nutrition guidelines.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food and nutrition practices play a key role in the health of a nation. Many common diseases or conditions leading to diseases such as diabetes, hypertension and heart disease are linked to poor food and nutrition choices. This is especially true within minority populations. Oklahoma, especially rural Oklahoma, ranks high among the states when it comes to overweight and obesity.

What has been done
Food and nutrition sessions were conducted with both adult and youth audiences. Sessions consisted of lessons on menu planning, health wellness, diet, exercise, food storage, food preparation and etiquette.

Results
Participants have indicated that this program was a factor in improving their health and the health of their families through better nutrition practices. They have also been able to reduce food costs by reducing food loss (via better food storage methods). Families have started practicing better food safety methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Government Regulations
- Competing Public priorities

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Participants indicated that they are making better decisions and choices related to food, nutrition, budgeting and balanced diets.

Key Items of Evaluation

- Improvement in food selection, preparation and storage skills
- Development of better budgeting skills

V(A). Planned Program (Summary)

Program # 24

1. Name of the Planned Program

Biotechnology (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	1.0
Actual Paid	0.0	0.0	0.0	0.5
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	0	14664
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	23166
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	257583

V(D). Planned Program (Activity)

1. Brief description of the Activity

Researchers will develop a local peanut nucleotide database and build a bioinformatics pipeline for peanut gene discovery.

2. Brief description of the target audience

All peanut producers in Oklahoma

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	200	50	150	50

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Biotechnology.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning about the peanut nucelotide database.
2	Number of farmers using the peanut nucleotide database.
3	Farmers who use the peanut nucleotide database or new peanut gene discoveries to improve their peanut production system.

Outcome #1

1. Outcome Measures

Number of farmers learning about the peanut nucelotide database.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for developing improved peanut genotypes that are higher yielding and more disease and insect resistant. Improved nutritional varieties would include higher protein levels and alleviation of plant DNA that causes allergens. The peanut is relatively easily accessible and a less-expensive source of vegetable protein. Its improvement will significantly help in the global war against hunger and poverty. Daylily production also serves as a profitable alternative crop for producers who want to diversify their operation. The pace for developing improved genotypes of these two crops will be accelerated through the use of modern techniques such as those used in the Biotechnology Program at Langston University.

What has been done
During 2018 biotechnology studies were conducted on the daylily. Primary microprogation studies were initiated. High school and college students were trained in biotechnology protocol and instrumentation.

Results
Activities in 2018 resulted in students increasing their interest in research and their skills in laboratory procedures. Students gained skills in field experimental design, soil preparation, transplanting, monitoring, nutrition and biotechnology techniques.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of farmers using the peanut nucleotide database.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for developing improved peanut genotypes that are higher yielding and more disease and insect resistant. Improved nutritional varieties would include higher protein levels and alleviation of plant DNA that causes allergens. The peanut is relatively easily accessible and a less-expensive source of vegetable protein. Its improvement will significantly help in the global war against hunger and poverty. Daylily production also serves as a profitable alternative crop for producers who want to diversify their operation. The pace for developing improved genotypes of these two crops will be accelerated through the use of modern techniques such as those used in the Biotechnology Program at Langston University.

What has been done
During 2018 biotechnology studies were conducted on the daylily. Primary microprogation studies were initiated. High school and college students were trained in biotechnology protocol and instrumentation.

Results
Activities in 2018 resulted in students increasing their interest in research and their skills in laboratory procedures. Students gained skills in field experimental design, soil preparation, transplanting, monitoring, nutrition and biotechnology techniques.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Farmers who use the peanut nucleotide database or new peanut gene discoveries to improve their peanut production system.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for developing improved peanut genotypes that are higher yielding and more disease and insect resistant. Improved nutritional varieties would include higher protein levels and alleviation of plant DNA that causes allergens. The peanut is relatively easily accessible and a less-expensive source of vegetable protein. Its improvement will significantly help in the global war against hunger and poverty. Daylily production also serves as a profitable alternative crop for producers who want to diversify their operation. The pace for developing improved genotypes of these two crops will be accelerated through the use of modern techniques such as those used in the Biotechnology Program at Langston University.

What has been done
During 2018 biotechnology studies were conducted on the daylily. Primary microprogation studies were initiated. High school and college students were trained in biotechnology protocol and instrumentation.

Results
Activities in 2018 resulted in students increasing their interest in research and their skills in laboratory procedures. Students gained skills in field experimental design, soil preparation, transplanting, monitoring, nutrition and biotechnology techniques.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Competing Public priorities

Brief Explanation

Time series (multiple points before and after program).

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Annual progress with mapping pathways and developing DNA libraries for improving test species.

Key Items of Evaluation

- Developing DNA libraries.

V(A). Planned Program (Summary)

Program # 25

1. Name of the Planned Program

Water Gardens (Aquaculture) (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
401	Structures, Facilities, and General Purpose Farm Supplies	0%	100%	0%	0%
	Total	0%	100%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.0	0.0	0.5
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

Fish loading testing will be performed and fish loading modeling will be conducted. Nutrient uptake experiments will be conducted.

2. Brief description of the target audience

All aquaculture farmers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Water Gardens

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning water garden techniques.
2	Number of farmers using water garden techniques.
3	Farmers who improve the water quality of their water gardens and reduce operational costs.

Outcome #1

1. Outcome Measures

Number of farmers learning water garden techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #2

1. Outcome Measures

Number of farmers using water garden techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #3

1. Outcome Measures

Farmers who improve the water quality of their water gardens and reduce operational costs.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

N/a

Key Items of Evaluation

N/a

V(A). Planned Program (Summary)

Program # 26

1. Name of the Planned Program

Alternative Species (Aquaculture) (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
307	Animal Management Systems	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.6	0.0	0.2
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

Buffalo fish species will be tested for sustainability and profitability in Oklahoma.

2. Brief description of the target audience

All aquaculture farmers in Oklahoma.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Alternative Species.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning alternative fish species techniques.
2	Number of farmers using alternative fish species techniques.
3	Farmers who improved their yearly income by using alternative fish species.

Outcome #1

1. Outcome Measures

Number of farmers learning alternative fish species techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Number of farmers using alternative fish species techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Farmers who improved their yearly income by using alternative fish species.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 27

1. Name of the Planned Program

Fishery Management (Aquaculture) (Langston University)

☐ Reporting on this Program

Reason for not reporting

No data for 2018.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.4	0.0	0.3
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

Work will be performed in fishery management under such conditions as drought, aquatic vegetation infestation and pond leaks.

2. Brief description of the target audience

All aquaculture farmers in Oklahoma.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Fishery Management.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning new fishery management techniques.
2	Number of farmers using new fishery management techniques.
3	Farmers who have improved their production efficiency and raised their profits with the new fishery management techniques.

Outcome #1

1. Outcome Measures

Number of farmers learning new fishery management techniques.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

Number of farmers using new fishery management techniques.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Farmers who have improved their production efficiency and raised their profits with the new fishery management techniques.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual

2018 0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 28

1. Name of the Planned Program

Sustainable Internal Parasite Control for Small Ruminants (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
313	Internal Parasites in Animals	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.2	0.0	0.1
Actual Paid	0.0	0.1	0.0	0.1
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	4693	0	293
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	23166
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	257583

V(D). Planned Program (Activity)

1. Brief description of the Activity

Internal parasites are the most important health issue in small ruminants; causing greater morbidity, mortality and lost production than the next three most important diseases. The problems with internal parasites include lack of knowledge on biology and management practices to control them, internet

misinformation and dewormer resistance.

2. Brief description of the target audience

All goat producers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	118	40	9	8

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on sustainable internal parasite control.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning internal parasite control techniques.
2	Number of goat producers using internal parasite control techniques.
3	Goat producers who have gotten internal parasites under control by using the learned control techniques.

Outcome #1

1. Outcome Measures

Number of goat producers learning internal parasite control techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Internal parasites (Gastrointestinal Nematodes) are the most important health issue in sheep and goats; causing greater morbidity, mortality and lost production than the next three most important diseases. The problems with internal parasites include lack of knowledge on biology and management practices to control them, internet misinformation and dewormer resistance. All goat producers in this region of the country have internal parasite challenges with their herds and significant to severe dewormer resistance. Therefore, both goat and sheep producers are interested in practices to better control internal parasites in their animals.

What has been done
During 2018, one parasite workshop was conducted. A parasite section was taught during a small ruminant class at Oklahoma State University. Parasite control was also taught at small producers' meetings in Oklahoma. Magazine articles were also written and a meat goat parasite control session is being broadcast on YouTube.

Results
2018 workshop post-tests showed an increase in producers' knowledge about internal parasite control in small ruminants. 2018 Field Day surveys indicated that most participants planned to make changes based upon information presented. Earlier results from this program reported that fifteen out of twenty-two producers experienced a reduction in the number of required dewormings (68%). Thirteen producers (59%) indicated a cost saving of $75 to $400 by reducing the number of herd dewormings. Also, seven out of the twenty-two producers (32%) reported a reduction in animal losses that was a saving of $300-$2,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

Outcome #2

1. Outcome Measures

Number of goat producers using internal parasite control techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Internal parasites (Gastrointestinal Nematodes) are the most important health issue in sheep and goats; causing greater morbidity, mortality and lost production than the next three most important diseases. The problems with internal parasites include lack of knowledge on biology and management practices to control them, internet misinformation and dewormer resistance. All goat producers in this region of the country have internal parasite challenges with their herds and significant to severe dewormer resistance. Therefore, both goat and sheep producers are interested in practices to better control internal parasites in their animals.

What has been done
During 2018, one parasite workshop was conducted. A parasite section was taught during a small ruminant class at Oklahoma State University. Parasite control was also taught at small producers' meetings in Oklahoma. Magazine articles were also written and a meat goat parasite control session is being broadcast on YouTube.

Results
2018 workshop post-tests showed an increase in producers' knowledge about internal parasite control in small ruminants. 2018 Field Day surveys indicated that most participants planned to make changes based upon information presented. Earlier results from this program reported that fifteen out of twenty-two producers experienced a reduction in the number of required dewormings (68%). Thirteen producers (59%) indicated a cost saving of $75 to $400 by reducing the number of herd dewormings. Also, seven out of the twenty-two producers (32%) reported a reduction in animal losses that was a saving of $300-$2,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

Outcome #3

1. Outcome Measures

Goat producers who have gotten internal parasites under control by using the learned control techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Internal parasites (Gastrointestinal Nematodes) are the most important health issue in sheep and goats; causing greater morbidity, mortality and lost production than the next three most important diseases. The problems with internal parasites include lack of knowledge on biology and management practices to control them, internet misinformation and dewormer resistance. All goat producers in this region of the country have internal parasite challenges with their herds and significant to severe dewormer resistance. Therefore, both goat and sheep producers are interested in practices to better control internal parasites in their animals.

What has been done
During 2018, one parasite workshop was conducted. A parasite section was taught during a small ruminant class at Oklahoma State University. Parasite control was also taught at small producers' meetings in Oklahoma. Magazine articles were also written and a meat goat parasite control session is being broadcast on YouTube.

Results
2018 workshop post-tests showed an increase in producers' knowledge about internal parasite control in small ruminants. 2018 Field Day surveys indicated that most participants planned to make changes based upon information presented. Earlier results from this program reported that fifteen out of twenty-two producers experienced a reduction in the number of required dewormings (68%). Thirteen producers (59%) indicated a cost saving of $75 to $400 by reducing

the number of herd dewormings. Also, seven out of the twenty-two producers (32%) reported a reduction in animal losses that was a saving of $300-$2,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
313	Internal Parasites in Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

Draught

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Eagerness of goat producers to adopt alternative parasite control methods.

Key Items of Evaluation

Goat producers adopt practices and experience improvements in their herds' health.

V(A). Planned Program (Summary)

Program # 29

1. Name of the Planned Program

Goat Internet Website (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
903	Communication, Education, and Information Delivery	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.2	0.0	0.1
Actual Paid	0.0	0.3	0.0	0.1
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	11053	0	590
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	23166
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	257583

V(D). Planned Program (Activity)

1. Brief description of the Activity

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 (QA) program is essential. Such a QA program ensures the production of a wholesome product that satisfies consumes and increases profits for the meat goat industry.

2. Brief description of the target audience

The target audience is primarily goat producers interested in becoming certified in meat goat production.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	62097	40000	200	100

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Goat Internet Website.

Year	Actual

2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning about information found on the goat internet website.
2	Number of goat producers using the goat internet website.
3	Goat producers who improved their operations with information from the goat internet website.

Outcome #1

1. Outcome Measures

Number of goat producers learning about information found on the goat internet website.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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. Many producers obtain goat production information from the World Wide Web. While scientifically-based information does exist on the internet, producers with little to no livestock experience may not be able to distinguish between good and bad information. As the meat goat industry grows and evolves, a quality assurance (QA) 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.

What has been done
Langston University was awarded funding by the Food Safety and Inspection Service of USDA to develop training and certification for meat goat producers. Langston University organized and led a consortium of 1890 universities and producer associations in this project. The consortium identified the subject topics most pertinent and pressing for the instructional modules. The consortium then identified experts on the selected subject topics and pursued these experts as module authors. These authors represent the most qualified persons in their field in academia as well as in the industry. Langston University translated the 22 instructional modules into web pages with accompanying images, and pre- and post-tests for those producers wishing to pursue certification. This program is known as the Quality Producer (QP) Online Certification. All modules are also available in pdf for easy printing and the introductory module is available as a podchapter for downloading and listening on your favorite mp3 player. The web-site (http://www2.luresext.edu/goats/training/qa.html) was well received by the goat community. In 2015 to better understand internet user's preferences, a tracking code for Goggle Analytics was again embedded in each web page. In 2018, an additional 21 participants were certified as

Meat Producers and 78 as Quality Dairy Producers.

Results

More than two thousand seven hundred (2,700) goat producers have enrolled in the online certification program and 489 goat producers have been certified via the site to date. Ninety-nine producers were certified in 2018. Knowledge gained by producers for more efficient and effective goat production will result in increased profits for many of these 489 producers. Based upon Goggle Analytics data, there were 77,639 visits to the online site in 2018. These visits represented over 150 countries or territories, all 50 U.S. States and the District of Columbia. Producers following quality assurance guidelines can expect higher values and profits from their animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of goat producers using the goat internet website.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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. Many producers obtain goat production information from the World Wide Web. While scientifically-based information does exist on the internet, producers with little to no livestock experience may not be able to distinguish between good and bad information. As the meat goat industry grows and evolves, a quality assurance (QA) 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.

What has been done

Langston University was awarded funding by the Food Safety and Inspection Service of USDA to develop training and certification for meat goat producers. Langston University organized and led a consortium of 1890 universities and producer associations in this project. The consortium identified the subject topics most pertinent and pressing for the instructional modules. The consortium then identified experts on the selected subject topics and pursued these experts as module authors. These authors represent the most qualified persons in their field in academia as well as in the industry. Langston University translated the 22 instructional modules into web pages with accompanying images, and pre- and post-tests for those producers wishing to pursue certification. This program is known as the Quality Producer (QP) Online Certification. All modules are also available in pdf for easy printing and the introductory module is available as a podchapter for downloading and listening on your favorite mp3 player. The web-site (http://www2.luresext.edu/goats/training/qa.html) was well received by the goat community. In 2015 to better understand internet user's preferences, a tracking code for Goggle Analytics was again embedded in each web page. In 2018, an additional 21 participants were certified as Quality Meat Producers and 78 as Quality Dairy Producers.

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4. Associated Knowledge Areas

KA Code	Knowledge Area
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Goat producers who improved their operations with information from the goat internet website.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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. Many producers obtain goat production information from the World Wide Web. While scientifically-based information does exist on the internet, producers with little to no livestock experience may not be able to distinguish between good and bad information. As the meat goat industry grows and evolves, a quality assurance (QA) 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.

What has been done

Langston University was awarded funding by the Food Safety and Inspection Service of USDA to develop training and certification for meat goat producers. Langston University organized and led a consortium of 1890 universities and producer associations in this project. The consortium identified the subject topics most pertinent and pressing for the instructional modules. The consortium then identified experts on the selected subject topics and pursued these experts as module authors. These authors represent the most qualified persons in their field in academia as well as in the industry. Langston University translated the 22 instructional modules into web pages with accompanying images, and pre- and post-tests for those producers wishing to pursue certification. This program is known as the Quality Producer (QP) Online Certification. All modules are also available in pdf for easy printing and the introductory module is available as a podchapter for downloading and listening on your favorite mp3 player. The web-site (http://www2.luresext.edu/goats/training/qa.html) was well received by the goat community. In 2015 to better understand internet user's preferences, a tracking code for Goggle Analytics was again embedded in each web page. In 2018, an additional 21 participants were certified as Quality Meat Producers and 78 as Quality Dairy Producers.

Results

More than two thousand seven hundred (2,700) goat producers have enrolled in the online certification program and 489 goat producers have been certified via the site to date. Ninety-nine producers were certified in 2018. Knowledge gained by producers for more efficient and effective goat production will result in increased profits for many of these 489 producers. Based upon Goggle Analytics data, there were 77,639 visits to the online site in 2018. These visits represented over 150 countries or territories, all 50 U.S. States and the District of Columbia. Producers following quality assurance guidelines can expect higher values and profits from their animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

External factors did not affect the outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Eagerness of goat producers to register for and complete the goat producer certification module.

Key Items of Evaluation

Certified goat producers who improved their goat production practices.

V(A). Planned Program (Summary)

Program # 30

1. Name of the Planned Program

Development of New Dairy Goat Products (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
502	New and Improved Food Products	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.3	0.0	0.3
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

No activity to report this year.

2. Brief description of the target audience

All goat producers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research projects completed on Development of New Dairy Goat Products

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning about techniques for developing new dairy goat products.
2	Number of goat producers using techniques for developing new dairy goat products.
3	Goat producers developing increasing yearly income from new dairy goat products.

Outcome #1

1. Outcome Measures

Number of goat producers learning about techniques for developing new dairy goat products.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
No activity occurred during 2018.

What has been done
No activity occurred during 2018.

Results
No activity occurred during 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #2

1. Outcome Measures

Number of goat producers using techniques for developing new dairy goat products.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
No activity occurred during 2018.

What has been done
No activity occurred during 2018.

Results
No activity occurred during 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #3

1. Outcome Measures

Goat producers developing increasing yearly income from new dairy goat products.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual

2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
No activity occurred during 2018.

What has been done
No activity occurred during 2018.

Results
No activity occurred during 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

No activity occurred during 2018.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No activity occurred during 2018.

Key Items of Evaluation

No activity occurred during 2018.

V(A). Planned Program (Summary)

Program # 31

1. Name of the Planned Program

Demonstration Clinic: Artificial Insemination for Goats (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.1	0.0	0.0
Actual Paid	0.0	0.1	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	3918	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Hands-on artifical insemination (AI) workshops will be conducted to teach AI techniques to goat producers. These AI skills will allow goat producers to gain access to genetically superior sires for

herd improvement.

2. Brief description of the target audience

All goat producers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11	20	0	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research projects completed on Demonstration Clinic: Artificial Insemination for Goats

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning about artificial insemination techniques.
2	Number of goat producers using artificial insemination techniques.
3	Goat producers who improved their herds by using artificial insemination techniques.

Outcome #1

1. Outcome Measures

Number of goat producers learning about artificial insemination techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The use of superior sires is imperative for improving the genetic composition of breeding stock. Artificial insemination (AI) 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 acquire 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. Acquiring goat artificial insemination skills also allows producers to save money by conducting the inseminations themselves, rather than hiring an inseminator.

What has been done
In 2018 AI workshops were held on 10/06/18 on the Langston University Campus (Langston, Oklahoma). Eleven (11) participants enrolled and received AI training.

Results
Two workshops were conducted in AI for goats. Goat producers are under-served in this area of herd improvement because traditional AI courses are geared toward cattle and the AI techniques differ drastically between the species. Goat producers participating in the workshops saved money by being able to conduct their own herd artificial inseminations. They can also improve their herds with access to genetic material from superior sires.

4. Associated Knowledge Areas

KA Code	Knowledge Area

301 Reproductive Performance of Animals

Outcome #2

1. Outcome Measures

Number of goat producers using artificial insemination techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	21

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The use of superior sires is imperative for improving the genetic composition of breeding stock. Artificial insemination (AI) 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 acquire 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. Acquiring goat artificial insemination skills also allows producers to save money by conducting the inseminations themselves, rather than hiring an inseminator.

What has been done
In 2018 AI workshops were held on 10/06/18 on the Langston University Campus (Langston, Oklahoma). Eleven (11) participants enrolled and received AI training.

Results
Two workshops were conducted in AI for goats. Goat producers are under-served in this area of herd improvement because traditional AI courses are geared toward cattle and the AI techniques differ drastically between the species. Goat producers participating in the workshops saved money by being able to conduct their own herd artificial inseminations. They can also improve their herds with access to genetic material from superior sires.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #3

1. Outcome Measures

Goat producers who improved their herds by using artificial insemination techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	21

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The use of superior sires is imperative for improving the genetic composition of breeding stock. Artificial insemination (AI) 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 acquire 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. Acquiring goat artificial insemination skills also allows producers to save money by conducting the inseminations themselves, rather than hiring an inseminator.

What has been done
In 2018 AI workshops were held on 10/06/18 on the Langston University Campus (Langston, Oklahoma). Eleven (11) participants enrolled and received AI training.

Results
Two workshops were conducted in AI for goats. Goat producers are under-served in this area of herd improvement because traditional AI courses are geared toward cattle and the AI techniques differ drastically between the species. Goat producers participating in the workshops saved money by being able to conduct their own herd artificial inseminations. They can also improve their herds with access to genetic material from superior sires.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Goat producers acquiring artificial insemination skills.

Key Items of Evaluation

- Goat producers saving money by performing artificial insemination on their own herds.
- Goat producers improving their herds via genetic material from superior sires.

V(A). Planned Program (Summary)

Program # 32

1. Name of the Planned Program

Fish Marketing (Aquaculture) (Langston University)

☐ Reporting on this Program

Reason for not reporting

No data for this section.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.4	0.0	0.2
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

Methods of marketing alternative fish species will be explored to increase fish producers' profits.

2. Brief description of the target audience

All aquaculture producers in Oklahoma

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Fish Marketing.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers learning new fish marketing techniques.
2	Number of farmers using new fish marketing techniques.
3	Farmers who use new fish marketing techniques to increase their profits.

Outcome #1

1. Outcome Measures

Number of farmers learning new fish marketing techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

Number of farmers using new fish marketing techniques.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Farmers who use new fish marketing techniques to increase their profits.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 33

1. Name of the Planned Program

Meat Buck Performance Test (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
303	Genetic Improvement of Animals	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.2	0.0	0.1
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will conduct the annual meat goat performance test for young, growing meat bucks to evaluate growth and feed efficiency.

2. Brief description of the target audience

All goat producers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Meat Buck Performance Test.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers learning about the meat buck performance test.
2	Number of goat producers using the meat goat performance test.
3	Goat producers who improve their herds via the meat buck performance test.

Outcome #1

1. Outcome Measures

Number of goat producers learning about the meat buck performance test.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An influential aspect of meat goat production is the growth rate and/or efficiency of kids. Objective performance records are needed when making informed genetic selections to improve average daily gain, feed efficiency and/or residual feed intake. In order to compare animals from different ranches or environments, a central performance meat buck testing is conducted. In 1997, Langston University established a meat buck performance test to promote the identification and increased utilization of genetically superior sires.

What has been done
No activity occurred in 2018.

Results
No activity occurred in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #2

1. Outcome Measures

Number of goat producers using the meat goat performance test.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An influential aspect of meat goat production is the growth rate and/or efficiency of kids. Objective performance records are needed when making informed genetic selections to improve average daily gain, feed efficiency and/or residual feed intake. In order to compare animals from different ranches or environments, a central performance meat buck testing is conducted. In 1997, Langston University established a meat buck performance test to promote the identification and increased utilization of genetically superior sires.

What has been done
No activity occurred in 2018.

Results
No activity occurred in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #3

1. Outcome Measures

Goat producers who improve their herds via the meat buck performance test.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An influential aspect of meat goat production is the growth rate and/or efficiency of kids. Objective performance records are needed when making informed genetic selections to improve average daily gain, feed efficiency and/or residual feed intake. In order to compare animals from different ranches or environments, a central performance meat buck testing is conducted. In 1997, Langston University established a meat buck performance test to promote the identification and increased utilization of genetically superior sires.

What has been done
No activity occurred in 2018.

Results
No activity occurred in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Meat buck performance tests give producers an accurate assessment of the market value of their animals.

Key Items of Evaluation

- Some meat goat producers are able to demand higher market values for their animals because of an accurate buck performance test.

V(A). Planned Program (Summary)

Program # 34

1. Name of the Planned Program

Goat Dairy Herd Improvement (DHI) Laboratory (Langston University)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
308	Improved Animal Products (Before Harvest)	0%	100%	0%	100%
	Total	0%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.2	0.0	1.3
Actual Paid	0.0	0.1	0.0	3.2
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	2694	0	27501
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	23166	0	23166
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	212941	0	257583

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension personnel will conduct goat milk quality tests in the Langston University Goat Dairy Herd Improvement Laboratory.

2. Brief description of the target audience

All goat producers in Oklahoma.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	500	100	300	50

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Research Projects completed on Goat Dairy Herd Improvement (DHI) Laboratory.

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of goat producers who learned about the Goat Dairy Herd Improvement Laboratory.
2	Number of goat producers who are using the Goat Dairy Herd Improvement Laboratory.
3	Goat producers who have increased their production profits by utilizing the Goat Dairy Herd Improvement Laboratory.

Outcome #1

1. Outcome Measures

Number of goat producers who learned about the Goat Dairy Herd Improvement Laboratory.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dairy Herd Improvement Association (DHIA) has been serving cow producers for decades. However, for many years dairy goat producers had to deal with records written in cow language. This meant that they could not get accurate information in goat terms and that all the reports reflected cows, bulls and calves rather than does, bucks and kids. The records produced by our DHI lab are used to identify high producing does. These records are useful for the exportation of does to foreign countries and accurate data could enhance the resale value of does and offspring for the producers domestically as well. DHI programs are playing a significant role in increasing goat milk production and quality. Langston University operates a certified laboratory that operates under the supervision of the National Dairy Herd Improvement Association.

What has been done
During 2018, we used a program developed in cooperation with other institutions to utilize goat language for accurate data measurements and recordings and expected dates for dairy goat breeds along with correct gender identification and expected delivery dates for pregnant does. Workshops and one-on-one demonstrations were conducted on the benefits of having DHIA records and how to collect raw data and milk samples for DHI laboratory processing. Over 15 tours were conducted for goat producers, high school and college students.

Results
Goat producers are now able to get records for their animals that reflect accurate information with the correct language. These records not only reflect higher fat and protein values for a doe, but also are easier to understand when used for genetic evaluation and for herd management. Currently, we are serving more than 230 goat producers in 36 states. Information provided by the Langston University DHI Laboratory has allowed goat producers to demand higher prices for their animals during sales. Of the 230 participating producers, information from this program has

helped them increase their profits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)

Outcome #2

1. Outcome Measures

Number of goat producers who are using the Goat Dairy Herd Improvement Laboratory.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dairy Herd Improvement Association (DHIA) has been serving cow producers for decades. However, for many years dairy goat producers had to deal with records written in cow language. This meant that they could not get accurate information in goat terms and that all the reports reflected cows, bulls and calves rather than does, bucks and kids. The records produced by our DHI lab are used to identify high producing does. These records are useful for the exportation of does to foreign countries and accurate data could enhance the resale value of does and offspring for the producers domestically as well. DHI programs are playing a significant role in increasing goat milk production and quality. Langston University operates a certified laboratory that operates under the supervision of the National Dairy Herd Improvement Association.

What has been done

During 2018, we used a program developed in cooperation with other institutions to utilize goat language for accurate data measurements and recordings and expected dates for dairy goat breeds along with correct gender identification and expected delivery dates for pregnant does. Workshops and one-on-one demonstrations were conducted on the benefits of having DHIA records and how to collect raw data and milk samples for DHI laboratory processing. Over 15 tours were conducted for goat producers, high school and college students.

Results
Goat producers are now able to get records for their animals that reflect accurate information with the correct language. These records not only reflect higher fat and protein values for a doe, but also are easier to understand when used for genetic evaluation and for herd management. Currently, we are serving more than 230 goat producers in 36 states. Information provided by the Langston University DHI Laboratory has allowed goat producers to demand higher prices for their animals during sales. Of the 230 participating producers, information from this program has helped them increase their profits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)

Outcome #3

1. Outcome Measures

Goat producers who have increased their production profits by utilizing the Goat Dairy Herd Improvement Laboratory.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dairy Herd Improvement Association (DHIA) has been serving cow producers for decades. However, for many years dairy goat producers had to deal with records written in cow language. This meant that they could not get accurate information in goat terms and that all the reports reflected cows, bulls and calves rather than does, bucks and kids. The records produced by our DHI lab are used to identify high producing does. These records are useful for the exportation of does to foreign countries and accurate data could enhance the resale value of does and offspring for the producers domestically as well. DHI programs are playing a significant role in increasing goat milk production and quality. Langston University operates a certified laboratory that operates under the supervision of the National Dairy Herd Improvement Association.

What has been done

During 2018, we used a program developed in cooperation with other institutions to utilize goat language for accurate data measurements and recordings and expected dates for dairy goat breeds along with correct gender identification and expected delivery dates for pregnant does. Workshops and one-on-one demonstrations were conducted on the benefits of having DHIA records and how to collect raw data and milk samples for DHI laboratory processing. Over 15 tours were conducted for goat producers, high school and college students.

Results

Goat producers are now able to get records for their animals that reflect accurate information with the correct language. These records not only reflect higher fat and protein values for a doe, but also are easier to understand when used for genetic evaluation and for herd management. Currently, we are serving more than 230 goat producers in 36 states. Information provided by the Langston University DHI Laboratory has allowed goat producers to demand higher prices for their animals during sales. Of the 230 participating producers, information from this program has helped them increase their profits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Goat producers are able to get accurate milk fat and protein records for their dairy goats.

Key Items of Evaluation

• Goat producers are able to get accurate milk fat and protein values to use in marketing their does and improving their herds.

V(A). Planned Program (Summary)

Program # 35

1. Name of the Planned Program

Water, Weather, and Climate

☐ Reporting on this Program

Reason for not reporting

The information was reported under other planned programs.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	100%	0%	100%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	2.0	0.0
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Submit grant proposals and conduct research that addresses priorities
- Forge collaborative relationships that build on current strengths in research and management.
- Partner with state and federal agencies to address pressing needs in water, weather, and climate.
- Produce scientific publications and disseminate information through print and on-line media outlets.
- Conduct workshops, field days, and other personal information exchanges to promote issues and alternatives in water, weather, and climate.
- Understand water use and quantify available water supplies in both surface water and groundwater resources throughout the state.
- Conduct research and extension programming on efficient use of water for agricultural and urban irrigation and water conservation practices;
- Understand mechanisms and best practices for controlling the fate and transport of sediment, nutrients, pesticides, and bacteria/viruses, and emerging contaminants in surface water and groundwater systems.
- Develop water use/demand, management, and water policy strategies to address the competing interests of rural and urban sectors, surface water and groundwater use and ownership, conservation, pollution control, and water supply development.
- Enhance ecosystem management through a better understanding of weather and climate impacts on the environment, landscape, and organisms.
- Provide agriculture and natural resource management technical expertise for weather and climate data and models maintained and operated by the Oklahoma Mesonet
- Conduct and deliver weather and climate information for the general public, agriculture, and natural resource sectors through OSU SUNUP TV, online video/audio tutorials, fact sheets, e-mail newsletters, educational programs, seminars and workshops

2. Brief description of the target audience

Water managers, state water agencies, federal water agencies, irrigation districts and irrigators, policy makers, urban homeowners, and K-12 students

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

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

Patent Applications Submitted

Year: 2018

Actual: {No Data Entered}

Patents listed
{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Grant proposals written and submitted

Year	Actual
2018	0

Output #2

Output Measure

- Conferences, workshops, and training sessions

Year	Actual
2018	0

Output #3

Output Measure

- Research reports

Year	Actual
2018	0

Output #4

Output Measure

- Extension fact sheets and other media

Year	Actual
2018	0

Output #5

Output Measure

- Water, climate, and weather-based agricultural decision support tools

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of users assessing websites and social media designed to deliver information about water quantity, water quality, education, policy, conservation, and efficient use
2	Number of downloads of videos, Extension fact sheets, Extension highlights, and related educational materials
3	Access by users of the Oklahoma Mesonet computer and mobile device weather and climate data and tools
4	Determination of the energy and water efficiency of current irrigation systems in western Oklahoma
5	Determination of groundwater recharge rates throughout the state of Oklahoma using data from the Oklahoma Mesonet
6	Comparison of grain sorghum and corn productivity under limited irrigation with subsurface drip irrigation
7	Quantification and development of modeling tools for simulating sediment and phosphorus loading rates from streambanks to sensitive streams in Oklahoma and quantification of the benefit of riparian conservation practices
8	Development and pilot-testing of an onsite wastewater training curriculum and establishment of an onsite wastewater training and demonstration facility

Outcome #1

1. Outcome Measures

Number of users assessing websites and social media designed to deliver information about water quantity, water quality, education, policy, conservation, and efficient use

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

Number of downloads of videos, Extension fact sheets, Extension highlights, and related educational materials

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Access by users of the Oklahoma Mesonet computer and mobile device weather and climate data and tools

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

Determination of the energy and water efficiency of current irrigation systems in western Oklahoma

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

Determination of groundwater recharge rates throughout the state of Oklahoma using data from the Oklahoma Mesonet

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #6

1. Outcome Measures

Comparison of grain sorghum and corn productivity under limited irrigation with subsurface drip irrigation

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #7

1. Outcome Measures

Quantification and development of modeling tools for simulating sediment and phosphorus loading rates from streambanks to sensitive streams in Oklahoma and quantification of the benefit of riparian conservation practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #8

1. Outcome Measures

Development and pilot-testing of an onsite wastewater training curriculum and establishment of an onsite wastewater training and demonstration facility

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

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