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

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I. Report Overview

1. Executive Summary

The Kentucky Accomplishment report presents an integration of Research and Extension efforts of the Kentucky Cooperative Extension system. Moreover, the document reveals the collaborative efforts of county and state level personnel working together to benefit millions of Kentuckians across the state.

Some of our 2018 accomplishments include: engaging over 1.8 million youth and nearly 400,000 adults in various Extension programs; Affording youth with opportunities to attend camp classes that include high ropes, Rocketry, Star Gazing, Planet Splash and other space science programs; Offered workshops to help Kentucky applicators comply with the new rules for products containing dicamba;. Identifying top research needs to help guide scientists interested in studying hemp. Launched a Promise Zone Downtown Revitalization project through the Community & Economic Development Initiative of Kentucky (CEDIK) as an effort to support long-term revitalization strategies; Aided over 1,000 community members have reported undertaking new leadership roles and opportunities; Created a Rosenwald 4-H Youth Development Center; Hosted free relationship checkups to give couples the opportunity to discover their strengths and problem areas in their relationship; provided a Woodland Owners Short Course to connect professionals with landowners to help the owners achieve their particular management goals relative to recreation, timber harvesting, wildlife or food production; Held a Wheat Field Day to help producers learn about the latest research and trends in wheat production; Held field days and workshops on Kentucky saltwater shrimp production and aquaponics; Established an agreement with a German company to grow the malaria-fighting plant Artemisia; Released a new pawpaw fruit cultivar to the public named KSU-ChappellTM; Hosted value-added product trainings and product assistance; Offered workshops and supporting research in urban agriculture opportunities and green roof technology; Hosted workshops and trainings on water quality to focus on the need for maintaining drinkable water; Offered agroforestry workshops; Hosted meat goat production workshops; Provided nutrition education programs for children and parents, offering lessons about eating more lean protein, choosing low or no-fat dairy, ramping up physical activity, meal planning, budgeting, food safety and portion sizes. Attracting underrepresented and minority youth to the college as participants in the Jr. MANRRS leadership institute, where youth people gained leadership skills and knowledge in agriculture, natural resources, science, technology, engineering, mathematics and related sciences.
Extension specialists from the UK Grain and Forage Center of Excellence addressed ways to minimize post harvest storage issues with grain, such as mycotoxins, insects and other biological activity, and maintaining grain quality through increasing storage periods. Extension specialists and county agents continued a focus on Kentucky Beef IRM through Master Cattleman program. Local foods initiatives remain a movement to advocate for fresher, healthier eating habits. Additional educational programs were provided in the areas of agriculture and the environments, animal science, farm production, and water quality. Programs for homeless and unstably housed youth resulted in youth gaining the life skills to become self sufficient. Extension has also taken a proactive stance in addressing the opioid epidemic across the state.
In 2018, listening sessions and discussions were conducted and completed around the state. A number of recommendations have been presented as a goal to make Extension more financially solvent and maintain its relevance to clientele and other stakeholders. This also put in motion an opportunity to take a look at

the process in which needs assessments are conducted. The data gathered is being used to reassess how data is gathered not only from Extension's traditional audiences, but also those who are not as aware of Extension's services. The data will also aim to align with the county Plan of Work data gathering process. With the emphasis on accountability, we also continue to make strides in highlighting specific programs through the development and use of public value materials, which are being used a marketing tools help articulate the Extension brand to a wider audience.
As a result of our collaborations with volunteers and other stakeholders in the 2018 program year, the percentage of our contacts were in the following areas:
25% Global Food Security and Hunger
2% Social and Economic Opportunity
22% Life Skill Development
2% Childhood Obesity
7% Leadership and Volunteerism
5% Food Safety
7% Diet, Nutrition and Healthy Lifestyles
5% Sustainable Energy
23% Agricultural and Environmental Quality
2% Climate Change

Research at the state's land-grant institutions continues to make great strides in addressing the knowledge gaps that are critical to advancing sustainable agricultural production and food systems, community and economic development, human nutrition and health, and natural resource management. The Kentucky Agricultural Experiment Station (KAES) at the University of Kentucky has been providing research results to farmers and residents for more than 130 years. Our research enterprise represents over 200 faculty directly involved in research as well as over 10,000 acres of farm/forest land and 320,000 square feet of laboratory space. Research encompasses both basic sciences that add new fundamental knowledge and applied research that, when delivered in conjunction with extension, impacts the lives of Kentuckians and people across the world. Our programs have garnered significant external support, including grants and contract of more than $37 million in FY18 and donations of nearly $4 million towards our Kentucky Grain and Forage Center of Excellence.
Research programs at the KAES are recognized as national and international leaders in areas including seed biology, plant-pathogen signaling and RNAi technology for insect control. During federal FY18 KAES researchers published 7 peer-reviewed articles published in research journals with impact factors above 10. More than 300 graduate students were engaged in research across the KAES-supported programs and 106 graduate degrees were awarded. As important, our research programs are able to have impact through the advancement of critical knowledge and the development of new technologies and programs that help ensure the sustainable production and availability of food and provide opportunities for economic growth and improved quality of life. Achievements include included advancements in finding new ways to manage insecticide-resistant Colorado potato beetle, developing and validating a method to control pests that will enable organic cucurbit production at a commercial scale in Kentucky, and developing and demonstrating a promising method for improving yields in fragipan soils among many other accomplishments detailed in throughout the report.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	470.0	52.5	180.0	46.7
Actual	477.0	58.6	149.1	52.5

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review
- Other (State Extension Advisory Committee)

2. Brief Explanation

Kentucky Cooperative Extension continues to define a merit review as a process used to judge the degree to which a planned program (1) is relevant to needs expressed by stakeholder groups, (2) draws upon current research and knowledge, (3) is congruent with quality standards and best practice, and (4) is likely to produce anticipated outcomes. Merit review for research is similar in that it uses the criteria of (1) consideration for potential impact, (2) relevance to the needs of stakeholders, and (3) appropriateness within the mission and priorities of the experiment station, USDA, and the land-grant mission.

The Plan of Work has been built on program goals that the Cooperative Extension Service identified through Extension advisory committees, developed through logic model program committees and reviewed through program area committees made up of Extension assistant directors, extension agents, department chairs, and specialists. The program area assistant directors select, refine and replace major programs based on identified needs in the greatest number of counties, current and planned research and educational resources, and the ability to effectively deal with the issues. Over 40 non- university individuals who comprise the State Extension Council representing both the University of Kentucky and Kentucky State University, all geographic regions of Kentucky as well as agriculture, youth, families, business, industry, and public education served as reviewers of the Plan of Work using the criteria identified above.
The University of Kentucky Agricultural Experiment Station focuses on scientific peer review and merit review on individual research projects. Scientific review is evaluation by other researchers who possess the expertise to conduct the same or similar research. Such review includes technical feasibility, originality, relevance and scientific/disciplinary significance of the research. Project proposals go through an initial anonymous departmental peer review. If satisfactory expertise is not available within the department or on campus, external reviews are solicited. After multiple reviews (usually three) a project committee recommends approval, rejection or revision. Only approved projects move forward for review at the college level. The college review committee conducts further scientific peer review by highly qualified individuals as well as a designated statistician and other appropriate faculty. Outside expertise, including researchers around the nation and stakeholder review, are also used.
Kentucky State University requires all project-based proposals to be peer-reviewed based on scientific merit and relevance to state, national and regional USDA priorities and the KSU mission. All Evans -Allen supported proposals are first sent for external peer-review by at least two scientists outside KSU to ensure the relevance and quality of the science. University of Kentucky faculty are often included on the proposal review panels in addition to peer reviews via, regional, national, and professional association colleagues.

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 groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (Training stakeholders in expectations relative to program needs)

Brief explanation.

The Kentucky Extension Advisory Council System has served as a primary mechanism for gaining input into program direction and development. For programs to meet the needs of the audiences they intend to serve, county level councils are to be diverse enough to represent the various constituencies within the counties including under-served and underrepresented audiences. Their purpose on the council is to express their own needs as well as to gain additional resident perspectives through traditional and non-traditional means in order to provide input into development of local extension programs. These representatives of the various audiences are not only involved in planning but also implementation and evaluation of those programs. In addition to a county extension council, each county also has an agricultural advisory council, homemaker's council, family & consumer sciences advisory council, and 4-H youth development council. They communicate resource needs to the universities. Through an Issues gathering process, topics of greatest importance are brought forward through district and state meetings attended by program leaders, extension agents and district directors. The issues identified are then presented to state program leaders, Extension specialists, and department chairs for response.

Each county also has a district board that manages the fiscal affairs of the Extension office. The board is comprised of citizens in the county that represent the various program areas, plus the county judge executive.

As full partners, the Cooperative Extension Service and Kentucky Agricultural Experiment Station set priorities for research activities with information from the county extension councils, district issues and program committees, and the University of Kentucky Council for Agricultural Research, Extension and Teaching (UK-CARET). UK-CARET functions as an advisory and advocacy group for the College of Agriculture. KSU-CARET functions in the same manner. Members have an opportunity to advise in the development of college priorities and assist in generating public support for those priorities at state and national levels. UK-CARET and KSU-CARET are representative of the full scope of the land-grant mission:
Extension, research, instruction, and service. Membership is comprised of active and progressive

leaders in agricultural and natural resource enterprises. UK-CARET provides a direct link to the national CARET organization. Two members of UK-CARET are designated as national CARET representatives. KSU's CARET representatives work closely with the University and are engaged in advising and representing the interests of its programs. KSU-CARET representatives also participate in national and state policy discussions and assist in the formation of partnerships that will generate programs and resources for KSU's expanded mission within its college.

In addition, the experiment station meets formally with other entities: quarterly with the Equine Programs advisory committee; quarterly with the Livestock Disease Diagnostic Center Advisory committee; bi-annually with the board of the Gluck Equine Research Center to discuss priorities for the equine industry; and regularly with commodity groups and state-selected boards that relate to agriculture and natural resources issues. Stakeholders are invited to be part of the interviews for key administrative positions, including associate deans, department chairs, and center directors. UK's College of Agriculture, Food and Environment encouraged significant stakeholder involvement in their strategic planning process. The strategic plan covers all missions of the college, including research and Extension. Listening sessions are periodically held in various locations across the state to garner as much stakeholder participation as possible. In addition a steering committee comprised of grain crop and forage system stakeholders met with UK officials regularly to provide input on the Grain and Forage Center of Excellence.
An advisory group remains in place for Kentucky State University's Cooperative Extension Program to help promote the university's research initiatives and Extension programs and advocate for the Land Grant Program in communities across the state. The Kentucky State University Land Grant Program Extension and Research Advisory Council (ERAC) is made up of community members and business leaders from across the state. It serves as a grassroots leadership group that advises the KYSU Land Grant Program on important issues facing the citizens in the Commonwealth. The ERAC works to ensure that research-based information is made available to the public by providing adequate leadership and support of the university's agriculture programs in their communities. Some areas of focus of the ERAC include advising staff on programs deemed appropriate as well as those that no longer meet the needs of communities, and establishing lines of communication to community leaders and local organizations.

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
- Use Surveys
- Other (Program participants; Project Collaborators)

Brief explanation.

The Kentucky Cooperative Extension program development process is based on a grassroots, six-stage model that begins with the engagement of local advisory councils for agriculture, 4-H, Family and Consumer Sciences and Extension Homemakers. All program committees used a variety of methods for developing linkages with the public to capture input, including council dialogue and discussion, focus groups, surveys, program evaluations, and working with other local agencies and organizations to conduct community assessments. Information from program committees are then shared with the total county Extension councils. Membership on these councils includes a broad

cross-section of the people in the county representing all demographic and economic segments as well as government, business, education, and community organizations in addition to those identified as under-represented audiences within extension programs. County Extension Councils assist Extension personnel in identifying program opportunities through which extension and local community organizations could effectively bring about positive change. Councils also help establish program priorities for which county program plans and outcome goals are developed. Counties also utilize a process for examining their council makeup and utilize membership committees and a rotation system to ensure new individuals have an opportunity to serve.

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
- Survey of the general public
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public
- Other (Serving on advisory groups/councils for organizations)

Brief explanation.

Even when Extension advisory councils appear to be broadly representative of the local population, it is possible that established program priorities fail to target important issues. Agents count heavily on their council members to identify program needs but recognize it is a mistake to think that the personal experiences of 15-40 individuals serving on the local Extension council can adequately identify the needs of the total population. Agents are trained to broaden that expression by involving members of the council in conducting a 'situation analysis.'

Councils use three major sources of information useful in conducting a situation analysis. (1) The first is data that have been collected by other individuals, agencies and/or organizations. This is typically called secondary or existing data.(2)The second is resident perspectives about issues, problems, resources and opportunities.(3)The third information source is current research and knowledge which may have implications for county programming. Extension Councils began the program development process by collecting situational data from these three sources. Council members and Extension staff together or independently pull this information together. Additional meetings of councils are held to review the data and discuss the implications of the findings. The product of this discussion is a list of program opportunities which may merit Extension's involvement. While existing data and current research and knowledge are as close as a computer and the internet, the council delegates themselves must be diligent in capturing local resident perspectives through one or more of several methods. Agents and local leaders were trained in the following methods to conduct community assessments:

• Community Forums - Community forums are public meetings in which individuals are invited to share and discuss their perspectives on issues facing the community.
• Focus Group Interviews - A focus group interview is a structured discussion with a small group of eight to twelve individuals on a clearly defined topic.
• Key Informant Interviews - In any community, there is a number of individuals who, because of

their unique position within the community, can provide important information about local issues and needs.

• Surveys - Surveys are a cost effective way of gathering data from a large number of people.

• Media Scan - A systematic review of the content of news articles and editorials appearing in local newspapers and on local radio and television stations provides more information about the community. UK College of Agriculture, Food and Environment's strategic planning process utilized community forums, focus groups and surveys to gather stakeholder input.

3. A statement of how the input will be considered

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

Brief explanation.

Information from stakeholders drives research and Extension agendas including our pursuit of resources to conduct research and educational programs. In addition, stakeholder input has been utilized across the board for hiring, budget development, resource acquisition, program implementation, and evaluation. Our stakeholders have also provided a voice in communicating the successes of the organization to campus administrators as well as to outside and nontraditional groups and decision-makers.

Brief Explanation of what you learned from your Stakeholders

Some of the issues that were identified and/or were under discussion in FY18included:

• Water Quality - continue educating Kentucky landowners and consumers on ways of preventing water pollution

• Youth outreach - engaging elementary students into horticulture with cooperation of master gardeners and through multidisciplinary approaches in rural KY.

• Grain storage - helping to provide alternative grain structures to help farmers who are challenged with grant storage

• Kentucky Income Tax Seminar Program - continuing the IRS-approved seminars designed to present updates for both federal and state tax preparation for tax professionals, enrolled agents, certified public accountants, certified financial planners, and attorneys

• Opioid Epidemic - implementing programs that address drug addiction and examine barriers to long term recovery

• Kindergarten Readiness - To assist in efforts to improve early childhood readiness

• Food Security- Engaging communities in conversations around effective ways to address hunger

• Economic & Financial Stability- continued emphasis on the need for Extension to continue focusing on educating youth and families about managing financial resources

• Accessing Healthy Foods - stakeholders are taking more interest in locally grown foods to address the shortage of healthy fresh food options. This includes produce grown in gardens as well as a splurge in backyard poultry/egg production

- Health Disparities/Weight Management - Obesity among youth and adults continues to be a statewide dilemma. Stakeholders continue to demand more current information that is easily accessible either in the local office or online.
- Pasture management - offering workshops relevant for horse owners and farm managers interested in the latest information about horse and cattle pasture management.
- Industrial Hemp- Planned and organized the fist Multistate research project related to hemp production.
- Grain Crops management- offering best practices that include demonstrations on nozzle selection for herbicide application, herbicide drift management, fungicide management considerations, nozzle nomenclature, spray technology overview, sprayer cleanout and sprayer safety.
- Environmental Camp Initiatives for youth - camps have helped spark youth interest in the food and environmental systems
- Sustainability around water use and waste management for Kentucky's distilling industry

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	8154112	1669175	6806460	1935157
Actual Matching	9379792	2619016	6806460	2141146
Actual All Other	0	0	11721516	0
Total Actual Expended	17533904	4288191	25334436	4076303

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	5247284	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Life Skill Development
2	Leadership and Volunteerism
3	Diet, Nutrition and Healthy Lifestyles
4	Social and Economic Opportunity
5	Global Food Security and Hunger
6	Agricultural and Environmental Quality
7	Food Safety
8	Climate Change
9	Sustainable Energy
10	Childhood Obesity

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Life Skill 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
801	Individual and Family Resource Management	5%	8%	0%	100%
802	Human Development and Family Well-Being	15%	25%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	0%	100%	0%
805	Community Institutions, Health, and Social Services	80%	0%	0%	0%
806	Youth Development	0%	67%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	120.0	16.5	4.5	0.1
Actual Paid	104.0	6.5	0.1	0.1
Actual Volunteer	87483.0	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**
1793905	155075	26324	5320
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2063554	348432	26324	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

Through extension specialists, agents, project coordinators, and program assistants, CES will partner with schools, businesses, and local agencies to present programs designed to build life skill opportunities and improve quality of life in adults and youth. Examples include:

- In-service training for extension agents on planning and retirement
- Agents and specialists conducting estate planning and retirement workshops and meetings for adult citizens of Kentucky
- Agents providing extension homemaker lessons on wills and retirement
- Small Steps to Health and Wealth and GPS Programming have become life skills featured programs
- Financial Stability Initiatives
- Estate planning and retirement publications will be made available to the public through the web, meetings and activities and county extension offices
- Agents and community collaborators training parents, grandparents and community partners in attachment and literacy building, child development, and preventive and non-violent discipline
- 4-H programing was offered to families at the Rosenwald 4-H Youth Development Center
- 4-H project groups with six hours or more of teaching time
- One-day 4-H project groups
- Camp classes
- Senior conference track: Child Care- Beyond Babysitting
- Middle school career classes - in school and on Web
- Alternative school day calendar programs
- School-sponsored day care centers for faculty and students
- Family Development and Management program for limited resource families
- Entrepreneurship Camp for High School Students * STEM-focused enrichment programs for youth

Development of agricultural productivity and sustainable land management models for small farmlands Through research, faculty in the department of Community and Leadership Development investigate effective methods for conveying STEM content through secondary agricultural education programs and the impact on success in college degree programs and subsequent careers in agriculture.

2. Brief description of the target audience

- Agents, community collaborators, and adults interested in financial management and retirement
- Adults with low financial literacy
- Parents with children and grandparents
- 4-H youth from 9 - 19 for project work
- 4-H youth 11 and up for Citizenship projects and Beyond Youth entrepreneurs
- Secondary agriculture/school teachers
- Community leaders

3. How was eXtension used?

Extension staff participated in online trainings, networking, and collaborating with colleagues.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1099832	4218547	510788	1985199

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	5	0	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na

  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 youth and adults who demonstrate increased practical living skills (learned through Extension programming)
2	Number of youth reporting the acquisition of one or more life skills as a result of participation in non-formal youth development programs conducted by Extension.
3	Number of youth and adults who demonstrate informed and effective decision-making.
4	Number of individuals who implemented at least one financial management strategy (e.g., checking credit report, developing a spending plan, etc.)
5	Number of individuals reporting changes in knowledge, skills, opinions or aspirations related to parenting or personal relationships.
6	Number of individuals reporting improved knowledge and skills related to securing financial stability (such as managing financial and non-financial resources; personal goal setting to maintain and improve financial stability).
7	Number of youth who apply the skills learned in 4-H and other activities at home, school or in the community.
8	Number of youth that have improved their communication skills.
9	Number of participants reporting behavior changes related to healthy, independent or quality aging (such as increasing communication and enhancing relationships; improving mental health; engaging a family unit to embrace aging issues).

Outcome #1

1. Outcome Measures

Number of youth and adults who demonstrate increased practical living skills (learned through Extension programming)

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of youth reporting the acquisition of one or more life skills as a result of participation in non-formal youth development programs conducted by Extension.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of youth and adults who demonstrate informed and effective decision-making.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	766

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kentucky 4-H aims to engage youth through hands-on leadership experiences where they can build leadership competencies at the beginner, intermediate, and advanced levels of 4-H involvement.

What has been done
The Kentucky 4-H Leadership Bootcamp was developed to provide senior 4-H?ers with opportunities to advance their leadership skills in the core area of their interest at the advanced

level. It also aims to prepare Kentucky 4-H State Officers for serving on state level boards before applying and running for office. The Kentucky 4-H State Officers represent the entire Kentucky 4-H Program, engaging youth, adults and stakeholders throughout their term in office. It is a goal of Kentucky 4-H that youth who are interested in applying to run as a Kentucky 4-H State Officer have state level opportunities to fully develop as a leader.

Results

This year, a total of 43 individuals who attended Kentucky 4-H Leadership Bootcamp represented youth from across the Commonwealth of Kentucky. All (100%) of the participants reported that due to their involvement in 4-H Leadership Bootcamp they are prepared to apply for a Kentucky 4-H State Officer position or state leadership board, feel more confident in an interview setting, understand the purpose of an elevator speech, showing appreciation to others, and the value of a team.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of individuals who implemented at least one financial management strategy (e.g., checking credit report, developing a spending plan, etc.)

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of individuals reporting changes in knowledge, skills, opinions or aspirations related to parenting or personal relationships.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of individuals reporting improved knowledge and skills related to securing financial stability (such as managing financial and non-financial resources; personal goal setting to maintain and improve financial stability).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	9840

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Financial literacy remains low among consumers of all ages and social/economic backgrounds. With the steady increase of consumer debt among the state and national households, there is a tremendous need to aid families in obtaining solid financial security.

What has been done
More than 300 participants learned how to identify different types of expenses, such as fixed, flexible and occasional expenses from the classes on Maximizing Your Dollars in Retirement. The Kenton County Extension Office, Kentucky State Area Specialist, collaborated with subject matter experts to present up-to-date information on these topics.

Results
As a result Extension programming, over 100 participants learned something they could implement into their lives immediately. Several members have adopted one or more methods for saving money, monitoring their spending, and looking into different types of banking options. Parents attending programs have also passed age-appropriate money knowledge to their children.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Number of youth who apply the skills learned in 4-H and other activities at home, school or in the community.

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	71460

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kentucky 4-H Youth Development holds prestige in its development and delivery of innovative youth programming across the state and its reputation across the United States. However, there is still a need for additional youth to take advantage of what the organization can offer. Despite environmental science having a presence in schools' curricula, students may not be equipped to understand simple and low-cost conservation behaviors that are available to address environmental issues.

It has been reported that less than 16 percent of Black, Hispanic, and Native American college students who aspire to earn a bachelor's degree in STEM actually accomplish that goal within five years of matriculation.

What has been done
After a 2017 needs assessment with the County Extension Council revealed that youth in the Appalachian area of Bell County need an opportunity to acquire life skills, leadership skills, value citizenship, and experience service-learning, the 4-H Junior Homemaker Club was born. This club, in its instructional design, represents a marriage of the core components of the University of Kentucky Cooperative Extension Service (UKCES) Family and Consumer Science (FCS) program and the UKCES 4-H Youth Development program.In addition, students were presented with relatively simple behaviors, such as turning off the faucet while brushing their teeth, that can positively impact the environment. Less water wasted is less energy used to process the water.

A three-month Professional Mentorship Program at Frankfort High School began during the fall of 2016 and spring 2017 semesters. Seniors at Frankfort High School participated in two 14-week

professional learning placements (e.g., career clusters) within local businesses and organizations by serving as an intern. Kentucky State University's Aquaculture Research Center was one career cluster on the list.

Results

4-H youth were urged to look for a problem in their community, their country, or their world (perspectives inherent in the 4-H model, as demonstrated through the 4-H pledge that all club members take). In this manner, the youth were conducting their own needs assessment while seeking to set their own service-learning project goals. The youth conducted a food drive for the homeless shelter across the street from the Bell County Extension Service office, where the club meets. They successfully implemented a plan and completed the task. The youth also collected hundreds of hygiene and school supply items and shipped them to the U.S. Virgin Islands to benefit other youth in St. Thomas who were devastated by a hurricane. Through these projects, the club learned how to effectively conducted a needs assessment, utilize technology to connect to a situation, set and complete goals, were exposed to logistical issues associated with delivering aid in times of emergency, and acquired leadership skills;30 students were directly impacted with information concerning how all land use affects water quality and students grasped that cumulative small changes would amount to a large scale reduction in pollution and impacts to water quality.

Students logged a minimum of 112 hours for each 14-week placement (e.g., one semester) and 224 hours between both placements. Three primary themes that emerged from the qualitative analysis were: 1) students gained self-confidence in their ability to explore and try new things, and viewed college as attainable after their experience in the program; 2)students gained practical life skills such as communication, collaborative teamwork, and responsibility of their learning experience; 3)the aquaculture mentorship program enhanced students' awareness of, interest in, and motivation toward learning more about STEM areas of study and careers.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Number of youth that have improved their communication skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	33541

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Communication skills are often mentioned as one of the most important areas of youth development. Interpersonal skills and how youth express themselves in written and spoken form has significant effects on youth personal endeavors throughout their lives. There is a need for more youth to gain exposure to the skills associated with effective communication.

What has been done
Kentucky 4-H continues to ensure that youth across the state have access to opportunities to enhance their communication skills.

Results
This year in Kentucky 4-H, 5940 youth improved their communications skills through participation in Kentucky 4-H Communication and Expressive Arts programming. A total of 3328 youth stated that they now have confidence speaking in front of groups. Finally, 2440 youth shared that they can now express themselves through the arts. A number of former 4-Hers often report back to Extension that they developed the communication skills they needed to be successful in their careers.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Number of participants reporting behavior changes related to healthy, independent or quality aging (such as increasing communication and enhancing relationships; improving mental health; engaging a family unit to embrace aging issues).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2888

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Health and safety-related decisions that individuals and families make across the lifespan directly affect overall well-being and the ability to age well. Yet many individuals make choices which result in poor overall health and high chronic disease rates.

What has been done
Keys to Embracing Aging is a Cooperative Extension educational health intervention aimed at improving overall health by focusing on ways in which individuals and families can be empowered to take control of their own lifestyle decisions and behaviors in terms of health and well-being. A number of Kentucky FCS agents presented various individual Keys to Embracing Aging lessons to participants

Results
Nearly 5,000 program participants indicated an increase in knowledge regarding healthy aging, independent aging, and quality aging. Of that total, 2888 reported their own behavior changes related to healthy, independent or quality aging. In Knox county, 92% of participants reporting more effectively managing stress.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase in behavior and intentional practices.

Key Items of Evaluation

Surveys, one-on-one interviews, testimonials.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Leadership and Volunteerism

☑ 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%	2%	0%	0%
802	Human Development and Family Well-Being	0%	1%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	100%	1%	0%	0%
902	Administration of Projects and Programs	0%	53%	0%	55%
903	Communication, Education, and Information Delivery	0%	43%	0%	45%
	Total	100%	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	77.0	10.0	0.0	6.4
Actual Paid	31.0	20.6	0.0	10.4
Actual Volunteer	34710.0	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**
570788	434737	0	112709
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
656585	1287945	0	784275
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

• Community leadership development programs will be conducted for the general public as well as training for those serving in leadership roles in extension councils and district boards, extension homemaker organizations and 4-H programs.
• Extension will continue to utilize Extension Advisory Leadership materials with extension leaders and in training facilitators to conduct local community programs.
• Counties will identify volunteers and send them to certification workshops, thereby reaching more 4-H members across Kentucky.
• Kentucky 4-H members will receive consistent, uniform education through school enrichment programs, after-school programs, day and /or summer camps and through communications events in the 4-H "Step Up to Leadership" and 4-H Communications - Speeches and Demonstrations projects and programs. Diversity workshops will be offered to program and county councils. Sustainable land management ecological training for socially disadvantaged farmers and community.

2. Brief description of the target audience

• General public as well as those serving in leadership roles in extension councils and district boards, extension homemaker organizations and 4-H programs
• Volunteers from Kentucky counties with appropriate background and experience in subject matter that we can build on for 4-H subject matter and leadership training
• "Step up to Leadership" curriculum and activities are designed for youth in grades K-12 Community-based non-profit organizations

3. How was eXtension used?

Reference materials, etc.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	371513	1190964	125102	396988

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

- na

  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 people who are involved in addressing significant community issues.
2	Number of people who increase their knowledge of governmental process
3	Number of youth who held leadership and/or advisory positions on community boards
4	Number of youth indicating increased leadership skills, knowledge or confidence through participation in Extension-related leadership programs
5	Number of adults indicating increased leadership skills, knowledge, and/or confidence through participation in volunteer programs related to youth development
6	Number of individuals who practice personal and interpersonal leadership skills in clubs, schools and community outreach.
7	Number of people who reported acquiring new leadership opportunities (through KY Extension Leadership & Youth Engagement Leadership Programs).
8	Number of people who have taken on leadership roles as a result of participating in Extension leadership programs (KY Extension Leadership & Youth engagement Leadership Programs).
9	Number of Youth who indicated they know how to use information they are given to make decisions.
10	Number of empowered individuals assessing community needs, engaging in existing coalitions or organizations, addressing a significant community issue and implementing solutions.

Outcome #1

1. **Outcome Measures**

Number of people who are involved in addressing significant community issues.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of people who increase their knowledge of governmental process

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of youth who held leadership and/or advisory positions on community boards

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of youth indicating increased leadership skills, knowledge or confidence through participation in Extension-related leadership programs

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Number of adults indicating increased leadership skills, knowledge, and/or confidence through participation in volunteer programs related to youth development

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of individuals who practice personal and interpersonal leadership skills in clubs, schools and community outreach.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6344

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need delivery modes to ensure that they have the opportunity (through programs) to attain appropriate leadership skills. Research suggests distinctive characteristics of young adolescents (middle school aged youth) regarding their physical, cognitive, moral, psychological, and social-emotional development, as well as spiritual development. Young adolescents warrant educational experiences and schools that are organized to address their developmental characteristics.

What has been done
Kentucky 4-H Summit seeks to engage middle school aged youth and retain their involvement in 4-H activities through the middle school years, along with empowering youth to become active 4-H leaders on the local and state levels. Objectives of Kentucky 4-H Summit are centered on the developmental needs of middle school aged youth: 4-H Summit aims to provide youth from across the Commonwealth with the opportunity to develop leadership skills through acquiring new knowledge to take back and implement within their local communities.

Results
This year, 89 counties from across Kentucky participated in Kentucky 4-H Summit. The state-wide event attracted 481 middle school 4-Hers, 84 teen volunteers, and 27 adult volunteers. Through the community service project, the participants created and donated over 75 fleece blankets to a homeless shelter in Somerset, Kentucky. The middle school aged youth evaluated their experience. As a result, 98% felt accepted by their team and 92% felt they had the opportunity to give back through the community service event. Youth expanded their leadership skills (90.82%) and reported they could conduct a leadership activity once they returned home (88.73%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Number of people who reported acquiring new leadership opportunities (through KY Extension Leadership & Youth Engagement Leadership Programs).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2317

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With the rise of youth in rural and metropolitan areas being involved with unsafe, risky, and problem behaviors, communities across the state have seen an onslaught on positive youth development. There is a continued need for the cultural understanding of the youth generation and their experiences.

What has been done
The Youth Engagement Leadership Program (YELP) seeks to equip youth with the civic engagement and entrepreneurial skills needed for them to emerge as change agents for their community. YELP provides opportunities to strengthen the youth voice around important social and economic issues that will impact future generations. Over 40 Bath County youth graduated from the program this year and every year this program averages 25-30 participants. Annual activities occur every year including visiting the state Capitol to meet with County Representative and Senators, visit to a Performing Arts Entity to learn how the arts make impact on communities.

Results

The YELP program reached youth across eight Kentucky counties. The programs took place in a variety of settings with several partners, including 4-H Youth Development Agents, Schools, Community Organizations, Chambers of Commerce, and Youth Service Centers.
As a result, nearly 200 people have taken on leadership roles as a result of participating, while 156 reported an increased confidence in their leadership abilities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Number of people who have taken on leadership roles as a result of participating in Extension leadership programs (KY Extension Leadership & Youth engagement Leadership Programs).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1078

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Volunteers play integral roles in 4-H programs, performing a variety of duties, functions, and tasks and possessing varied and rich knowledge, skills, and backgrounds. The success of Extension programming is due, in part, to the dedication of a large cadre of volunteers. Kentucky Extension relies on the commitment of youth and adult volunteers to aid in planning, implementing, and evaluating programs. However, although highly valued, volunteer involvement does not guarantee achievement of Extension's goals and fulfillment of learners' needs. These individuals must be equipped for the tasks at hand.

What has been done
The Kentucky Volunteer Forum provided professional development training to a total of 1108 people from 110 counties, making it the largest volunteer forum in Kentucky's history.

Results
A follow-up survey revealed that the majority of participants gained more knowledge about being a 4-H volunteer and that the training experience motivated them to continue serving in volunteer roles given the new skills they developed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #9

1. Outcome Measures

Number of Youth who indicated they know how to use information they are given to make decisions.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	69719

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Civic engagement helps create and cultivate vibrant communities. Studies have shown social capital is necessary for effective government and economic development. These experiences should be afforded to youth in order for them to be effective decision makers now and in the future.

What has been done
County 4-H teen councils have been useful mechanisms in the development of youth leadership skills. Serving on local councils has been a primary way for 4-H youth to become more confident and competent in their abilities.

Results

The Pulaski County 4-H Teen Council currently has very active members that are truly dedicated to service and leadership. One of the service projects that they have completed was a book drive, collecting over 600 books to be given to children with limited access to books. They have also began plans to create small lending libraries that would be stationed at a local church that a homeschool co-op uses weekly for classes. Two of the council members were placed on the State Teen Council this year and have been wonderful about bringing back what they have learned to the county council. They have helped fellow council members learn parliamentary procedure, and have helped with programs designed for younger youth.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

Outcome #10

1. Outcome Measures

Number of empowered individuals assessing community needs, engaging in existing coalitions or organizations, addressing a significant community issue and implementing solutions.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	7264

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agriculture depends on skilled and passionate leaders to be effective advocates for issues facing agriculture, our local communities, Kentucky and our nation. However, there is a need to train individuals to have the confidence and competence to address community issues.
The State of Kentucky faces many disasters that are mostly weather- related; winter storms, heavy winds, tornadoes, lightning, and flooding.

What has been done
The Cooperative Extension Agricultural Leadership Experience programs were conducted for

leaders with an interest or focus on agriculture. Classes often visit the state capital (Frankfort) during the general assembly, followed by a trip to Washington D.C. to meet with elected officials and commodity organizations.
The Youth Emergency Preparedness (YEP) event of Kentucky Cooperative Extension was established as an Extension Disaster Education Network (EDEN) delegate to educate young individuals on emergency preparedness for natural and man-made disasters

Results

In Kenton County, a group project was the centerpiece of the program and the participants chose the exploration of a retail store to sell Kenton County farm products. Several of the participants stepped forward to seek out others with experience in farmer centered retail ventures. These leaders contacted and designed one of the sessions to hear from these experienced individuals. As a result of the program, one participant has been asked to be on the Kenton County Farm Bureau board. Two participants will be joining the County Extension Council. One participant is assisting a local farmer in her campaign bid for a state house seat. A committee of five participants has stepped forward to start a local retail pop-up store in downtown Covington.
The students were engaged in performing cardiopulmonary resuscitation and chest compressions on dummies. They were also trained and equipped with fire extinguishers as well as provided with the opportunity to practice their response in the event they pulled over by the police for a traffic violation and how to follow instructions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Use of Extension resources; State level and local Extension personnel provided expertise

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase in knowledge, skills, improved practices and behavior

Key Items of Evaluation

Use of survey items, case studies, focus groups

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Diet, Nutrition and Healthy Lifestyles

☑ 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
312	External Parasites and Pests of Animals	0%	0%	7%	0%
502	New and Improved Food Products	0%	0%	20%	0%
701	Nutrient Composition of Food	0%	58%	0%	100%
703	Nutrition Education and Behavior	43%	0%	0%	0%
721	Insects and Other Pests Affecting Humans	0%	0%	46%	0%
722	Zoonotic Diseases and Parasites Affecting Humans	0%	0%	7%	0%
723	Hazards to Human Health and Safety	3%	0%	0%	0%
724	Healthy Lifestyle	54%	42%	20%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	95.0	2.0	6.0	1.5
Actual Paid	35.0	1.8	4.0	0.7
Actual Volunteer	40686.0	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**
570788	149520	233293	25946
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
656585	0	233293	28886
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	194156	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Contacts with clientele related to diet and health will include volunteer training, health fairs, Extension Homemaker leader lessons, safe night programs, healthy homes programs, and more.
• Multidisciplinary programs aimed at strengthening local food systems. Examples of programs to be offered will include: 4-H school enrichment, after-school programs and day and/or summer camp programs on 4-H Health, 4-H Youth Physical Fitness and Healthy Lifestyles, Small Steps to Health And Wealth - Kentucky physical activity and weight management programs, LEAP-Literacy, Eating and Activity for Preschool Program and other programs for elementary school age children.
• EFNEP - Expanded Food and Nutrition Educational Program for low income families with children.
• Multi-agency activities related to diet and health.
• Continued research in the areas of nutrient effects on high-fat diets, antioxidant effects on cancer prevention, environmental effects on nutrient requirements and more.
• Alternative technology to replace unhealthy
fats in processed foods
• Bioprotective effects of phytochemicals to mediate immunity and antigenotoxic
potential
• The biology, ecology and control of disease vectors and other insects of importance to public health
• Understanding how in-store marketing and product placement influence healthy food purchases in low-income caregivers

2. Brief description of the target audience

• Extension agents
• Community agencies
• Volunteer leaders
• Parents
• Grandparents
• General public
• Public housing residents
• Scientific community
• Jump into Food and Fitness participants: curriculum designed for youth ages 8-11
• Food processors
• Public health entomologists

3. How was eXtension used?

Reference materials.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	299006	3761656	225482	2837741

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	34	14	48

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na

  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 individuals who experienced an increase in knowledge, opinions, skills or aspirations regarding lifestyle changes (diet, exercise, healthy home practices, managing stress, etc.) that improve personal health
2	Number of individuals who made lifestyle changes (diet, exercise, healthy home practices, managing stress, etc.) for the purpose of improving their health
3	Number of individuals implementing personal health protection practices (screening, immunizations, well-baby care, preventive health practices, etc.)
4	Number of individuals who reported practice changes related to safety (use of bicycle helmets, fire extinguishers, tractor roll bars, radon testing, smoke detectors, proper ATV operation, etc.).
5	Number of individuals who experienced an increase in knowledge, opinions, skills, or aspirations regarding lifestyle changes (det, stress management, etc.) that improve personal health.
6	Number of individuals who made lifestyle changes (diet, exercise, managing stressors, etc.) for the purpose of improving their health.
7	Number of people reporting improved lifestyles through a focus on proper nutrition, disease and injury reduction and comprehensive health maintenance.
8	Number of individuals who reported an increase in their fruit and/or vegetable consumption
9	Availability of methods to improve the healthfulness of processed foods

Outcome #1

1. **Outcome Measures**

   Number of individuals who experienced an increase in knowledge, opinions, skills or aspirations regarding lifestyle changes (diet, exercise, healthy home practices, managing stress, etc.) that improve personal health

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Number of individuals who made lifestyle changes (diet, exercise, healthy home practices, managing stress, etc.) for the purpose of improving their health

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number of individuals implementing personal health protection practices (screening, immunizations, well-baby care, preventive health practices, etc.)

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of individuals who reported practice changes related to safety (use of bicycle helmets, fire extinguishers, tractor roll bars, radon testing, smoke detectors, proper ATV operation, etc.).

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of individuals who experienced an increase in knowledge, opinions, skills, or aspirations regarding lifestyle changes (det, stress management, etc.) that improve personal health.

2. **Associated Institution Types**

- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	13889

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Diabetes is a common, serious, and costly disease in Kentucky. Data from the Kentucky Behavioral Risk Factor Surveillance Survey 2017 (BRFSS) reported that diagnosed diabetes among adults has more than doubled from 6.5% (198,052) to the current rate of 13.4% (458,381). Based on data from the CDC, an estimated 152,793 additional adult Kentuckians are estimated to be living with undiagnosed diabetes. Kentucky has the 4th highest diabetes mortality rate in the nation.

What has been done
The session on diabetes management nutrition education, was organized at the Anderson Adult Education Learning center, Lawrenceburg, Anderson County, KY. This was done with the help of SNAP-Ed assistant in the county. Six adults attended the session. Two of them were diabetic, two had a family history of diabetes. One participant wanted to know about the nutritional management since one of her parents has borderline sugar levels.

Results
At the end of the session, everyone was assured that making some simple changes in their personal habits, eating healthy, small meals performing some physical activity on as many days of the week as possible.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of individuals who made lifestyle changes (diet, exercise, managing stressors, etc.) for the purpose of improving their health.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	20669

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the U.S. Census Bureau Population Estimates, the largest population that is increasing in Kentucky are baby bombers (person born between 1946 and 1964), the 2014 census estimate that population over 60 years old was over 925,000, 21% and is expected to increase to 1.17 million by 2030 or 25.6% and according to the Cornell University Disability Status Report 33.4% of Kentucky?s population ages 65-74 have some form of disability.It also important to know that Kentucky ranks the fifth state for the highest poverty rate for older adults according to Administration on Community living?s ?A Profile of Older American?.

What has been done
The KSU SNAP-ED Assistant partnered with Williamsburg Senior Citizen Community Center to worked with a group of 18 seniors once a week for 9 weeks using the Healthy Choices for Everybody curriculum. In addition, smoothie recipes were introduce to increase the consumption of vegetables and fruits to the participants. Since the participants had some form of disability the SNAP Ed assistant introduced exercises tips for sitting in a chair.

Results
Seniors in the program changed their eating habits by purchasing more healthier snacks while decreasing the amount of sugary beverages they drink. Overall the participants express more awareness of exercise, serving sizes, and what it means to have a more balanced diet.

4. Associated Knowledge Areas

KA Code	Knowledge Area

703	Nutrition Education and Behavior
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

Outcome #7

1. Outcome Measures

Number of people reporting improved lifestyles through a focus on proper nutrition, disease and injury reduction and comprehensive health maintenance.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	25587

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to a report from the Community & Economic Development Initiative of Kentucky (CEDIK) over 30% of the state?s population KY is obese and 32% are physically inactive. Obesity is a risk factor for diabetes as well as other diseases that hinder the well-being of citizens.

What has been done
In response to these staggering statistics on diabetes, the University of Kentucky Cooperative Extension Service in northern Kentucky collaborated with the Northern Kentucky Health Department and has been focusing on Making Healthy Life Style Choices through monthly food/nutrition demonstrations and hands-on cooking classes. Topics such as portion control, nutrient dense foods, making better food and drink choices, kitchen/cooking skills, My Plate, cooking for one or two and the low-fat way, soups, salads, main dish meals and freezing basics were included.

Results
Over 200 Participants in Extension programming took part in physical activity for 30 or more minutes on five or more days of the week. Over 50% lost 5-7 % of their body weight. In Campbell County, 17 participants completed the follow-up evaluation, revealing that 41% found that managing their diabetes has saved them money and 82% had a foot exam in the last year and have adopted a meal plan.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Number of individuals who reported an increase in their fruit and/or vegetable consumption

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	9132

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kentucky remains as a state near the top of the list when it comes to having one of the highest adult obesity rate in the nation. This is due in part to an increased consumption of unhealthy food. Families need healthy advice about ways to obtain and prepare fruits and vegetables. In Kentucky, 55% of farmers markets do not accept SNAP benefits. Yet, recent surveys conducted by the University of Kentucky Nutrition Education Program revealed that SNAP-eligible Kentuckians who shopped for fruit and vegetables at farmers markets, roadside stands and pick-your-own produce farms in addition to grocery stores ate an average of one serving more per day than those who shopped only at grocery stores.

What has been done
The UK Nutrition Education Programs Farmers Market Research Project applied a Community Based Prevention Marketing approach to determine the barriers to and promoters of low-income Kentuckians shopping for fresh produce at farmers markets. The process gathered data and information from eighty SNAP-eligible Kentuckians in eight geographically dispersed counties, including four metro and four non-metro counties. Also, a marketing campaign was introduced to provide indirect education to limited resource families in conjunction with direct education provided by University of Kentucky Nutrition Education program assistants and University of KY Cooperative Extension Agents. The goal of the campaign is to have families consume more fruits and vegetables; improve food resource management practices and prevent or postpone the onset

of diet-related chronic diseases.

Results
As result of Extension programs, clientele have been able to learn effective ways to manage body weight by eating more fresh fruits and vegetables. Over 23, 000 individuals reported eating healthier food options. A total of 363 individuals reported increased access to vegetables through Farmers Markets, farm-to-institution and community supported agriculture programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #9

1. Outcome Measures

Availability of methods to improve the healthfulness of processed foods

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)
Kentucky produces 95% of the worlds bourbon, and also supports a growing local craft beer industry. Beer and bourbon are brewed using a mixture of cereal grains namely, corn, malted barley, rye, wheat, etc. Brewing and distilling lead to production of significant amount of spent grain, which contains a high percentage of useful macromolecules like protein, fat, and fiber. Despite their high nutritional value, spent grains are generally a wasted byproduct for producers. The industry is in need of value-added uses for spent grains.

What has been done
Biosystems and agricultural engineers at UK evaluated the physical properties of extruded puffed snacks fortified with spent grains from beer and bourbon production. Samples were produced using a co-rotating twin screw 25:1 L/D laboratory scale extruder. Three particle sizes (180, 300 and 500 μm) were tested. Spent grain sources (beer vs. bourbon) were used as a block factor.

Results

Distiller spent grain (DSG) resulted in significantly greater radial expansion across each particle size than brewer spent grain (BSG). DSG was lighter in color compared to BSG across all particle sizes. The 300956 m particle size resulted in the most expansion, lowest bulk density, lowest hardness, and highest crispiness. The largest particle size resulted in snacks with uneven air bubbles. The study shows the potential for using spent grain in the production of high fiber extruded snacks. We developed an extrusion process that incorporates high insoluble fiber spent grain from bourbon production into puffed snacks, adding nutritional value, and in return, increasing the value of the spent grains.

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

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

Brief Explanation

Additional programs that related to Extension programs; participants willingness to fully participate

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase in knowledge, awareness, practice and behavior changes

Key Items of Evaluation

Surveys, interviews, observations collected

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Social and Economic Opportunity

☑ 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	0%	88%	30%	97%
602	Business Management, Finance, and Taxation	4%	0%	0%	0%
603	Market Economics	25%	0%	13%	0%
604	Marketing and Distribution Practices	0%	3%	4%	3%
605	Natural Resource and Environmental Economics	4%	0%	0%	0%
606	International Trade and Development	0%	0%	14%	0%
607	Consumer Economics	1%	0%	0%	0%
608	Community Resource Planning and Development	66%	9%	26%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	0%	13%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	25.0	10.5	20.0	4.6
Actual Paid	11.0	16.7	7.3	3.3
Actual Volunteer	7059.0	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**
163082	338989	295356	130313
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
187596	640710	295356	75369
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	1057836	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Delivery of educational programming and workshops on topics such as understanding community dynamics, asset analysis, business planning, marketing and hospitality management.
• Efforts to educate producers about marketing and adding value to Kentucky Agricultural products including MarketMaker, Agritourism, Agribusiness, Farmers Markets, Kentucky Proud Campaign, specialty livestock markets and marketing programs, Kentucky Entrepreneurial Institute, etc.
• Formation of nontraditonal advisory councils in the areas of community and economic development, tourism, agritourism, and arts where appropriate need and resources are identified.
• Research projects including the impact of low commodity prices and declining federal support on farm viability, investigating how community structure and policy impact entrepreneurship, understanding how health policy and health system structure impact rural communities and low-income families, finding ways to optimize the economic value of precision agriculture, understanding how consumers and producers react to unexpected shocks in agriculture markets due to natural disasters and food safety incidents, and understanding the factors affecting equine markets. Determining the preferred methods and capability of farmers and consumers to receive relevant evidence-supported information.
• The Family Economics and Management Program will focus on Earned Income Credit and Tax Credit opportunities for Kentucky Families. Youth entrepreneurship education Entrepreneurial development and outreach to educate local officials and leaders on the importance of planning for economic development.

2. Brief description of the target audience

- County Extension agents
- Kentucky crop, livestock, produce producers
- Entrepreneurs
- Agritourism providers
- Active and potential community leaders
- 4-H members
- scientific community High school students, teachers, and counselors
- Locally elected and appointed officials
- Thoroughbred operations and non-racing horse owners

3. How was eXtension used?

Reference materials to enhance programming.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	102789	389716	9510	33888

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	11	1	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na

  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 new coalitions formed as a result of Extension efforts
2	Number of individuals reporting changes in knowledge, opinions, skills or aspirations related to economic or enterprise development
3	Number of farmers self-reporting an increase in profits as a result of adopting one or more practices recommended by Extension
4	Number of citizens (youth & adults) utilizing skills learned through Extension programming
5	Number of individuals who reported increased levels of understanding how to manage/address current estate planning issues facing the family, farming operation, or business.
6	Number of businesses reached through CED-based Extension programming (e.g., Business Retention, Agritourism, First Impressions, Economic Gardening).
7	Number of artisans who reported an increase in income based on what they learned through Extension's Arts & Creativity Programs.
8	Number of partners Extension engaged in community strategic planning processes

Outcome #1

1. **Outcome Measures**

   Number of new coalitions formed as a result of Extension efforts

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Number of individuals reporting changes in knowledge, opinions, skills or aspirations related to economic or enterprise development

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number of farmers self-reporting an increase in profits as a result of adopting one or more practices recommended by Extension

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of citizens (youth & adults) utilizing skills learned through Extension programming

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of individuals who reported increased levels of understanding how to manage/address current estate planning issues facing the family, farming operation, or business.

2. **Associated Institution Types**

   - 1862 Extension
   - 1890 Extension
   - 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	231

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Regardless of net worth, estate planning is important to protect, and ensure personal and financial goals are realized after death. Unfortunately many people fail to properly plan for transfer of possessions and property at the time of death. A properly executed estate plan can reduce family stress, reduce federal and state tax obligations, and allow the estate to be settled in an expedient fashion saving both time and money. Many individuals perceive estate planning as complicated, costly, and unpleasant; thereby, possibly leaving their family, farming operation, or small business at risk.

What has been done
Extension Offices in Kentucky hosted Estate Planning workshops for the general public. Emphasis was on the estate planning process, including steps to develop an estate plan, establishing goals for an estate plan, explanation of estate planning tools, the probate process, insurance, funeral planning and estate tax laws.

Results
As a result, a total of 203 consumers identified estate planning strategies for the family, farming operation, or business and developed more confidence in address financial matters associated with estate planning. participated in the workshops across Kentucky. Participants were surveyed following the classes. Additionally, a total of 161 (nearly 80%) took the initiative to implement at least one specific estate planning goal.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
608	Community Resource Planning and Development

Outcome #6

1. Outcome Measures

Number of businesses reached through CED-based Extension programming (e.g., Business Retention, Agritourism, First Impressions, Economic Gardening).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1910

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In today's economic climate, many residents are taking proactive measures to be more entrepreneurial and/or pursuing their own business opportunities. As a result, more individuals are in need of guidance. In addition, employable skills are lacking among residents.

What has been done
Extension continues to lead efforts that promote the economic and business vitality across the commonwealth of Kentucky. Extension professionals have served on committees and other entities to promote local business ventures. Extension is also partnering with local Chambers of Commerce to partner with local school district to develop soft skills for students.

Results
In Shelby County, a Farm Tour for the fifth consecutive year in hopes of promoting Extension programming while connecting the community to local agriculture. Surveys were collected from over 300 respondents. A total of 96% indicating that they increased their knowledge about agriculture in Shelby County and 88% indicating an increased knowledge of the economic impact of agriculture in the county. Over 90% of respondents planned to seek more information about locally produced food, fiber and crafts and 92% indicated that their views about agriculture were expanded or changed in a positive way due to the Farm Tour.

4. Associated Knowledge Areas

KA Code	Knowledge Area

601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics
608	Community Resource Planning and Development

Outcome #7

1. Outcome Measures

Number of artisans who reported an increase in income based on what they learned through Extension's Arts & Creativity Programs.

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over the past several years, staple arts education programs have been cut from several Kentucky schools. Many local community members who desire to participate in arts activities (theatre, music, dance, painting) have few options but to travel outside of their county or sometimes out of state. Extension professionals and local stakeholders have identified the need for more local arts programs, for both youth and adults. These programs have proven vital to many rural/small communities.

What has been done
The Johnson County Extension office helped launch a project to unite historic sites, all relevant supporting agencies, artists, events and products under one umbrella of "Packaged Tours". Volunteers have produced over 600 hand made products. Of the 45 artisans that were trained in exclusive products, 10% have continued making products they have learned and begun selling them at local events as well as continuing to train others.

Results

As a result of the efforts in Johnson County, one package tour was booked, and 25 bus tours have indicated they will be calling this fall to book in 2019. The Route 23 Cultural Heritage Network has prioritized the education of others as to what is being done in the region and why it is significant. They also prioritized a hospitality training for front line workers. To date, three presentations were created by FCS Extension, and three of these trainings have been presented to groups ranging from 30-75 in attendance. A presentation is now being developed by FCS for schools and local groups as well.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
607	Consumer Economics
608	Community Resource Planning and Development

Outcome #8

1. Outcome Measures

Number of partners Extension engaged in community strategic planning processes

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1233

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community involvement and input from a strong local leadership base is essential for any County Cooperative Extension program. It is imperative that Extension serve as the organization to bring local residents together to put forth plans for the future.

What has been done
Extension has participated in initiatives called, On the Table - a one-day opportunity to gather around a table with friends, neighbors, colleagues (and potential new clientele) to share a meal

and have a real conversation about what's important to us. On the Table conversations are meant to encourage everyone to think about the community issues they care about while adding a diversity of voices to the discussion of who we are, where we?re going and what we can do, together, to get there. The goal is to discover how each of us can join with the hundreds of people and organizations that make our community a better place for all.

Results

Over 9000 citizens have been engaged in strategic planning initiatives led by Extension. Many of these individuals are now better prepared to serve their communities and Extension as volunteer leaders. Several are members of county Extension councils and will work with county staff (agents, etc.) to implement plans of work that will aim to implement relevant programs for youth, families and organizations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
606	International Trade and Development
607	Consumer Economics
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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Aim for increased levels of expertise within communities

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Pre/post evaluations, observations, case studies

Key Items of Evaluation

Case studies

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%	1%	5%	1%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	11%	6%
205	Plant Management Systems	31%	36%	6%	11%
206	Basic Plant Biology	0%	0%	10%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	0%	15%	1%
212	Pathogens and Nematodes Affecting Plants	0%	0%	7%	0%
215	Biological Control of Pests Affecting Plants	0%	0%	3%	4%
216	Integrated Pest Management Systems	0%	0%	0%	5%
301	Reproductive Performance of Animals	0%	0%	4%	0%
302	Nutrient Utilization in Animals	0%	0%	11%	0%
303	Genetic Improvement of Animals	0%	0%	0%	4%
304	Animal Genome	0%	0%	5%	4%
307	Animal Management Systems	22%	61%	5%	62%
311	Animal Diseases	0%	0%	8%	0%
313	Internal Parasites in Animals	0%	0%	5%	0%
404	Instrumentation and Control Systems	0%	0%	5%	0%
601	Economics of Agricultural Production and Farm Management	0%	1%	0%	1%
604	Marketing and Distribution Practices	3%	0%	0%	0%
704	Nutrition and Hunger in the Population	44%	1%	0%	1%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890

Plan	180.0	9.0	105.0	19.1
Actual Paid	118.0	6.8	114.9	25.6
Actual Volunteer	46872.0	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**
2038528	383150	4888393	976942
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2344948	187518	4888393	949818
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	8399594	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The development and transfer of technical resources is a critical dimension of a strategy to advance agriculture and the competitiveness of the state's agricultural economy.

•Field days, demonstration programs, plot work and hands-on training by agents and specialists will continue to be important mechanisms for disseminating technical information on production agriculture and horticulture •Printed material, mass media, Web sites, audio, and electronic communications will be employed to disseminate the latest research findings on decision-making •Establishing a Grains Center of Excellence at UK's Research and Education Center at Princeton •Featured programs for this plan of work cycle will include: Grain Crops Academy, Master Grazer Program, Horse College and the Innovative Tobacco Producer Program •Goat Production and Management Programs •Small Farm Program at KSU will focus on needs of small and limited-resource farmers •The Kentucky Fruit and Vegetable Conference plays a major role in commercial horticultural producer education •Third Thursday programs will be conducted at KSU and their research and demonstration farms will attract small and limited-resource farmers and will also serve as training for County Extension Agents and students •Aquaculture and Fish Disease/Management Programs •Master Cattlemen and advanced Master Cattlemen programs will be conducted •Educational programs qualifying producers to receive Tobacco Settlement funds in the areas of goats, forages, bull selection and hay storage will improve producer skills in these areas •New Research findings from KSU's Aquaculture Research center, pawpaw, goats, and honeybees programs will be the subject of field days and meetings to bolster the expanding alternative in Kentucky and the Southern Region Demonstration and training for appropriate production and processing of pastured poultry and honey •Home-based processing training •On-site food demonstrations

Ongoing research at UK supporting competitive agriculture included: •Plants and their systems (corn, soybeans, wheat, forages, horticultural crops, specialty crops like chia and industrial hemp)

•Animals and their systems (beef, horses, dairy, swine, and poultry) with special emphasis on forage-based production and animal well-being •Technologies for precision agriculture •Biology, ecology and control of insect pests in plant and animal systems •Development of food and non-food products •How socioeconomic factors and food system structure impact food purchasing choices in rural and urban communities •Optimization of irrigation in row crop and horticultural production •Pollinator biology

KSU has active research areas in areas of: • Aquaculture projects are concerned with the

commercialization of paddlefish and other aquaculture species, genetics, and nutrition and diet formulation programs for freshwater, and saltwater crustaceans and other aquaculture species, and developing technologies for raising largemouth bass • Sustainable soil management practices • Urban agriculture techniques • Organic agriculture methods • Doe and kid production evaluation for meat goats is a relatively new research and Extension area for KSU • Pawpaw, hazelnut, primocane blackberries, and ornamental crops, such as orchids, are under development as niche crops in Kentucky • Livestock and poultry production • Integrated pest management • High tunnel fruit and vegetable production and aquaponics • Drought resistance of agronomic crops • Agroforestry and forestry management practices for small-scale land owners • Honey bee nutrition •The control of Nosema diseases is being researched as a potential cause of colony collapse disorder (CCD) of honey bees

2. Brief description of the target audience

• Kentucky farmer operations with agents recruiting and selecting producers for participation in Grain Academy, Master Cattlemen, Innovative Tobacco Grower Program, Horse College, and Master Grazer Programs
- Farm owners, operators, absentee land owners with a variety of backgrounds and experiences
- Farmers' market members and potential members
- Community and farm leaders
- Consumers
- Extension agents

3. How was eXtension used?

Reference materials.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1441634	11903871	261923	2100683

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

Patent Applications Submitted

Year:	2018
Actual:	1

Patents listed
Application # 20180279609. Archbold, D. and Nosarzewski, M. "Herbicide".

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	22	102	124

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na
  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 families who gained knowledge about eating healthy foods
2	Number of families that reported eating more healthy foods
3	Number of families that reported supplementing their diets with healthy foods that they produced/preserved (utilizing community/backyard gardens, fishing, hunting, etc.)
4	Number of individuals adopting one or more recommended practices to increase access to food or make it more affordable
5	Development of new niche crops for small farmers in Kentucky and the surrounding region.
6	Number of residents indicating a willingness t support local food markets as a result of awareness raised through Extension programming.
7	Number of residents reporting an increase in accessing fresh, local foods.
8	Number of individuals reporting that they utilized delivery systems/access points (e.g., farmers' markets, CSAs, WIC, Food Pantry) that offer healthy foods.
9	Number of individuals who assessed the cost savings and/or benefits associated with newly adopted practices.
10	Number of people who increased access to vegetables through Farmers' Markets, farm to institution and community supported agriculture programs.
11	Availability of a non-destructive reliable method for determining seed lot germination and vigor
12	Availability of non-drug based tools for increasing reproductive efficiency in agricultural animals
13	Availability of ways to improve crop yields on fragipan soils
14	Availability of better methods for predicting variable-rate sprayer performance in the field
15	Availability of new ways to manage insecticide-resistant pests
16	Availability of optimized production systems for organic farming

Outcome #1

1. **Outcome Measures**

Number of families who gained knowledge about eating healthy foods

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of families that reported eating more healthy foods

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Number of families that reported supplementing their diets with healthy foods that they produced/preserved (utilizing community/backyard gardens, fishing, hunting, etc.)

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of individuals adopting one or more recommended practices to increase access to food or make it more affordable

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Development of new niche crops for small farmers in Kentucky and the surrounding region.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of residents indicating a willingness t support local food markets as a result of awareness raised through Extension programming.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	16564

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Establishing a strong, accessible local food system has proven to address such issues as food insecurity as well as helping to reverse poor health outcomes such as obesity, diabetes, and hypertension in other states. Purchasing locally produced items continues to gain momentum across the state as Extension continues efforts through programming.

What has been done
Extension has hosted a number of Farm-to-Table events to highlight that healthy meals and be grown, harvested and prepared locally.

Results
In Spencer County, Extension hosted a fifth annual Farm to Table event. A committee made of members of all of the Extension Program councils worked with a well-known local chef and members of the Taylorsville Farmers Market to plan and host a 5 course Italian dinner. All of the food prepared and served by the chef came from those who are members of the farmers market, with products including beef, pork, vegetables, breads, desserts, and mums for decorations. More than 160 people paid $35 each to participate in the meal with the proceeds of more than $3,700 helping to sponsor Spencer County 4-H programs and Homemakers activities. Kentucky State University's Thorobred Nutrition Kitchen, a thirty foot enclosed trailer equipped with a full complement of commercial grade kitchen appliances and equipment worked with a diverse group of community leaders in Hart County. Approximately 250 attendees enjoyed a meal sourced almost 100% from local growers. Over 1400 participants statewide have indicated an increased awareness of the importance of supporting local food systems. A total of 2306 producers were successful in marketing their own products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #7

1. Outcome Measures

Number of residents reporting an increase in accessing fresh, local foods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	18015

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food insecurity is rapidly increasing across the state of Kentucky. There is a need to address the number of children and families with little access to healthy food choices. Many children do not get the chance to taste fresh vegetables nor do they get the opportunity to grow their own food.

West Louisville continues to lose grocery stores classifying it as a food desert an area where there is limited access to healthy and affordable food. The U.S. Department of Agriculture reported that food deserts are not just a problem of convenience but the decreased access contributes to a poor diet and higher levels of obesity and other diet-related diseases.

What has been done

In Mason County, Extension partnered with Girl Scouts to teach a program at the local Boys & Girls club which consisted of youth gaining nutritional knowledge and incorporating fresh produce into their diet. In Jefferson County, Extension partnered with a Fresh Stop affiliated organization, a Community Supported Agriculture market where local farmers provide produce at affordable prices in lower-income food deserts

Results

In Mason County, youth learned how to select fruits as ingredients to make tasty healthy snacks and smoothies. In Jefferson County, Over 80% of the 110 participating families reported utilizing recipes and food preparations hints that were provided by Extension. Within a few weeks, past participants were reporting back that they had tried the new recipes and foods and were learning how to prepare healthier meals (thus avoiding the unhealthy options often found in food deserts).

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #8

1. Outcome Measures

Number of individuals reporting that they utilized delivery systems/access points (e.g., farmers' markets, CSAs, WIC, Food Pantry) that offer healthy foods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	418

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Local Farmers Markets play a key role in the local food system by providing access to fresh and nutritious fruits, vegetables and other locally produced goods. The local markets often fill the void in limited resource communities, providing these high quality items to all with a desire to have access to fresh foods.

In addition, millions of school children go hungry throughout the summer months without the meals once provided at school.

What has been done

The UK Nutrition Education Program Farmers Market Research Project was conducted to determine the barriers to and promoters of low-income Kentuckians shopping for fresh produce at farmers markets. Extension also hosted a marketing campaign to provide indirect education to limited resource families in conjunction with direct education provided by University of Kentucky Nutrition Education program assistants and University of KY Cooperative Extension Agents. The goal of the campaign is to have families consume more fruits and vegetables; improve food resource management practices and prevent or postpone the onset of diet-related chronic diseases.

Kentucky State University Extension continues to work in various counties to providing summer meals in Anderson, Franklin, and Henry Counties. The Summer Food Service Program mobile unit and the KSU SNAP-ED assistants deliver food with educational programs throughout the county to several at-risk poverty locations.

Results

In regard to marketing campaign, robust participation in nutrition education classes continued with 850,00 receiving direct education and 11,000 youth who participated in nutrition and food preparation classes. Approximately 1,025 SNAP-Ed qualified individuals were reached each month. In Hardin County, an Extension program helped youth become more knowledge of foods through the local farmers market. After the program, over 75% of parents reported that their children were not only trying new foods at the Taste Kitchen, but were requesting new foods at home. In Trigg County, participants increased the redemption of WIC Farmers Market Nutrition Program vouchers to 67%, a significant increase in comparison to previous years.

As it relates to the Summer Food Service Program, children and youth improve their abilities to choose foods according to federal dietary recommendations. Children and youth improve their physical activity practices. Children and youth improve their ability to prepare simple, nutritious, affordable food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
311	Animal Diseases
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #9

1. Outcome Measures

Number of individuals who assessed the cost savings and/or benefits associated with newly adopted practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1237

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The ability to obtain a household budget is crucial for the financial and physical well-being of most families. Budgeting and financial management are crucial skills for healthy family and farm life. It is also essential in operating a farm or business.

What has been done
In order to help farmers improve their understanding of grain marketing and price risk management tools, Extension led workshops and meetings explaining commodity futures, options, and various price risk contracts for both beginning farmers and established farmers. enterprise. In Jefferson County, Extension partnered with Common Earth Gardens (CEG); Kentucky Center for Agricultural and Rural Development (KCARD) and Navigate Enterprises of the Jewish Family & Career Center (NE) along with support from the University of Kentucky Center for Crop Diversity (CCD) to develop and implement a three year incubator farm program for Louisville's immigrant and refugee population to help interested participants develop the skills to run small farm businesses. Several farm teams were established.

Results
In Jefferson County, six of the seven farm teams had met with the Navigate Enterprises and the Kentucky Center for Agricultural and Rural Development to begin organizing their farm business records. All seven farm teams have identified local farmers markets to sell their produce and five of the seven teams have become regular vendors at farmers markets throughout Louisville.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #10

1. Outcome Measures

Number of people who increased access to vegetables through Farmers' Markets, farm to institution and community supported agriculture programs.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	364

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over the last several years, there has been a call for consumers to buy locally grown produce and meat. However, there is still a limited target audience that enjoy all the market has to offer.

What has been done
Several counties have expanded the reach of their Farmers' Markets.

Results
In Lyon County, of the 53 past participants 80% indicated that they had increased the amount of fruits and vegetables in their diet this year, while 91% said that access to local produce increased the amount of vegetables they consumed. In Cumberland County, Extension collaborated with the Cumberland County Health Coalition, who in turn, donated one family voucher to the first 100 families that signed up at the Extension Office. These vouchers were worth $5.00 each for a total of $500.00 that could go back into the market for the purchase of locally grown produce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
303	Genetic Improvement of Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #11

1. Outcome Measures

Availability of a non-destructive reliable method for determining seed lot germination and vigor

2. Associated Institution Types

- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Commercial seeds must be evaluated using a standard germination test. It can also be desirable to test seed lots for their vigor, which indicates how well they may establish under more variable field conditions. This information helps producers determine seeding rates, timing and sometimes location for planting. The seed industry has long desired a simple, fast and non-destructive method for determining seed germination and vigor.

Fruit and nut crops are of interest to small-scale farmers as potential new economic opportunities. The North American pawpaw is a native tree fruit in the early stages of commercial fruit production in Kentucky and the surrounding region. Pawpaw has a unique, tropically flavored fruit, with great potential for fresh market sales and the processed fruit market.

What has been done

A team of scientists from UK, ARS, Iraq and Brazil evaluated 81 soybean seed lots using standard methods for germination rate and vigor and then separated them into groups according to the results (i.e., high germinating, low seed vigor, etc.). Each group was analyzed using near-infrared spectra (NIRS) (950 1650 nm) and used to create a partial least squares (PLS) prediction model. The model was validated using a separate subset of the same groups of seeds.

Kentucky State University serves as a National Clonal Germplasm Repository, or gene bank, for pawpaw. Research is focused on increasing the production of pawpaw orchards and selecting new, high-yielding pawpaw fruit varieties with enhanced fruit quality. In 2011, KSU released the pawpaw cultivar KSU-AtwoodTM and, in 2016, KSU released KSU-BensonTM. However, additional pawpaw varieties with high quality fruit are needed by growers.

Results

The models developed correctly identified high and low germinating seed lots with accuracy between 85.7 to 89.7%. The prediction models also correctly identified low vigor seed lots between 80 to 100% and high vigor seed lots between 96.3 to 96.6%. To our knowledge, this is the first research to provide NIRS-based predictive models using agronomically meaningful cut-offs for standard germination and vigor on a commercial scale using over 80 seed lots. This work has proven the viability of using hyperspectral methods, specifically near-infrared spectra, as a non-destructive technology for determining the germination rates and seed vigor of seed lots. The availability of these methods will help seed producers ensure the quality of their products in a cost-effective way.

In 2018, KSU released the pawpaw cultivar, KSU-ChappellTM. This pawpaw variety is a mid-season ripening cultivar that is extremely vigorous and high-yielding, with large fruit, a creamy pulp, a mild banana-pineapple flavor with floral notes, and low percent seed. Trees of KSU-ChappellTM are available for purchase by farmers from licensed nurseries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

Outcome #12

1. Outcome Measures

Availability of non-drug based tools for increasing reproductive efficiency in agricultural 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)

A primary factor affecting profitability of swine production is sow productivity. An ideal nutrition program should provide adequate nutrients to maximize sow productivity while minimizing excreted nutrients and feed costs. The continuing trends to earlier weaning, confinement housing, and intensive production schedules place biological demands on the sow that make high performance difficult to obtain and maintain. An increase in the number of pigs marketed per sow per year, through improved sow nutrition, would result in increased profitability by allocating the fixed sow costs over more pigs.

What has been done

As part of a multistate project, UK animal scientists investigated the long-term effects of feeding supplemental levels (20, 120, or 220 mg/kg) of dietary copper (Cu) as tribasic copper chloride (TBCC) or copper sulfate (CuSO4) on performance, antioxidant status, nutrient digestibility, and trace mineral deposition of 60 sows. The study also assessed the impact of nursery dietary Cu levels on growth performance and response to immunological challenge in nursery pigs from sows fed either high or low Cu diets.

Results

Sows fed TBCC diets had greater adjusted weaning weight for litters and individual piglets, as well as greater adjusted litter and piglet weight gain when compared to sows that received CuSO4 diets. Increasing dietary Cu level linearly increased live born piglet weight. In the nursery pig experiment, pigs from sows fed 120 mg/kg Cu diets had greater average daily gains from day 0 to 14, and tended to have greater average daily gains over the longer term when compared to pigs from sows fed 20 mg/kg Cu diets. TBCC appears to be a superior Cu source compared to CuSO4 regarding reproductive performance, and higher dietary Cu levels result in greater birth weight of piglets. Furthermore, high Cu levels in sow and nursery diets promoted growth performance of nursery pigs and improved their responses to immunological challenge. The increased weight at birth and subsequent reduced mortality and shorter time to market from the right level and type of copper supplementation result in both better health for the pig and reduced costs for producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #13

1. Outcome Measures

Availability of ways to improve crop yields on fragipan soils

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)
Fragipan is a cement-like layer in the soil profile that reduces soil depth and limits water availability to crops during dry periods while resulting in poor drainage during wet ones. Crop yields in fragipan soils are typically significantly lower than in deeper soils. Of the cropable land in Kentucky, 1.5 million acres contain fragipan. Though both chemical amendments and physical methods for breaking up the fragipan have been proposed, none has proven ideal or widely adapted.

What has been done
Following a producer's observation that annual ryegrass roots were able to penetrate deep within his farm's soil despite a shallow fragipan, researchers at UK's West Kentucky Research & Education Center expanded work started by a former University of Illinois colleague to investigate the phenomenon. Laboratory and greenhouse studies were conducted to see if ryegrass or exudates from its roots were actually breaking down the restrictive layer. Field studies followed to measure the extent to which ryegrass plantings could reduce the fragipan layer in-situ.

Results
In the laboratory, extract of ryegrass was shown to start breaking down the fragipan structure within two to four weeks of emersion. Field tests growing ryegrass as a cover crop in a corn-soybean rotation showed a 25% increase in yields after two consecutive years. But research shows that sticking with ryegrass over time yields increasing benefits. Farmers in Illinois who have been growing ryegrass for more than 8 years have been able to increase the depth of their soils by up to 15 inches and substantially increase yields. Based on yield increases observed and the cost associated with managing ryegrass as a cover crop, UK agricultural economists estimate this management method will average a $225 per acre increase over 10 years, making use of ryegrass as a cover crop the most promising method to date for treating the over 50 million acres of fragipan soils across the U.S.

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

Availability of better methods for predicting variable-rate sprayer performance in the field

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)
Precise and efficient chemical spray technology is needed to minimize outputs in cropping systems, thereby reducing costs to the producer as well as potential for negative environmental impacts. As more producers adopt newer variable-rate sprayer technologies, a method is needed for validating nozzle performance under actual operating conditions.

What has been done
UK biosystems and agricultural engineers sought to develop a data-driven distributed control system to improve the accuracy of agricultural chemical spray applications by addressing challenges related to individual nozzle control, turn compensation, and spray drift. A combination of basic and applied research methods were used to study relationships between nozzle pressure, flow rate, spray pattern,
and percent coverage. Initial work revealed the need for practical validation methods to assess performance of newer control methods. Test fixtures were developed and utilized to demonstrate novel control methodology and for quantifying as-applied performance of sprayer subsystems under laboratory controlled conditions.

Results
The major impact of this work was establishing a relationship between instantanous sprayer nozzle settings and the amount of chemical deposited to a target area using relatively inexpensive yet accurate means at high resolutions. Better understanding of this relationship was needed to enable validation of variable-rate nozzle performance. Existing simulation models that predict coverage rates including skips, overlaps, off rate, and off target applications will benefit from the ability to estimate variable-rate performance. Several methods for field validation of

variable-rate sprayer control systems were demonstrated that improve the spatiotemporal resolution at which systems can be evaluated. The broader outcome of this work is improved accuracy and precision when making estimations or sensing as-applied applications, which in turn will improve our understanding of how well modern spray
applications meet their desired performance. Additionally, results showed that measurements made on a moving platform were highly correlated with stationary measurements. Thus, it is feasible to use on-board environmental sensors as inputs for nozzle control to mitigate spray drift

4. Associated Knowledge Areas

KA Code	Knowledge Area
404	Instrumentation and Control Systems

Outcome #15

1. Outcome Measures

Availability of new ways to manage insecticide-resistant pests

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)
Colorado potato beetle (CPB) is a notorious pest. High fecundity, diverse and flexible life history and an ability to detoxify insecticides make this insect difficult to manage. This pest developed resistance to imidacloprid after exposure to this insecticide for multiple generations. A better understanding of the genes that contribute to CPB's ability to detoxify pesticides and resist susceptibility to RNAi is needed to develop new targets for its control.

What has been done
A team of entomology researchers at UK had previously shown that the xenobiotic transcription factor, cap 'n' collar isoform C (CncC), regulates the expression of multiple cytochrome P450 genes, which play essential roles in resistance to plant allelochemicals and insecticides. In this study, researchers sought to obtain a comprehensive picture of the genes regulated by CncC in imidacloprid-resistant Colorado potato beetles (CPB). They performed sequencing of RNA isolated from imidacloprid-resistant CPB treated with dsRNA targeting CncC or gene coding for

green fluorescent protein as a control.

Results

Comparative transcriptome analysis showed that CncC regulated the expression of 1798 genes, out of which 1499 genes were downregulated in CncC knockdown beetles. Interestingly, expression of 79% of the imidacloprid induced P450 genes requires CncC. We performed quantitative real-time PCR to verify the reduction in the expression of 20 genes including those coding for detoxification enzymes (P450s, glutathione S-transferases, and esterases) and ABC transporters. The genes coding for ABC transporters are induced in insecticide resistant CPB and require CncC for their expression. Knockdown of genes coding for ABC transporters simultaneously or individually caused an increase in imidacloprid-induced mortality in resistant beetles confirming their contribution to insecticide resistance. These studies identified CncC as a transcription factor involved in the regulation of genes responsible for imidacloprid resistance. Small molecule inhibitors of CncC or suppression of CncC by RNAi could provide effective synergists for pest control or management of insecticide resistance in this agriculturally important pest.

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

Availability of optimized production systems for organic farming

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)

In 2016, cucurbit crops were grown on 417,000 acres in the U.S. with a farm gate value of $1.6 billion. In Kentucky, and throughout the eastern United States, organic cucurbit production is limited by striped cucumber beetle, spotted cucumber beetle, and squash bug. In addition feeding

damage, their main impact results from the transmission of a bacterium they vector. Cucumber beetles vector Erwinia tracheiphila, the causal agent of bacterial wilt, and squash bugs vector Serratia marcescens, which causes cucurbit yellow vine decline disease. Since there is no way to stop the internal spread of these diseases, fruit loss is common. These pest and diseases complexes make organic cucurbit production extremely difficult in Kentucky. To raise profit margins and safeguard pollinators, cucurbit growers need more cost effective ways to suppress a devastating group of pests and diseases.

What has been done

UK horticulturists developed and tested a new approach to management of these key cucurbit pests. They compared two pest management systems for excluding cucumber beetles and squash bugs on two important cucurbit crops, muskmelon and acorn squash. One experiment tested the usage of two pest management exclusion materials, ProtekNet (a new mesh material made in France) over bent conduit hoops (mesotunnels); and Remay (a spun-bonded material commonly used for insect exclusion and thermal retention) over traditional low wire hoops. Another experiment evaluated the usage of different mulches in these systems for weed control. In 2017 and 2018 modifications were made to the mesotunnel system to increase efficiency and potential for scaling up the system. A new custom-fabricated metal rack system was developed that streamlined the handling, placement and removal of the bent conduit hoops and allowed for mechanization with a tractor. Also, a system that utilized rock filled strawberry hold-down bags was modified to optimize the perimeter security of the system to further prevent insect entry.

Results

The ProtekNet system installed on bent electrical conduit hoops provided excellent season long control of the main limiting pest of cucurbits. This system proved to be very effective and was capable of producing 93% of the muskmelon yield experienced on our research farm for conventional muskmelons. This system also worked extremely well in winter squash systems, and was capable of producing yields similar to conventional. Significantly, this system allowed for insecticides, including those that have been implicated in pollinator decline, to be reduced by 50-75%. These chemical inputs along with crop losses due to these pests cost growers $90 million per year. This new and innovative production system will allow growers to overcome very significant hurdles to organic cucurbit production, and achieve yields comparable to conventional systems. The system has been demonstrated to more than 500 people through field days and visits with various stakeholder groups. Some farmers have adopted the system and others appear to be beginning to adopt it across Kentucky and the region.

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 Programmatic Challenges

Brief Explanation

cross programming, participant response/involvement levels

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase in knowledge and awareness; more positive behavior changes

Key Items of Evaluation

Post evaluations, follow up assessments, testimonials

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Agricultural and Environmental Quality

☑ 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
101	Appraisal of Soil Resources	0%	0%	13%	0%
102	Soil, Plant, Water, Nutrient Relationships	29%	3%	40%	3%
104	Protect Soil from Harmful Effects of Natural Elements	0%	0%	0%	17%
111	Conservation and Efficient Use of Water	0%	0%	8%	0%
112	Watershed Protection and Management	4%	7%	0%	0%
123	Management and Sustainability of Forest Resources	25%	2%	0%	16%
125	Agroforestry	0%	5%	0%	0%
131	Alternative Uses of Land	0%	17%	0%	7%
133	Pollution Prevention and Mitigation	5%	0%	0%	0%
135	Aquatic and Terrestrial Wildlife	0%	15%	13%	3%
136	Conservation of Biological Diversity	0%	0%	10%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	0%	15%
205	Plant Management Systems	12%	35%	0%	28%
216	Integrated Pest Management Systems	4%	0%	3%	0%
301	Reproductive Performance of Animals	0%	0%	13%	0%
402	Engineering Systems and Equipment	0%	10%	0%	7%
403	Waste Disposal, Recycling, and Reuse	0%	6%	0%	0%
605	Natural Resource and Environmental Economics	21%	0%	0%	4%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	35.0	4.0	20.0	9.8

Actual Paid	108.0	5.0	8.3	7.5
Actual Volunteer	45716.0	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**
1875447	124544	693018	308252
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2157352	136042	693018	232269
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	940712	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The University of Kentucky and Kentucky State University are engaged in a wide range of programs geared towards achieving greater harmony between agriculture, people, and the environment. All components of the research and extension focus on the broader goal of practicing agricultural and related disciplines in a manner consistent with improving sustainability of resources and protecting ecosystem integrity. Program examples include:

• Master Gardener Program consisting of 12-15 three-hour sessions related to gardening, resource management, botany, soils, pesticides and pesticide safety • Master Logger program consisting of three one-day sessions focusing on best management practices, safety, laws and regulations • Integrated Pest Management programs including programs aimed at homeowner application of pesticides and fertilizers. • Woodlot owner education program focusing on best management practices, harvesting, contracts, wood products and alternative forest products • Water quality, Water Pioneer, day camps, and forestry camp programs aimed at developing a better understanding of stewardship between youth and the environment

Agricultural and environmental research at UK includes: • Best management practices for improving water quality on farms, rural home sites, in horticultural operations and mine reclamation sites •Impact of reclaimed water and solids use on soil and human health • Examination of micro- and nano-scale particles in the soil environment • Soil microbial community structure and function •Investigating how soil physical properties impact biogeochemical processes across multiple scales in cropping systems • Environmental impact and hazard of chemical pesticides in landscapes and turf • Impact of feral horse populations and management strategies on agricultural lands • Understanding the value of water infrastructure and how that shapes water use by consumers.

KSU Extension Programs will continue to support efforts related to policies to improve environmental quality: •Organic Agricultural Programs, KSU research projects focusing on improving environmental quality include: • Organic production practices, • Biochar and biofilters for on-farm bioremediation of pesticide residues in surface runoff and seepage water arising from agricultural fields, • Soil quality, carbon flow, and greenhouse gasses in forest resource management, and agroforestry, • Remote sensing geospatial applications in agriculture and forest areas

2. Brief description of the target audience

• General public •Community volunteers advanced in horticulture instruction and willing to give back to the community •Individual commercial loggers in Kentucky and those out of state wishing to do business in Kentucky •Woodlot owners •Farm owners and operators •Homeowners

3. How was eXtension used?

Resources

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1399467	17036886	197799	2323212

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	254	23	277

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na

  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 producers adopting resource management technologies (IRM, IPM, soil testing, soil fertility management) as a result of Extension programs
2	Number of individuals adopting practices (recommended by Extension) that ensure safe water
3	Number of individuals utilizing forest management practices recommended by Extension
4	Number of individuals who made a lifestyle change for the purpose of improving water and/or natural resources (due to recommendations from Extension)
5	Number of landowners who implemented one or more best practices for soil conservation as a result of Extension programming.
6	Number of individuals who made informed decisions that affect water quality.
7	Number of producers reporting changed or improved pasture management practices.
8	Number of youth who use their skills to conserve natural resources.

Outcome #1

1. **Outcome Measures**

   Number of producers adopting resource management technologies (IRM, IPM, soil testing, soil fertility management) as a result of Extension programs

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Number of individuals adopting practices (recommended by Extension) that ensure safe water

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number of individuals utilizing forest management practices recommended by Extension

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of individuals who made a lifestyle change for the purpose of improving water and/or natural resources (due to recommendations from Extension)

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of landowners who implemented one or more best practices for soil conservation as a result of Extension programming.

2. **Associated Institution Types**

   - 1862 Extension
   - 1890 Extension
   - 1862 Research
   - 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	716

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As the cost of buying farmland and renting farmland has exploded over the last few years, more farmers are looking at ways to improve the land they already own and make it more productive. Soil testing and other best practices are important management tools of crop production program. Soil testing can increase yields by enabling the producer to apply exactly what is needed and can save money by eliminating over application of unneeded nutrients.

What has been done
Extension continues to provide research-based education on the importance of proper soil management. A Living along a Kentucky Stream workshop was offered for residents. The program was a joint planning and teaching effort among the following agencies: Cooperative Extension Service; Curry's Fork Watershed; Darby Creek Watershed; Oldham County Conservation District; and Solid Waste & Recycling.

Results
In Greenup County, 79 soil tests have been taken, with individuals participating in the soil testing indicated that Extension has raised their awareness; they did not know they were putting too much lime and fertilizer on their garden. In Franklin County, Extension helped raise $10,000 for a land trust established to protect a nature preserve.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Number of individuals who made informed decisions that affect water quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	3886

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Kentucky Agriculture Water Quality Act was passed in 1994 and requires farms 10 acres or greater in size to have a water quality plan developed and implemented to protect water resources. Despite the law being in place for more than 20 years, education is still needed on the goals and objectives of the Act and the importance of having an individual plan.
Aquaculturists must maintain the health of their fish and the quality of their water to make a profit.There is a need for a fish disease diagnostic laboratory able to inspect fish and certify them as pathogen-free. Helping clients maintain good water quality and recommend proper prevention and treatment keeps fish healthy and actively growing.

What has been done
The Little River Water Quality Consortium was formed to assess the current situation in the watershed, identify the cause and sources of contaminants, and work with those responsible to decrease the overall contaminant level in the river.
A fish health inspection was performed for fish farmers in the Bluegrass Region of the state (in Midway). In addition, eight water quality cases were tested at the Diagnostic Lab.

Results
The impact of this program to date has been the forming of a watershed plan with a consulting service from Lexington and the application of a grant from Kentucky Division of Water for remediation efforts throughout the watershed. An action plan has been implemented which will identify consumer wishes for the watershed, and these will be implemented into the overall watershed plan. The role of Cooperative Extension in this program has been to facilitate the joining of the various groups serving on the consortium, identifying cooperating landowners interested in the project, and organizing meetings for disseminating information, as well as

individual landowner education about Best Management Practices, Nutrient Management, and the Ag Water Quality Program.

Water quality samples submitted to the Laboratory helped farmers and pond owners know how to treat their bodies of water to maximize fish growth and survival and prevent establishment of aquatic weeds.Clients also benefited economically from adopting Best Management Practices (e.g., stocking and feeding at recommended levels, and marketing to proper outlets).

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

Outcome #7

1. Outcome Measures

Number of producers reporting changed or improved pasture management practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5096

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Proper pasture management is vital to livestock. Extension remains a primary resource for producers who wish to maximize their herd operations.

What has been done
A central Kentucky thoroughbred horse farm experienced a high incidence of fescue toxicosis symptoms in pregnant and foaling mares. The UK Plant and Soil Science Forage Group was

contacted by the farm at the advice of the consulting veterinarian.

Results
As a result of the knowledge of fescue presence and fescue eradication in selected pastures, the farm was able to avoid exposing pregnant mares to toxic tall fescue. As a result, the farm experience no difficulty in foaling (dystocia) and fewer thickened placentas (red bags) and no foal losses due to tall fescue in 2018. Fewer fescue-related foal deaths and associated syndromes resulted in four more live foals and greatly reduced veterinary costs in 2018 compared to 2017. The economic impact of having four more foals was estimated to be $428,000 using the previous three-year average Keeneland September yearling sale figures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land

Outcome #8

1. Outcome Measures

Number of youth who use their skills to conserve natural resources.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	15612

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kentucky has over 91,000 miles of rivers and streams and more than 225,000 acres of ponds, lakes, and reservoirs. These water resources not only play a vital role in Kentucky's drinking water systems, but also are imperative to our agriculture industry. Our youth need to play an active part in knowing how to protect this vital resource.

What has been done

The 4-H Natural Resources and Environmental Sciences Academy (NRESci) is a three-year program designed to teach middle and high school aged youth about their natural environment. The overall goal of the program is for youth to develop a greater understanding of natural resources and environmental sciences in Kentucky while increasing leadership skills.

Results

As a result of participating in the academy, 96% of youth strongly agreed or agreed that they were more confident in their leadership abilities, 96% of youth strongly agreed or agreed that they have a greater understanding of natural resources and environmental sciences in Kentucky, and 92% of youth strongly agreed or agreed on having a greater understanding of career opportunities in natural resources and environmental sciences. As a result of the program, 15,612 youth used their skills to conserve natural resources , a total of 21,690 youth were able to identify the natural resources in their community, a total of 20,210 youth gained an understanding of the ecosystems in nature and 7,012 youth engaged in a community service project related to natural resource conservation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

individuals' levels of participation, response rate of surveys, length of programs

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Change in knowledge/skills/practices/behaviors

Key Items of Evaluation

Surveys, reports

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	11%	0%	0%	0%
502	New and Improved Food Products	0%	0%	25%	0%
603	Market Economics	0%	0%	50%	0%
703	Nutrition Education and Behavior	42%	100%	0%	32%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	34%	0%	0%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	13%	0%	0%	51%
723	Hazards to Human Health and Safety	0%	0%	25%	17%
	Total	100%	100%	100%	100%

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	3.0	10.0	3.1
Actual Paid	23.0	0.3	3.5	4.3
Actual Volunteer	21236.0	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**
407705	26600	246612	303118
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
468990	0	246612	70529
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	321436	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

-Training and certification workshops will be conducted for home-based microprocessors
-Research was conducted on the identification of best practices to reduce contamination of food pathogens and toxins
-Research included analysis of how changing food safety standards impact producers
-Educational programs will be targeted toward parents and others who prepare food in the home
-Educational programs will be directed toward young children and teens on basic cleanliness such as hand washing
-Potential pathogenic bacteria and antibiotic resistance profiles in small-scale organic and conventional farms in Kentucky

2. Brief description of the target audience

-extension agents
-food producers
-food processors
-parents
-volunteer leaders
-youth and children
-consumers

3. How was eXtension used?

Reference materials

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	187017	852464	149144	669793

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	15	5	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na
  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 individuals who experienced a change in knowledge, opinions, skills or aspirations regarding the safe storage, handling, or preparation of food (safe preservation techniques, hand washing, following time and temperature guidelines)
2	Number of individuals who implemented recommended practices for the safe storage, handling or preparation of food (safe preservation techniques, hand washing, following time and temperature guidelines)
3	Total number of individuals reached through Extension programming related to health and safety
4	Number of producers who were encouraged by Extension programming to seek additional training on food safety (FAP, FSMA, etc.)
5	Number of producers who were successfully trained by Extension on food safety (GAP or FSMA).
6	Number of individuals who demonstrated safe handling and preparation of food.

Outcome #1

1. **Outcome Measures**

Number of individuals who experienced a change in knowledge, opinions, skills or aspirations regarding the safe storage, handling, or preparation of food (safe preservation techniques, hand washing, following time and temperature guidelines)

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of individuals who implemented recommended practices for the safe storage, handling or preparation of food (safe preservation techniques, hand washing, following time and temperature guidelines)

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Total number of individuals reached through Extension programming related to health and safety

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of producers who were encouraged by Extension programming to seek additional training on food safety (FAP, FSMA, etc.)

2. **Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1398

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The FDA Food Safety Modernization Act (FSMA) is a federal law transforming the nations food safety system. The Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption, aka Produce Safety Rule (PSR), establishes for the first time, science-based minimum standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption. The rule is part of the agency's ongoing efforts to implement the FDA Food Safety Modernization Act. producers need to attend trainings in order to fulfill FSMA Produce Safety Rule regulatory requirement.

What has been done
Extension provides training within the state for growers/producers. Extension also offers a certificate that is accepted by the Kentucky Food Safety Branch, which authorizes producers to sell their products at framers markets approved by the Kentucky Department of Agriculture and roadside stands approved by Kentucky Farm Bureau.

Results
Eighty-nine participants, which included growers from the Amish and Mennonite population, and 16 senior food science students from University of Kentucky participated and successfully completed the program. Thirteen small and medium sized processors participated and successfully passed the post-training test to earn a certificate. Also, completion of the homebased microprocessing workshop is the first step toward obtaining certification from the KY Food Safety Branch to sell home canned products at farmer's markets, certified roadside stands, or from the farm. There are currently 142 homebased microprocessors who became certified to sell canned goods across the state through Extension.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of producers who were successfully trained by Extension on food safety (GAP or FSMA).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1204

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The FDA Food Safety Modernization Act (FSMA) is a federal law transforming the nation?s food safety system. The Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption, aka Produce Safety Rule (PSR), establishes for the first time, science-based minimum standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption. The rule is part of the agency's ongoing efforts to implement the FDA Food Safety Modernization Act. producers need to attend trainings in order to fulfill FSMA Produce Safety Rule regulatory requirement.

What has been done
Extension provides training within the state for growers/producers. Extension also offers a certificate that is accepted by the Kentucky Food Safety Branch, which authorizes producers to sell their products at framers markets approved by the Kentucky Department of Agriculture and roadside stands approved by Kentucky Farm Bureau.

Results
Also, an Extension specialist (working in collaboration with the Food Systems Innovation Center and the Food Microbiology Laboratory in the Department of Animal and Food Sciences,) tested, reviewed and issued process review letters for 36 different products from 12 small businesses in Kentucky. This Process Authority letter helped all 12 processors obtain a commercial permit from the Kentucky State Food Safety branch, which authorizes the processors to sell their value added products at any market in Kentucky and beyond.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of individuals who demonstrated safe handling and preparation of food.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	8169

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to Consumer Reports in 2016 more than $720 billion were spent at restaurants across the United States. A recent Forbes poll shows that millennials spend more than 44% of their food budget eating outside of the home. With obesity rates for adults steadily on the rise, this can be a direct correlation between fast food/eating out.
The Supplemental Assistance Program (SNAP) and SNAP Education agree that early intervention improves nutrition and overall health. Increasing the amount of fruit and vegetables,consuming lowfat dairy, and eating whole grain foods will lead to improved health.

What has been done
Extension has held numerous programs, including hosting a four-part series of classes focusing on grilling techniques, using a smoker, slow cooking, and the last class will focus on holiday meals and food safety.

KSU SNAP-Ed assistants used the Teen Cuisine curriculum, along with Healthy Choices for Everybody, to focus on the importance of good nutrition, food safety, and preparation of easy, healthy recipes.

Results
The four-part lesson was taught 10 times throughout the Pennyrile region of Western Kentucky with close to 200 people attending the sessions. Participants were able to watch a demonstration of how each small appliance works as well as taste test healthy recipes that reduced fat and calories. The participants were surveyed after the program and 90% of participants said they were more likely to purchase one of the small appliances after the lesson. Additionally, 100% of surveyed participants said they would be more likely to cook at home if they had one of these appliances. Over 27,000 participants were engaged in food preparation programming across the

state. Approximately 50% gained knowledge and skills, while 8169 reporting utilizing safe food handling and preparation practices.
Upon completion of the Teen Cuisine program, participants mentioned using food safety in their homes as well as preparing some of the recipes from class and they were working together to find new healthy recipes to enjoy with their family.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Awareness of subject matter.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Change in knowledge and practices.

Key Items of Evaluation

Surveys, testing.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%	0%	33%	0%
102	Soil, Plant, Water, Nutrient Relationships	0%	0%	33%	0%
132	Weather and Climate	28%	100%	34%	100%
403	Waste Disposal, Recycling, and Reuse	48%	0%	0%	0%
601	Economics of Agricultural Production and Farm Management	24%	0%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.5	1.0	0.6
Actual Paid	11.0	0.4	4.7	0.1
Actual Volunteer	7784.0	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**
163082	35280	151102	10640
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
187596	0	151102	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	321838	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Emergency preparedness plans will be implemented with be prepared for all Extension offices
• The Agricultural Weather Center will supply information on temperature and moisture conditions to guide agricultural operations
• Economists conduct research and educational programs for Extension agents and agricultural producers on ways to reduce risks
• Research on the impact of climate change on the ecology of plant pests and diseases was conducted
• Creation of new technologies and best management practices for managing production systems and on-site wastewater treatment in response to climate change and variability is ongoing
• Research was conducted to determine the impact of climate change on the timing of seedling emergence
• KSU offers a floating science lab to show students the impact of climate and human use on aquatic systems and a demonstration forest to educate the public on the impact of forest ecosystems

2. Brief description of the target audience

-extension agents
-extension office staff
-agricultural producers
-community leaders
-general public

3. How was eXtension used?

Resource materials.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	101174	1470246	8888	127847

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	2	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na
  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 individuals reporting changes in knowledge, opinions, skills or aspirations related to the impact of public policies on agriculture and the environment
2	Number of individuals reporting an increase in knowledge, opinions, skills or aspirations related to climate change
3	Number of individuals reporting improved knowledge, opinions, skills, and/or aspirations related to climate change.
4	Number of producers who incorporated best practices (in regard to soils) recommended by Extension.
5	Number of producers making changes to their operation as a result of increase of knowledge of economic impacts of environmental policy.

Outcome #1

1. Outcome Measures

Number of individuals reporting changes in knowledge, opinions, skills or aspirations related to the impact of public policies on agriculture and the environment

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of individuals reporting an increase in knowledge, opinions, skills or aspirations related to climate change

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of individuals reporting improved knowledge, opinions, skills, and/or aspirations related to climate change.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6813

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the U.S. Environmental Protection Agency, over the last fifty years, the per person average amount of solid waste generated each day in the United States increased from 2.7 lbs. to 4.4 pounds. In Franklin County, Kentucky, we send an average of over 7,000 tons annually to the landfill. The county currently maintains a 22% landfill diversion rate, or the amount of the total waste stream that is recycled or composted rather than landfilled, with a goal of reaching 50% in the coming years.

What has been done

To address this goal, in 2017, the Kentucky State University Sustainability Extension program partnered with Franklin County Solid Waste to develop and pilot the Commonwealth's first ever Master Recycler course, only the third of its kind in the country. The community class, based on the implementation and feedback of three pilot courses in 2016, consisted of 6 evening sessions focusing on topics including: the solid waste stream, composting, source reduction of waste, recycling economics, and community education for success. Community participants toured the county landfill, recycling center, and livestock compost site as part of their work and learned along the way about individual impacts on solid waste and the environment.
There were 11 total participants from Franklin County enrolled in the first round of the course who each received over 15 hours of solid waste training in the classroom, as well as participated in three field trips.

Results

Upon completing the classroom portion of the course, participants proceeded to implement over 50 hours of community outreach (valued at $25/hour per the national volunteer rate), to over 2,000 Franklin County residents. Community service projects included placing new recycle bins and educational materials at individual places of work; staffing recycling booths at county fairs and other events; creating and hosting displays at community events about what can and cannot be recycled in central Kentucky; presenting solid waste stream information at various Frankfort neighborhood association meetings, and more.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
403	Waste Disposal, Recycling, and Reuse

Outcome #4

1. Outcome Measures

Number of producers who incorporated best practices (in regard to soils) recommended by Extension.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	13462

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kentucky's natural resources play an important role in our state's social, economic, and environmental well-being. Kentucky has over 91,000 miles of rivers and streams, more than 225,000 acres of ponds, lakes, and reservoirs, and Kentucky is 48% forested. Kentucky is rich in natural resources, and there is a growing need for Environmental Education among producers to develop knowledge and skills and gain a better understanding of environmental impacts.

What has been done
Extension provided a number of workshops, field days and seminars to provide education on best practices for soils.

Results
A total of 13538 producers indicated an increased awareness of sustainable agriculture practices. Moreover, over 9,000 producers implemented sustainable practices as a result of participating in Extension programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
601	Economics of Agricultural Production and Farm Management

Outcome #5

1. Outcome Measures

Number of producers making changes to their operation as a result of increase of knowledge of economic impacts of environmental policy.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	289

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The EPA considers some leftover household products that can catch fire, react, or explode under certain circumstances, or that are corrosive or toxic as household hazardous waste. Products,

such as paints, cleaners, oils, batteries, and pesticides can contain hazardous ingredients and require special care when you dispose of them. According to the EPA, the average household generates more than 20 pounds of household hazardous waste per year. The EPA has delegated the oversight of hazardous waste in Kentucky to the Division of Waste Management. The Division provides grants for community household hazardous waste collection events to ensure that certain control and safety measures are taken.

What has been done

Extension representatives served on the Northern Kentucky Solid Waste Management Area?s Household Hazardous Waste Coalition. The coalition received a $127,000 grant from the Division in to conduct a Household Hazardous Waste Collection Event. In addition, The Campbell County Extension District Board contributed $5000 to help increase Campbell County participation.

Results

Forty-four thousand residences were notified about the event. Members of the Household Hazardous Waste Coalition, Extension staff and over 100 volunteers from NKY schools and businesses worked at the event. Participants received educational information about household hazardous waste as they registered. A total of 2841 residents of Boone, Campbell, and Kenton County participated. Disposal and recycling vendors reported collecting 144,620 pounds of electronics, 137,681 pounds of paint (14% increase from previous year), 22,710 pounds of fuel, anti-freeze, corrosives, and flammables, 7,442 pounds of pesticides (22% increase from previous year), 3,451 pounds of household cleaners and 3,209 pounds of dry cell, and NiCd batteries (12% increase from previous year)

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Number of participants with interest.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Increase of awareness, practice change

Key Items of Evaluation

Surveys, observations

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Sustainable Energy

☑ 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
131	Alternative Uses of Land	63%	100%	0%	0%
204	Plant Product Quality and Utility (Preharvest)	0%	0%	0%	100%
402	Engineering Systems and Equipment	37%	0%	100%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	5.4	0.2	10.0	0.9
Actual Paid	24.0	0.1	6.3	0.2
Actual Volunteer	9746.0	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**
407705	0	272362	23613
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
468990	7726	272362	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	485944	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research at UK included developing pre-treatment and conversion processes for biomass conversion to fuels and other chemicals of value from a variety of feedstocks. Research was also conducted on the handling and potential value-added use of bioprocess coproducts.

2. Brief description of the target audience

-producers
-extension agents
-electric company representatives
-other researchers and extension specialists

3. How was eXtension used?

Reference materials

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	253813	6175898	99347	2401738

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	5	1	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na
  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 individuals who reported an increase in knowledge of sustainable energy as a result of Extension related programming
2	Number of individuals who incorporated practices suggested by Extension that promote sustainable energy (i.e., applied water conservation policies, participating in energy audits, installed energy efficient equipment, etc.)
3	Number of producers who reported an increase in their production of bioenergy crops (corn, soybeans, switchgrass, etc.)
4	Number of youth reporting an increase in knowledge of energy conservation practices
5	Number of individuals reporting improved knowledge regarding environmental sustainability and responsibility.
6	Number of producers that implemented sustainable practices as a result of participating in Extension programs.
7	Number of individuals who implemented one or more energy conservation strategies (at home, on the road, in appliances, water conservation).
8	Number of individuals who implemented one or more new or additional strategies to promote environmental sustainability.

Outcome #1

1. **Outcome Measures**

   Number of individuals who reported an increase in knowledge of sustainable energy as a result of Extension related programming

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Number of individuals who incorporated practices suggested by Extension that promote sustainable energy (i.e., applied water conservation policies, participating in energy audits, installed energy efficient equipment, etc.)

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number of producers who reported an increase in their production of bioenergy crops (corn, soybeans, switchgrass, etc.)

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of youth reporting an increase in knowledge of energy conservation practices

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of individuals reporting improved knowledge regarding environmental sustainability and responsibility.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1773

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Application of crop protection chemicals and lawn/landscape chemicals is an important industry in South Central Kentucky. Professional applicators must receive training to stay current on issues, pests, techniques, and safety for the products they apply. In turn, applicators need to receive 12 hours of continuing education during a three year cycle to maintain their applicator license. Three of these hours must address specific topics that pertain to their license category. Many applicators have a difficult time finding training opportunities that are close to their business operation and fit into their work schedule.

What has been done
Extension responded to a need for commercial training opportunity by developing the Southern Kentucky Pesticide Training Program. Extension organized, promoted, secured speakers, coordinated with the KY Dept. of Agriculture, and facilitated the event. The UK Pesticide Applicator Training Program provides guidance and support for this training. UK Extension Specialists, a KSU Extension Specialist, a Public Information Officer from the Ky. State Police, and industry professionals presented information during the two day program.

Results
A total of 166 people attended the two day training, who received nearly 1,000 hours of continuing education. Paper evaluations were collected after each day of the program. The information is used to improve the program for next year. Of those responding, 93% indicated that they increased their knowledge of the topics presented. Forty-six percent indicated they would make changes to their daily job duties and responsibilities as a result of the training. They also provided input on topics they would like to see addressed in future trainings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
402	Engineering Systems and Equipment

Outcome #6

1. Outcome Measures

Number of producers that implemented sustainable practices as a result of participating in Extension programs.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	9033

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Recent research shows that nutrient loads from urban areas meet or exceed the agricultural sector. Primary inputs to urban runoff include fertilizers, natural amendments, and lawn debris which contribute nitrogen (N) and phosphorus (P) to our stormwater systems. Educating homeowners on the relationship between over fertilization and improperly timed nutrient applications is imperative to improve water quality.

What has been done
The public education program "No P on My Lawn!" was developed to engage with the residential audience about proper nutrient management. The program outlines the issues associated with over fertilization, demonstrates the benefit and method of soil testing, and emphasizes appropriate plant nutrient applications utilizing the 5R approach to nutrient management: right source, right rate, right time, right place, right price.

Results
Initial results from the survey of current lawn care practices show that at least 50% of homeowners apply their own fertilizers, yet of those surveyed, 69% had not conducted a soil test. Assessments of level of participant understanding prior to workshops showed that over half had an above average understanding that excessive nutrients negatively impact water quality, yet most did not realize that urban areas contribute excess nutrients to stormwater. A survey of intentions post-workshop indicates that participants are willing to change their current practices and adopt methods including conducting a soil test prior to applying P (94%), applying at the right time and rate (100%), and properly placing fertilizer to minimize impact to runoff (98%). Through the program, homeowners have been assisted with collection of 202 samples for soil tests. Results from these samples along with 252 samples from public areas around Fayette County confirm the 25-year data that most Fayette County lawns will need no P. These preliminary

results confirm the need for increased public education in the area of nutrient management and indicate that an informed public will select for behaviors that will reduce nutrient contributions to stormwater.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
402	Engineering Systems and Equipment

Outcome #7

1. Outcome Measures

Number of individuals who implemented one or more energy conservation strategies (at home, on the road, in appliances, water conservation).

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	285

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With a number of changes in regard to policies addressing energy and the environment, residents are in need of being educated on the impact small changes can make in regard to energy conservation. Renewable energy is an environmentally responsible alternative to fossil fuels and has become a hot topic recently for many producers as well as homeowners looking for ways to save on their energy costs. Extension maintains an opportunity to be the premier source for providing pertinent information.

What has been done
In Scott County, Extension presented Toaster Ovens: A Primer to attendees in the nine counties of the Bluegrass Area. In Henderson County, Extension organized an Introduction to Solar program aimed at getting the answers concerning solar potential in Kentucky. A total of 86 attendees ranged from homeowners to small and large farmers. Lawrence County Extension hosted a six-part series of workshops targeted at individuals who are looking to conserve on home energy, start a compost pile, and how to limit use of harsh chemicals in the home. Boyle County Extension partnered with the Boyle County Health Department to host a Radon

Awareness Workshop where the public could be educated on the risk of radon exposure and how to test for it.

Results
As a result of the program, 80 Scott County participants indicated they were more aware of the benefits of using a toaster oven to prepare small amounts of food. Additionally, 88% of those responding to a follow up survey indicated they shared information from the program with others. In Boyle county, one family, after utilizing the radon kit that was provided at the program, learned that their home had high levels of radon and needed to be mitigated. The Extension program was beneficial in helping them to be proactive towards the matter.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #8

1. Outcome Measures

Number of individuals who implemented one or more new or additional strategies to promote environmental sustainability.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	696

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Communities throughout Kentucky face the continued challenges of a growing urban-rural interface. An additional programming focus is to increase the visibility and relevance of Extension to an expanding audience of increasingly diverse clientele while maintaining environmental quality.

What has been done
Shelby County Extension hosted a outdoor naturalist program to promote environmental sustainability. The Outdoor Naturalist series of classes provided a wide-ranging curriculum which attracted participants not typical to Extension programming, as well as offering existing clientele a new and unique program.

Results

Of the 61 participants, 90% indicated they became more aware of or connected to nature as a result of the series, and 100 % of respondents said they are more aware of their relationship to their environment and their responsibilities as an outdoor advocate as a result of one or more of the classes in the series. All (100%) of respondents also indicated that they plan to seek out additional information about one or more of the topics presented. Participants were overwhelmingly positive about the Outdoor Naturalist series with 60% indicating that they had already applied information learned in one or more sessions to their own outdoor environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
402	Engineering Systems and Equipment

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Length of programs, use of evaluation tools.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Change in knowledge, opinions, skills, aspirations, behavior.

Key Items of Evaluation

Surveys, interviews, testimonials

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	96%	80%	0%	72%
724	Healthy Lifestyle	4%	20%	0%	28%
	Total	100%	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	30.0	3.0	0.5	0.6
Actual Paid	8.0	0.5	0.0	0.4
Actual Volunteer	8909.0	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**
163082	21280	0	38304
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
187596	10643	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

-Conducting educational programs for children
-Training extension agents

-Developing educational materials
-Conducting programs with parents
-Conducting research to understand the relationship

2. Brief description of the target audience

-children
-youth
-extension agents
-teachers
-parents

3. How was eXtension used?

Resource materials

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	94589	1251970	156598	2042689

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	3	0	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- na

  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	Total number of children and youth reached through Extension programming related to eating healthy foods
2	Total number of children and youth who gained knowledge about eating more healthy foods
3	Total number of children and youth who reported eating more healthy foods
4	Number of environmental changes implemented to support physical activity (e.g., walking trails opened, bike paths built)
5	Number of individuals who experiences an increase in knowledge, opinions, skills, or aspirations regarding lifestyle changes (diet, exercise, etc.) that improve personal health.
6	Number of individuals who reported improving at least one behavior related to subjects taught (e.g., food preparation, addition of fruits and vegetables into the diet, movement of the body that leads to better physical fitness, and reducing the risk of chronic disease).
7	Number of children, grades 3-5, who report eating vegetables and fruits.
8	Number of youth that report making healthy lifestyle choices.

Outcome #1

1. **Outcome Measures**

   Total number of children and youth reached through Extension programming related to eating healthy foods

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Total number of children and youth who gained knowledge about eating more healthy foods

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Total number of children and youth who reported eating more healthy foods

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Number of environmental changes implemented to support physical activity (e.g., walking trails opened, bike paths built)

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of individuals who experiences an increase in knowledge, opinions, skills, or aspirations regarding lifestyle changes (diet, exercise, etc.) that improve personal health.

2. **Associated Institution Types**

   - 1862 Extension
   - 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to most recent healthcare profiles and health facts for many Kentucky counties, at least 33% of adults are obese, 31% report a lack of personal physical activity, 12.6% adults have diabetes. In addition local healthcare and school professionals across the state report an increase in health disparities among youth in relation to obesity.

What has been done
Over the course of the school year, Extension providing opportunities for more than 4,000 students and teachers in Pulaski County to sample fruits that are not a common offering. Shelby County Extension worked with the Student Affairs Specialist for the Migrant Education Program to plan a three-day summer enrichment program for 44 Hispanic Shelby County youth whose parents are migrant farm workers. The Nutrition Education Program in Kentucky taught basic nutrition in 91 of the 120 counties.

Results
Overall, the Nutrition Education Program conducted nutrition lessons with 8,146 limited resource adult clientele, resulting in 5,445 participants graduating from the program. Reports show that 95% had a positive change in food consumption and food behavior change. At graduation, 70% reported that they plan meals in advance and read food labels to make healthier choices. In addition, NEP paraprofessionals taught more than 28,320 youth a series of 6 or more nutrition lessons, resulting in 85% reporting a positive change in nutrition knowledge.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of individuals who reported improving at least one behavior related to subjects taught (e.g., food preparation, addition of fruits and vegetables into the diet, movement of the body that leads to better physical fitness, and reducing the risk of chronic disease).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1082

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Moderate physical activity can reduce the risk of developing heart disease, diabetes, colon cancer, stress and high blood pressure. Physically active people live longer and better quality lives that inactive people. Physical activity levels decrease across the lifespan.

There is a significant decrease in the amount of physical activity between elementary school and high school students.

What has been done
The Todd County 4-H program in partnership with the 21st Century Learning Center provided a twelve week fitness and nutrition education program to 27 middle school youth to improve their physical activity and healthy eating behavior skills leading to a healthier lifestyle. In addition, the Todd County 4-H program also provided a 4-H Cooking Club for 10 elementary and middle school youth to teach healthy recipes and physical fitness.

Hickman County Extension held its second Ready Set Run Club program, which is designed to promote exercise as well as character building, program that targets youth ages 8-13 (3rd-8th grades).

Results
In Todd County, 65% of the youth participants increased their physical activity from no activity to twice a week moderate exercise due to participation in the 4-H fitness program. Nearly 40% reported eating healthier foods.
Participants reported exercising more often on their own than before the fitness program. In Hickman County, 44 youth participated, walking/running a total of 1,088 miles.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Number of children, grades 3-5, who report eating vegetables and fruits.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	8462

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Healthy eating in childhood and adolescence is important for proper growth and development and to prevent various health conditions. Although total fruit intake and whole fruit intake among children and adolescents may have increased, most youth still do not meet fruit and vegetable recommendations.
Research shows that one in three youth in this country are overweight or obese. (American Heart Association) Teaching kids that exercise can be fun may help these numbers to improve.

What has been done
McCracken County Extension worked with a local Elementary School to provide a Junior Master Gardener school enrichment program for the fourth-grade class. The program held monthly classes in which 105 youth participated. The Campbell County 4-H program conducted 6 one hour sessions with 17 third-fifth graders. In Greenup County, students participated in hands on learning and received literature about each food group as well as participated in physical activities.
Supplemental Nutritional Program Assistant in Anderson County Kentucky put together a traveling obstacle course for three of the schools in her county. Using pool noodles, cones, hopscotch and yoga mats, the kids got plenty of physical activity by running, jumping, hopping and crawling over and under the many stations.

Results
In Campbell County, 100% of the students learned a new recipe to make for their family. In Greenup County, 125 students made a change to making better food choices. The students who participated in the series showed an 85% improvement in two or more food groups, as well as food safety practices.Nationwide 1,300 schools and 600,000 students, teachers and parents

participated in the Every Kid Healthy Event.(www.everykidhealthyweek.org) In Anderson County alone there were 600 student participants and an additional 300 in the other counties we serve.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Number of youth that report making healthy lifestyle choices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	30641

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Teaching youth how to prepare their own food and read nutrition facts on labels will give them a skill they can use for a lifetime. As a result, they will be more likely to eat healthier as adults, and build self-confidence

What has been done
Hopkins County Extension provided all children at a local elementary school with a month-long program, Food for Thought aimed at introducing new healthy foods into student?s diets. Each week, students learned about the health benefits of a new fruit or vegetable, read a book about the food, and taste the food during the school day.

Results
In Fleming County, parents commented how much the students had gained from this Extension programs. One parent said her daughter asked her to stop buying junk food and wanted more fruits and vegetables for the family to eat for snacks and so they could get healthy together! In Hopkins County, A total of 371 students participated in the program. On post-program surveys, 91% (338) of students reported that they tried at least one new food during the program and 64%

(237) of students reported that they have eaten at least one of the new foods at home since the conclusion of the Food for Thought program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Length of program, target audiences.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Change in knowledge and behaviors

Key Items of Evaluation

Follow-up survey, observations

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
23567	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.