2017 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

University of Arkansas System Division of Agriculture (Division of Agriculture) faculty, staff and facilities are located on five university campuses, five regional Research and Extension Centers, six Research Stations, three Extension Centers, and in 75 counties. Unlike most states today, the UA Division of Agriculture remains committed to this statewide infrastructure with a presence in all 75 Arkansas counties; ensuring that researchers and Extension educators are readily available to address the science and business of agriculture and the broader needs of families and the communities we serve.

The University of Arkansas at Pine Bluff (UAPB), School of Agriculture, Fisheries and Human Sciences is composed of three academic departments, the 1890 research and Extension programs, the Aquaculture/Fisheries Center of Excellence, the Regulatory Science Center of Excellence, and six Research and Extension sites (including North Little Rock). Research faculty members are integrated into the academic units in agriculture and human sciences, while Extension personnel are under the direct supervision of associate Extension administrators. The Department of Aquaculture/Fisheries and the Aquaculture/Fisheries Center of Excellence are administered by a department head/center director supervised by the dean/director. Under this structure, academic, research and/or Extension responsibilities are integrated. The primary clientele served by the University of Arkansas at Pine Bluff are limited resource farmers and rural families, sweet potato producers and industry, as well as the Aquaculture industry and the Arkansas Game and Fish Commission.

Consistent with the land grant mission, the Division of Agriculture and UAPB research and Extension faculty have a long history of providing leadership in the development and dissemination of innovative practices and emerging technology. Division researchers conduct basic and applied research for Arkansas producers, businesses, communities and families. During FY2017, Division of Agriculture research efforts resulted in the submission of 7 patent applications. Division of Agriculture and UAPB Extension educators and researchers delivered research-based education through 11,893,713 educational contacts with Arkansans. Division of Agriculture Extension educators employed diverse educational methods statewide including: 34,800 educational classes, 20,005 landowner visits, 63,394 individual consultations, 2,536 demonstrations, and 2,002 field days/tours/camps. County agents and specialists strive to provide the best science-based recommendations available. Information is readily available in the Digital Age but the Division of Agriculture and UAPB remains providers of information that are independent of financial or philosophical interests.

During 2017, the Division also delivered timely and responsive distance education webinars through the National Center for Agricultural Law on emerging issues including: the veterinary feed directive rules, federal & state check off programs, GMO regulations, use of LLCs in agriculture, and invasive species. Extension educational programming for Arkansas clientele is also available 24/7/365 through web-based instruction at the Extension online course website http://courses.uaex.edu. Family and consumer science and agriculture and natural resource online Extension education was delivered to and completed by 16,345 participants in FY2017 through 56 course offerings. One key new course added in the 2017 program year was an online sprayer course required by the Arkansas Plant Board as a new requirement to purchase certain herbicides.

The focus of work conducted by Division of Agriculture and continues to be guided annually by grass-roots, community-based input from a diverse range of Arkansas citizens, mainly through the use of

County Extension Councils and other local advisory groups. The Division of Agriculture formally engaged a large pool of stakeholders (including individual clientele, producers, schools, partner agencies and organizations, state government officials, community leaders, underserved groups, and legislators) in the design and development of the 2011-2015 Strategic Plan, which was extended to 2016-2017. Based on broad stakeholder feedback, the Division identified five emphasis areas to focus our efforts that include:

- Agricultural Production and Processing;
- Environment, Energy and Climate;
- Access to Safe and Nutritious Food;
- Increasing Opportunities for Families and Youth; and
- Economic and Community Development.

These five emphasis areas help to provide guidance for Division research and Extension programs and help to support integrated research/extension efforts in these areas. Similarly, UAPB continues to meet the needs of clientele by working in the NIFA areas of emphasis.

2017 Arkansas Extension and Research Planned Program Impact Highlights

Agricultural Production & Processing

Agriculture contributes more than $20 billion per year to the Arkansas economy, and 1 in 6 jobs. Our continued success in agriculture relies on the abundant resources in the state, including good soils, abundant water, favorable climate, and hard-working people.

Challenges to sustained agricultural production and processing increased in 2017 as commodity prices continued to fall while production costs remained high. In the row crop area, prices for corn, cotton, rice, wheat and soybeans have fallen since 2011, with no turnaround in sight.

New pests continued to emerge in this sector with the fourth year establishment of the sugarcane aphid in sorghum, third year of detection of kudzu bug in soybean, first year of red banded stink bug, additional spread of the emerald ash borer and crepe myrtle bark scale in forests and urban landscapes, and the continued issue of PPO-resistant palmer amaranth populations in the Delta. HPPD resistance appears to be increasing and herbicide resistant plants are less susceptible to new chemistry. The introduction of dicamba resistant technology and the volatility of the compound has complicated political and weed control issues. Emerging diseases in baitfish and other aquatic production in recent years led to more intense monitoring by disease labs in the state, as well as stricter certification efforts in the large aquaculture industry in Arkansas. Challenges related to invasive species, new pathogens, global economic turmoil, and the plethora of bizarre "research" reports and "recommendations" from low-quality and belief-driven "science" continue to demonstrate, as a Division of Agriculture specialist put it, "there has never been a time when land grant University research and extension were more needed" than today.

Arkansas had about 43,000 farms on 13.7 million acres and another 19 million acres in managed forests as of 2017. The state ranked 16th in agricultural cash receipts of $8.9 billion as of 2015. Of this amount, crop production totaled $3.7 billion and livestock/poultry $5.2 billion. The public value of our agricultural and forest lands also enhanced the tourism and travel potential of the state through natural beauty, diversity of plant and animal life, and rural charm.

Nationally, Arkansas is 1st in rice, baitfish and sport/game fish production, 2nd in poultry production, 3rd in catfish, and among the top 25 states in production of cotton, sweet potatoes, hogs, cattle, and meat goats. Poultry production is concentrated in the northwest section of the state, but during 2014 a major new area in north central and northeast Arkansas was opened to poultry production. Cattle are raised in every county, with a January 1, 2016 inventory of 1.6 million head. Horses continue to increase in popularity with 60,000 households having horses.

The Division of Agriculture and UAPB assists livestock and poultry production with research and Extension programs focused on enhancement of well-being and animal handling methods to minimize stressors in food animals, determination of the impact of common stressors (castration, parasite load, disease, etc.) that aid in development of on-farm best management practices, improvement of food safety while maintaining product quality characteristics, improvement of environmental sustainability (reduction of greenhouse gasses, and nitrogen cycling/use); input efficiency of production, enhancement of reproductive

performance, animal and poultry health, and reduction of feed/forage needs and costs.

UAPB Extension livestock programs focus on small and socially disadvantage farmers (SSDF) in southern and eastern Arkansas. UAPB is working with sheep and goat producers to control a parasite (Haemonchus contortus) that has become resistant conventional dewormers. Scientist are conducting a feeding study ground black walnut hulls mixed in ground corn to control the parasites organically. UAPB small farm program is working with small and limited resource farmers to get assistance from NRCS in installing cross fencing and watering facilities to control grazing in pastures and improve livestock handling facilities. Also, Small farm program continue to work with small and limited resource farmers on biosecurity issues affecting livestock.

Commercial poultry production is a huge industry in the state, with Arkansas ranking 4th in broilers and 5th in turkeys, as of 2016. Division extension staff increased biosecurity and IACUC education across the state by conducting presentations on biosecurity practices and dissemination of biosecurity information to individuals at seminars, county fairs, the Arkansas and Arkansas/Oklahoma state fair, short courses, 4H pullet chain delivery, and farm visits were done.

Nationally, Arkansas ranks 1st in rice production; 6th in cotton; 3rd in grain sorghum; 10th in soybean; and 21st in corn. The Division of Agriculture conducts extensive research and Extension programs to assist these industries and producers remain up to date and competitive. Our agronomic programs emphasize utilizations of new varieties in rice, soybeans and wheat; adoption of relevant best management practices, IPM and environmental quality practices. The Division of Agriculture has released 27 improved rice varieties since the beginning of the breeding program in 1980, contributing approximately $137 million to the agricultural economy of Arkansas. Since 1980, Arkansas rice yields have increased from 4,110 lbs per acre to 7,200 per acre in 2017.

Sweet potato production continues to grow both nationally and within the state. In Arkansas, sweet potato production has grown from 2000 acres in 2008 to 4000 acres in 2017 with an annual production value of $20 million. The marked increase in domestic demand for sweet potatoes, due to their health benefits and fiber, is being well served by UAPB Sweet Potato Foundation Seed Program. The program supplies disease and mutation free, generation zero sweet potato slips to support Arkansas sweet potato industry. This has enabled UAPB to join the National Clean Plant Network (NCPN) and become the only 1890 institution among six NCPN Sweetpotato Clean Plant Centers.

The internationally renowned UAPB aquaculture and fisheries program conducted research in a variety of important areas including systems development, economics and marketing, nutrition and feeds, water quality, stress and reproductive physiology, and fish health. Most of the research was targeted at catfish, baitfish and sportfish - Arkansas is a major producer of all 3 categories of fish. The overarching goal was to develop more cost-effective methods of production that will increase profitability for farmers, and create superior products for end-users. In 2017, UAPB scientists conducted research related to the identification of cost-effective treatments for fish bacterial disease that align with the strict guidelines on treatment options available for use. Researchers analyzed the anti-microbial properties of herbs and spices for use in aquaculture production. Initial results found that Syzygium aromaticum and Cinnamomum verum had the highest antimicrobial activity against Flavobacterium columnare and exceeded the level of commercially available antibiotics. This has potential implications for producers to have more options available to them in choosing a treatment for fish bacterial diseases in the future. Additional research was conducted by UAPB scientists analyzing how fish cope with common stressors, such as high environmental ammonia, namely largemouth bass, which possesses a high commercial value in and out of Arkansas.

The Division of Agriculture and UAPB labs have continued to provide diagnostic services, not just to those in Arkansas, but across the United States, for little or no cost. In 2017, the Division of Agriculture's Plant and Nematode labs processed 5,367 samples. The UAPB Fish Disease Diagnostic labs processed over 1,660 samples for disease testing, and 22,225 fish for health certificates to allow inter-state/international transportation. The UAPB Fish Health Inspection lab in Lonoke, Arkansas, conducted routine health inspections; issued health certificates for fish being shipped to other states and countries, conducted inspections for the baitfish certification program in Arkansas, analyzed water quality, and identified aquatic weeds. The Lonoke Fish Health Inspection Lab is one of 11 APHIS approved

laboratories in the US for aquatic organisms.

Commercial Horticulture encompasses the production of fruits, vegetables, turf, and ornamentals. Arkansas ranks in the top 25 states in production of at least 15 horticulture crops. The Division of Agriculture's blackberry breeding program is recognized worldwide, with nineteen varieties released to date, and planted throughout the US and in other countries. Total plants produced and sold to growers and home gardeners for 2012-2014 as reported by nurseries licensed to produce the Arkansas-developed blackberries was over three million plants. The potential crop area for these plants was over 1,700 acres and wholesale fruit value of over $90 million annually. This production includes both the summer-fruiting floricane types and the innovative primocane-fruiting type, extending the production and marketing season for this high-value crop.

UAPB's agricultural production efforts continue to be focused upon serving small and socially disadvantaged producers in eastern and southwestern Arkansas. The programs provide research based information that is used for training and technical assistance to row crop, vegetable crop, and livestock producers. Assistance was provided in farm financial planning/business planning; vegetable and row crop production and marketing; livestock production and marketing; access to USDA assistance programs; food safety education; and housing. These programs have helped more than 100 limited resource farm families stay on their farm and keep farming. UAPB used the foundation sweet potato seed program to provide virus indexed sweet potatoes to the sweet potato industry in Arkansas. This helped small row crop farmers in the Delta diversify their operations with vegetables to increase profitability. Good Agricultural Practice (GAP) training was also provided to farmers to increase their markets opportunities. Also, UAPB conducted research trials that evaluated the potential for industrial hemp and other bio-fibers to be used in the commercial textile industry.

Over the past several years, there has been an overall decline in support for IPM education and emphasis at the national level. This has resulted in increased use of "blanket" or "preventative" pesticide applications to row crops in many states. UA Division and UAPB scientists and staff have battled this trend over the years, including 2016, in spite of declining resources. Division entomologists and plant pathologists initiated a new demonstration program in the Delta to compare blanket applications of insecticides and fungicides based on growth stage to applications based on IPM principles of scouting and using "only when needed". Results showed that blanket applications were less cost effective than IPM applications. This work will continue in several crops for two more years. Results were presented in 2017 to more than 50 planned crop production winter meetings and events, which typically host more than 3,200 active row crop farmers and consultants in the Delta region. Given the increasing economic difficulties of row crop producers combined with the risk of resistance development by crop pests where blanket applications result in high selection pressure, this educational work is of critical importance and should serve as a model for a national initiative.

Water quality and water quantity continued to be critical areas of emphasis in agriculture production during 2017. The Division of Agriculture conducts research and evaluated edge-of-field water quality data from the thirteen Discovery Farm sites in the state. Data from these sites showed very low movement of nitrogen and phosphorus. These early results were shared at the state and regional level with stakeholders and regulators. They have also lead to the creation of best management practices for producers to implement. Irrigation efficiency was emphasized in a major effort to teach growers proper use of computerized hole sizing software with poly pipe in furrow irrigated systems. Follow-up demonstrations showed an average water savings of 22% using this simple tool. UAPB participates in the edge of field monitoring studies by working with NRCS and demonstrate the use of multiple inlet irrigation at field days. Also, water use efficiency on soybeans and rice is demonstrated during filed days on a zero grade field verses a .1ft./100 ft. grade field during alternate years. The zero grade field usually requires about 4" less water per year than the .1" grade field to produce a crop.

Most consumers of agricultural products are far removed from production and the abundance of internet "information" can complicate their understanding of the challenges and benefits of our modern science-based food, feed and fiber systems. During 2015, Division educators launched two modular online courses on biotechnology crops. These courses were marketed for use by the public, schools, and community colleges. Another blended educational effort was the Arkansas Soybean Science Challenge

project, funded through the Arkansas Soybean Promotion Board. In its third year, the project targeted high-school science students and included a five-hour online course, face-to-face lab instruction, incentive awards for high-school student initiated research, an Arkansas Department of Education approved online in-service training for teachers, a Pinterest site, and other online educational resources. Sixty-seven students completed the online course and ten teachers took advantage of the two online courses geared towards them.

Gardening and landscaping continue to be of strong interest to citizens of Arkansas. Both UA Division and UAPB faculty and staff are heavily involved in extension education of gardeners, landscapers, and interested community volunteers in local food production and beautification of our living environment. A huge program in the state in this area is the Division of Agriculture's Master Gardener program. In 2017, this program certified 3,437 volunteers who logged 170,234 volunteer hours for their communities. This group led the efforts to highlight research-based gardening at the annual Arkansas Flower and Garden Show in February 2017.

Across all these agricultural focus areas, UAPB and the UA Division conducted 681 meetings with 1761 demonstrations that impacted over 4.8 million acres. This impact is the adoption of best management practices that keep the producer in business and protect the natural resources of the state.

Environment, Energy and Climate

Arkansas has tremendous soil, water and air resources that provide a multitude of beneficial uses. These resources support a highly productive, efficient agricultural system that annually accounts for $20 billion of value-added to the Arkansas economy. Yet, Arkansas still remains the "Natural State," as its scenic beauty attracts many outdoor enthusiasts and generates over $5.9 billion in tourism expenditures annually.

Managing Arkansas's natural resources to protect and sustain these multiple beneficial uses for future generations is not without its challenges. Air and water quality concerns have evoked lawsuits, new state and federal regulations, as well as voluntary natural resource conservation programs, such as USDA-NRCS' and Mississippi Healthy River Basin Initiative (MRBI). Large-scale modeling studies of the Mississippi River basin point to agriculture as the leading source of excessive nutrients that cause hypoxia in the Gulf of Mexico. The Division also jointly produces a regional newsletter entitled "Confluence" to provide information to the agricultural public on nutrient reduction and water quality protection efforts within the 13 states participating in the Gulf of Mexico Hypoxia Task Force. Other sectors of society, such as municipalities and urban areas also face nonpoint source water issues. Municipalities and urban areas are also required to address storm water management issues and provide education on reducing the impact of storm water on runoff water quality. Municipalities in three Arkansas counties have contracted with Extension to provide storm water education, providing research-based and unbiased information to Arkansans to assist with voluntary efforts to address nonpoint source water quality issues. UAPB scientists are conducting studies with cover crops to reduce erosion, improve soil health, and keep the soil in a productive state with a minimum of off farm inputs. It is anticipated that this will decrease the flow of sediments that flow into streams, improve soil health and increase the sustainability of these farms in the long run.

The UAPB Aquaculture and Fisheries Department (AQFI) provided management training and assistance to private impoundment owners of Arkansas. Privately-owned impoundments can be used for numerous purposes and the management of those impoundments is affected by, and can have an impact on, the environment immediately surrounding the impoundment and its watershed. Proper management helps to ensure a healthy and productive environment within the impoundment and the surrounding area. In addition, research is underway to assist the Arkansas Game and Fish Commission in determining the success of their supplemental stocking programs with crappie and other important sportfish.

Monitoring water quality and nutrient levels on a tributary to the Buffalo National River was assigned to an environmental task force in late 2013 by the Arkansas Governor's office and a subcommittee of the Arkansas General Assembly. This action was in response to public interest in a state-permitted swine farm in the Big Creek Watershed. The Big Creek Research & Extension Team was formed in fall 2013 and received $340,000 from the governor's office to initiate the environmental study and

monitor potential environmental impacts of the swine operation. Monitoring efforts have continued through FY2017. Members of this team, including the team leadership, include Division of Agriculture research and Extension faculty and staff. After four years of extensive monitoring, no impacts or consistent trends of farm operation on area water quality are evident.

Efforts to reconcile competing agricultural and environmental interests are often hampered by a lack of definitive best practices. The Division of Agriculture has created a multidisciplinary team approach to discovery, demonstration and promotion of agricultural/environmental best practices. The Center for Agricultural and Rural Sustainability (CARS), the Arkansas Water Resources Center and the Environmental Task Force represent team efforts that range from basic discovery to economic consequences of implementing best practices.

Agricultural production and processing sustainability has been a focus of the Division of Agriculture and UAPB for many years. Evidence of this is the Division's hosting of the Center for Agricultural and Rural Sustainability (CARS), a nationally known center of excellence. Faculty associated with the Center have pioneered life cycle analysis of cropping practices, studied alternative production and marketing systems, organic agriculture, phytoremediation, alternative residue and water management, and trace gas emissions. The projects carried out by CARS faculty are diverse covering all major areas of agricultural production including animal and livestock, rice, forestry and timber, soybeans, specialty crops, local foods, etc. Their work provides the unparalleled support to the agricultural industries and rural communities to build sustainable, "green" agriculture in the State. In 2014, the Walmart Foundation donated an additional $1,050,000 million to fund the creation of the "Success in the Field" e-book, which focused on disseminating the research findings and outlined the accomplishments of the National Strawberry Sustainability Initiative that was created with the Foundation's 2013 $3 million investment. The initial investment was to improve fresh strawberry production in the U.S. and conduct research on the processing of various strawberry products to ensure retention of anthocyanins, which are attributed to the vivid red color of strawberries. This e-book was completed and published in 2016.

The Division of Agriculture's Nitrogen Soil Test for Rice (N-STaR) was merely a research tool just a few years ago. The N-STaR program for determining optimum site-specific Nitrogen fertilization rates on rice has been adopted quickly by Arkansas rice producers. In 2017, 2,455 N-STaR samples were analyzed and new producers are entering the program every year which increases the scope of N-STaR's impact on Arkansas rice production, representing approximately 21,000 acres. Since 2012, the N-STaR lab has processed >20,000 soil samples representing over 350,000 rice acres in Arkansas. For many fields, N applications were reduced without sacrificing yield, thus reducing potential greenhouse gas (GHG) emissions and reducing potential N losses to watersheds.

The Division of Agriculture has continued to conduct research in the area of biomass and renewable energy sources. In 2017, field trials on the implications of varying harvest timing in switchgrass in usage as biomass was conducted in Arkansas, Oklahoma, and Louisiana by Division faculty. Initial findings conclude that there is potential to have cost savings in delaying harvest in lower yielding fields, which can increase the nutrient replacement cost savings and the capacity utilization of harvesting equipment.

UAPB is working with the US Army Corps of Engineers to provide local ecotypes of switchgrass and Indiangrass to control erosion and provide wildlife habitat on the Bayou Meto and Grand Prairie Irrigation projects. These projects are designed to decrease dependence on groundwater and increase the use of surface water that will be captured and stored in reservoirs during the winter and spring months when evapotranspiration is at a minimum and rainfall is at a premium.

Access to Safe and Nutritious Food

Food Safety

The Division of Agriculture continues to have a strong emphasis on food safety with efforts in both basic and applied research and supporting extension efforts for youth, the public and the food industry. Research efforts are focused mostly on gaining a better understanding of the ecology of food pathogens, improving food processing systems to minimize food pathogens and improving detection systems for Listeria, Salmonella, E. Coli and other major food pathogens. An example of current research is the

exploration of management strategies to prevent enteric diseases in organic chicken, which is a product gaining popularity each day. Studies were conducted in 2016 to examine the efficacy of the natural compound, resorcylic acid against Campylobacter colonization in broiler chickens and the ability of select probiotics to reduce enteric Campylobacter colonization in broiler chickens. The study results are being analyzed and will be published.

Arkansas has a large food industry with a need for food safety education of its workforce. These food safety educational programs help food processing companies remain nationally competitive and prevent foodborne illness. The Division of Agriculture also offers restaurant managers, employees and food handlers the opportunity to taking classes and an exam to become ServSafe certified with 268 receiving Certified Food Protection Manager certification in 2017. Improvements in restaurant and food service food safety have the potential to save Arkansas money and time by way of reducing cases of foodborne illnesses.

The University of Arkansas at Pine Bluff provided Good Agriculture Practice (GAP) and Good Handling Practices (GHP) education to vegetable farmers in eastern Arkansas. This training helped small and limited farmers to become GAP Certified and sell their products to Walmart and School lunch programs in Eastern Arkansas and Memphis.

Food Processing Innovation

The State of Arkansas has a large food manufacturing sector that needs a qualified workforce. To meet this need, Division of Agriculture faculty have developed programs addressing the needs of the industry. Of particular importance is the development of culinary training for research & development (R&D) personnel working in the poultry industry. The curriculum developed has allowed numerous employees to achieve the status of Certified Culinary Scientist. This experience is meant to enable the food technologist to understand what the R & D chef wants to ensure the chef's vision and taste are translated to the production plant floor. The Division of Agriculture also contributes to the state's economic development by providing assistance to entrepreneurs. The Arkansas Food Innovation Center (AFIC) assists small food processing companies and entrepreneurs by providing necessary education and services such as: product development assistance; sample production; FDA process approval (FDA form 2541a); measurement of pH and water activity (Aw); provision of nutritional labels; development of food labels; delivery of food-related workshops; and other forms of technical and business assistance, much of which is available through a dedicated website for entrepreneurs. AFIC generally assists 15-25 entrepreneurs each year, as well as a number of non-profit organizations. In 2017, 7 small businesses started as a result of the food entrepreneur assistance program. The efforts of the program and making the Division of Agriculture's food pilot processing plant available to entrepreneurs has resulted in assisting start-up food companies in creating five fulltime processing jobs and 15-20 full time jobs in FY17. Over the past several years, several food companies have emerged with the assistance of the program.

Division of Agriculture faculty also conduct innovative research in food processing. Research activities in food chemistry and food processing include work to improve the quality of rice and improve rice processes; expand the utilization of soybeans and its co-products; assess the health benefits associated with fish, vegetables and other processed foods; and improve the sensory quality of processed foods. An example of current research is the exploration of the parboiled rice production process and the impacts of feedstock, parboiling conditions, and fortification concentration on micronutrient retention. Initial findings indicate that parboiling is effective in fortifying rice with minerals and brown rice is a better feedstock than rough rice for mineral fortification via parboiling.

UAPB scientists are working in concert with clientele to develop ideas for using sweet potatoes in new and different ways. The experimental kitchen which was funded in part by USDA Rural Development and has produced sweet potato chips, sweet potato jelly, sweet potato wine, Sweet potato flower etc.

The Aquaculture/Seafood Marketing team at UAPB developed several pragmatic economic models and analytical tools that can be used to produce thorough analyses of seafood markets at regional, national and global levels. At the national level, the UAPB team collaborated with Texas State University to analyze long term trends in catfish. A decline in catfish production was identified for a number of reasons, including increased production costs, increased market competition (namely imported white fleshed fish), and increased price risks related to market fluctuations. At the regional and national levels in the United

States, the team analyzed consumers' preferences for seafood products based on weekly scanner data from ten regional markets, and developed a U.S. fish supply, demand and trade simulation model (USFish model). Preliminary findings have found U.S. consumers are likely to meet their increased demand for seafood by imported products, which is relatively cheaper in price, and will probably decrease their consumption of U.S. farm-raised catfish during the period up to 2030. In order to expand the market for U.S. farm raised catfish products in the United States, there is a need for marketing strategies that favor product distinctiveness and branding (independently or co-labeling with retailer) as well as identifying segments of market that are willing to pay a price premium for the U.S. farm-raised catfish products. Based on these findings, several U.S. aquaculture farmers and processors have started redesigning their business and marketing plans to expand their market size and share.

Nutritious Food, Food Security and Childhood Obesity

Arkansans face challenges when it comes to obesity and food insecurity. According to Centers for Disease Control and Prevention (BRFSS), in 2016, 68.2% of adults (age 18 and over) in the state of Arkansas were classified as either overweight or obese. In 2016, Arkansas was the sixth most obese state in the United States with 35.7% of adults being obese. Five of the ten leading causes of death in the U.S. have been linked to diet and lifestyle as contributing factors. Poor diet and obesity remain common problems especially among under-served populations. To compound the issues already present in the state, Arkansas has the third highest poverty rate in the nation, with one in four children living in poverty. Food security is defined as access at all times to enough nutritional foods for an active and healthy lifestyle. Arkansans in many areas of the state have limited access to nutritious and affordable food. To address these issue the Division of Agriculture and UAPB conducted Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program - Education (SNAP-Ed). The Division of Agriculture and UAPB's EFNEP programs were delivered in 16 counties in Arkansas. The SNAP-Ed program was delivered in every Arkansas county by the Division of Agriculture and in two counties by UAPB in FY2017. They provided Arkansas's most vulnerable families and youth with hands-on opportunities to address food security challenges. SNAP-Ed programs were conducted at a variety of locations throughout Arkansas including schools, Head Starts, senior centers, food banks and pantries, shelters, DHS offices, WIC offices and grocery stores. Lessons focused on: making healthy choices within a limited budget, learning how to read food labels, cook, grocery shop and increase physical activity.

Extension program evaluations identified some of the significant impacts of these programs. For example, 37% of EFNEP and 72% of SNAP-Ed adult participants reported they less often ran out of food before the end of the month after participating in Division of Agriculture and UAPB programming. With a focus on practical food preparation, cooking, tasting, and shopping, the Division of Agriculture and UAPB Extension programming is having a measurable impact on reducing food insecurity in Arkansas.

Research within the Division of Agriculture focuses on various aspects of adult and children's health with hopes of reducing the incidence of these diseases within the state and nationally. For example, studies conducted by the University of Arkansas System Division of Agriculture show that diets higher in protein can spare muscle mass and increase fat loss as well as lower plasma triglycerides in both men and women. High protein diets have also been found to improve glycemic regulation and post meal glucose and insulin response in type 2 diabetics. Our research has identified whey protein as the most ideal protein source, compared to pea and beef protein, for increases in postprandial energy expenditure (calories burned after the meal). Based on this finding, we believe that whey protein-based beverages are ideal for breakfast, especially for children. In addition, Division of Agriculture and UAPB faculty are conducting novel research to determine the impact of diet and food composition and functional food components on body weight and health.

Other areas of research include exploring increasing the nutritive qualities of foods. In 2017, Division of Agriculture scientists explored the addition of glutathione to blackberry juice in the prevention of anthocyanin degradation during storage. Initial results are positive in comparison to other stabilizing agents, but further research is being conducted to determine the mechanism of stabilization.

Aquaculture

UAPB Researchers and other collaborators have studied how declines in marine fish supply will affect human health. Results were reported in a paper entitled "Fall in Fish Catches Threatens Human

Nutrition" published in Nature (Vol 534, 16 June, 2016). Researchers coupled two databases ("Global Expanded Nutrient Supply" and "Sea Around Us" databases) from 2010 (most recent data from both). Nearly 11 % of the current global population could become deficient in iron, zinc or vitamin-A by 2050 if current trajectories in fish catch declines continue. The negative health impact of fisheries decline will be felt more severely in some countries than others. Low-latitude developing nations are at high risk because human nutrition in these areas depends mostly on wild capture fisheries.

Increasing Opportunities for Families and Youth

The Division of Agriculture and UAPB are parts of the land grant system that focuses on the human dimensions of food and agriculture through programs in the areas of Health and Aging, Strengthening Families, Family Resource Management, and 4-H Youth Development. UAPB's initiative areas include the Ag Discovery Program and 4-H Youth Development. As a result of intensive programming in these areas, program participants gained knowledge based on educational lessons, experienced changes in behavior, enhanced skills, and adopted new research-based practices learned from Research and Extension programs.

In the areas of Health and Aging, Division of Agriculture's Extension Wellness Ambassador program trained 137 Ambassadors and engaged 6,484 people in addressing local health issues by implementing projects and conducting health improvement activities through 363 educational classes and sessions. This volunteer based program contributed over 2,800 volunteer hours, valued at over $68,600 to the State of Arkansas.

Individuals who participated in family economics educational programs gained the knowledge and skills they need to increase financial security and build wealth. Extension's personal finance educational programs gave 6,860 Arkansans the knowledge and skills they need to build financial security. Program participants learned the basics of financial management for spending, saving, credit management, and retirement and estate planning. They developed skills such as creating a spending plan, checking a credit report, shopping smartly, setting financial goals, etc. County FCS Agents conducted educational outreach across the state including programs, such as: Navigating Your Financial Journey (basic financial management); Your Farm, Your Legacy (estate planning seminar); Debtor Education; and Get Real - Here's the Deal (youth personal finance simulation), just to name a few of the many topics and educational opportunities offered. A new collaboration created in 2017 was with Consumer Credit Counseling. Division of Agriculture Agents in ten counties provided quarterly educational sessions on personal finance in 15 Rich Smith housing property locations. As a result of these programs, 5,450 participants reported intention to adopt behavior changes related to individual and family resource management. Participants in these family economics educational programs reported increasing knowledge (90.4%) and the intention of implementing at least one positive money management behavior (71.8%).

A key to happiness in family life is learning how to be an emotionally healthy individual, a good partner, and an effective parent. The Division of Agriculture Extension provided in-person and web-based educational resources and training in the areas of personal well-being, couple relationships, and parenting. Extension educators trained 3,705 people in our personal well-being, relationship and parenting programs.

Child Care Provider Education programs were delivered through Extension's statewide network. Our programs, supported through $535,000 in external funding, are available in multiple formats (e.g., face-to-face, online, and self-guided) to accommodate different learning styles and work schedules. The RAND Institute, in a review of benefits and savings of early childhood intervention programs, calculated that for every dollar invested in such programs, there is an estimated return of $2.50 to $4.00. That means that the return on investment within the state of Arkansas for our child care professional training programs is between $1.19 and $1.90 million. In 2017, 1,130 child care professionals successfully completed over 90,000 hours of training. As a result of the training, 88% of participants indicated they intended to change at least one behavior or practice.

The Arkansas Extension Homemakers Council and the Division of Agriculture Cooperative Extension Service are partners in providing education to families throughout Arkansas. The Arkansas Extension Homemakers Council's mission is to empower individuals and families to improve their lives through continuing education, leadership development, and community service. The organization is one of

the largest nonprofit volunteer groups in the state with a membership of 4,400 in over 350 clubs. In 2017, Extension Homemakers served as volunteers in many capacities, contributing a total of 562,622 volunteer hours, with a value of $13,581,695.

Both the Division of Agriculture and UAPB are uniquely positioned to teach and demonstrate scientific exploration. In 2017, 123,891 young people in Arkansas's 75 counties were reached through some aspect of the Arkansas 4-H youth development program. Eight hundred and sixteen 4-H Clubs across Arkansas involved young people in hands-on education and service learning opportunities that enhanced their life skills, including decision making, problem solving, critical thinking, communications, service learning, and healthy lifestyle choices. In 2017, the 4-H program focused on three initiative areas: Healthy Living, 4-H Science and Citizenship Leadership. Impact programs were delivered in each of the areas (Yoga for Kids, ATV Safety, Robotics, Shooting Sports, Citizenship/Leadership Camp, One Day of Service, 4-H Day at the Capital, and Civic Engagement activities). As a result of Division of Agriculture and UAPB 4-H youth programs, 35,861 expressed an interest and engaged in science-related activities. The Ag Discovery program from UAPB has aided in youth having a better understanding of agriculture, its industry and communities. UAPB conducted the 2017 Youth Fishing Outreach Program: The Arkansas Collegiate Series attracted 85 students from 13 institutions in Arkansas, Missouri and Texas. The ratio of return on the Fisheries Center investment in the tournament to Arkansas was $37.62 - $56.54 for every $1 invested. Also, UAPB conducted its annual Youth Conservation Field Day which included education on conservation for 150 students and information on careers in Agriculture from 38 speakers.

Volunteer leaders are essential in the delivery and execution of programs with community clubs, project clubs, spin clubs, service learning and special interest activities. During 2017, 4-H volunteers contributed 163,760 hours of time to the 4-H program, which was valued at $3,953,166.

Economic and Community Development

Economics and community development programs have focused on assisting businesses and entrepreneurs, helping communities and regions to improve their economic viability and quality of life, increasing civic engagement, and leadership development.

Business and entrepreneurship programs provided by the Division of Agriculture included technical assistance for entrepreneurs interested in starting or growing there businesses; programs for agricultural businesses seeking to start or diversify through agritourism and direct marketing to consumers; the Arkansas Procurement Assistance Center (APAC); and annual Income Tax Schools for accountants and professional tax preparers. Programs also educated community leaders about strategies they can employ to better support entrepreneurs and business development.

Community and economic development programming through APAC's training and one-on-one technical assistance continued to produce significant value for Arkansans. In 2017, 1,161 local, state and federal contracts were awarded Arkansas' client businesses, worth approximately $92.9 million in contract value. Overall, the Division's business and entrepreneurship programs resulted in 2,177 jobs created or retained and 82 businesses created, retained, or expanded

Programs to help communities and regions improve their economic viability and quality of life included facilitation for visioning, strategic and action planning, economic impact and opportunity analyses, and technical assistance in implementing community and economic development plans. These programs resulted in steps to adopt and implement 35 plans across the state and 42 new alliances or partnerships. Over $402,000 in grants and in-kind support was reported as being generated by organizations, communities and regions to support their community and economic development efforts.

Policy research and education remain important priorities, particularly in training county agents to deal with controversial issues, developing unbiased policy representative educational materials and educating the public regarding complex ballot questions, and policy issues. The Division of Agriculture's Public Policy Center and National Agricultural Law Center play an integral role in these programs. There were seven ballot measures proposed during November 2016 statewide general election. An Arkansas Ballot Issue Voter Guide was developed and over 23,000 were printed and distributed throughout the state. In addition to print, online resources were shared on the Extension's ballot website in the form of newsletters, PDF guides, and educational videos. This website attracted over 300,000 views. Social media

was also used to reach an additional 50,000 people.

Leadership development programs included both local and statewide leadership training seminars and fellowships. This system engages resources of the UA Division of Agriculture at every level. Leadership efforts span the program emphasis areas and demographics of Extension clientele. LeadAR, our two-year statewide rural and agricultural leadership program, is connected to an international network of leadership programs (IAPAL). The LeadAR program has proven effective in educating a diverse pool of leaders from the public, non-profit and private sectors. The network of trained leaders now counts over 460 graduates as LeadAR alumni, with the 17th class graduating 22 participants in 2017. Alumni continue to support the program and each other through their own nonprofit organization, the Arkansas Association of LeadAR Alumni.

The efforts of the University of Arkansas System Division of Agriculture and University of Arkansas Pine Bluff research scientists and Extension educators in the five identified focus areas described in this Report of Accomplishments have continued to contribute to the discovery of new knowledge, the dissemination of needed educational programs and the well-being of Arkansans and their communities in 2017.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	328.4	22.1	465.5	27.2
Actual	372.9	21.9	449.9	28.2

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
- Expert Peer Review

2. Brief Explanation

Programs went through a three-tiered review process:

1. Stakeholder program identification and review
2. Administrative approval and review
3. External review

Stakeholder Program Identification and Review

Stakeholder input into program identification and review was derived from both formal and informal means for all program areas. Public comment on current and future Extension and research programs was obtained from county and community meetings, commodity and community associations, commodity check-off boards, state legislative committees and open public forms concerning specific issues. Open public meetings, field days and county and regional production meetings provided forums for stakeholder input open to under-served or under-represented individuals, groups or organizations.

For the Division of Agriculture Extension, county councils and advisory groups met during the summers of 2016 and 2017 (at a minimum) to provide input, feedback and/or review of program implementation, redirection, or newly identified needs. Members of these groups were invited to participate in programs, field days, special tours, workshops and conferences throughout the year and for the duration of the program. All reviews of research and Extension programs included a stakeholder member or members of the community or industry most influenced by the program area. Open public forums were held to address specific issues of importance to the stakeholder community or industry.

Administrative Approval and Review

Identified planned program areas for research and Extension activities were administratively reviewed and approved by the Director of the Agricultural Experiment Station and/or Cooperative Extension Service, as appropriate, within the context of the Division of Agriculture's Strategic Plan and the specific needs identified by stakeholder groups. Smith-Lever, Hatch, McIntire-Stennis, Animal Health and regional research projects were administratively reviewed and approved by the subject matter department head and the director of the Arkansas Agricultural Station. All research projects were reviewed by three outside scientists prior to submission to the respective subject matter department head and the experiment station.

External Review

Merit review is conducted as part of the Division of Agriculture's on-going program review process. The reviews have been department or programmatic and cut across departments. Reviews are scheduled on a five to seven-year cycle and conducted concurrently for research, Extension and instruction. All reviews have been conducted by a team of recognized outside research, Extension and teaching professionals balanced to reflect the programmatic needs and diversity. All reviews include one or more stakeholders. The actual review process involves a period of self-study, followed by program assessment and bench marking. The review team evaluates the programs' effectiveness relative to the stated mission and goals of the department or program as well as the needs of stakeholders. Following the outside review teams' written evaluation, the department or program prepares a response to the review. The Division of Agriculture and University administration then meet with the department or program faculty one more time to develop a plan for implementing changes. As a result, annual progress is reported to Division and University administration.

External review of the University of Arkansas Pine Bluff Agriculture Department was conducted during Fall 2011 and concluded in Fall 2012. One of the suggestions for the review was that the Department should develop an advisory board for review of academic programs. Although there is an advisory board for research and Extension programs, none exists for academic programs. The Regulatory Science Program which is a component of the Agriculture Department, successfully underwent an external review in Fall 2014. Reviewers suggested including distance education courses to the program's future priorities. The Aquaculture/Fisheries program underwent a program review in 2015.

III. Stakeholder Input

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

- Other (County Extension Council and program advisory committee planning meetings.)

Brief explanation.

The University of Arkansas System Division of Agriculture and the University of Arkansas Pine Bluff have utilized both formal and informal mechanisms for ensuring the planned programs address areas of strategic importance to the state.

Each Division of Agriculture planned program was based on the needs identified in a series

of electronically delivered surveys with current and potential stakeholders representing the diversity of the population in the regions and state. Single issue and county level meetings were held as needed to address emerging issues and to craft additional program responses if needed to promptly address the problem.

The University of Arkansas Pine Bluff Dean/Research Director uses formal stakeholder input developed by the Agriculture Research & Extension Council. Aquaculture and Fisheries is in the process of reconstituting their advisory Board, and relied on meetings with Producer Association Groups and Arkansas Game and Fish Commission for research and extension input in 2017. All stakeholder groups provide meaningful suggestions for programmatic improvements. The Agriculture Research and Extension Council met summer and winter 2014 and summer 2015.

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
- Needs Assessments
- Use Surveys

Brief explanation.

In 2016, the University of Arkansas Division of Agriculture sought input from diverse stakeholder groups. Stakeholders serve on county councils, advisory committees, and boards that advise and oversee the work of the Division. Individuals and stakeholder groups were identified by Arkansas Experiment Station faculty and administrators and by asking county Extension staffs to identify individuals in their local communities who were representative of one or more of the following fifteen stakeholder categories: county services (e.g., DHS, Food Bank or Pantry); financial sector (e.g., banks, agricultural lending, investments); faith-based sector (e.g., church, youth minister); education (public, private, vocational); commercial sector (e.g., chambers of commerce, industry); health (e.g., hospital, public health, doctor); agricultural production; agricultural businesses; county Extension council; 4-H program (e.g., leader, teen, alumni, foundation); government official (e.g., county, city); Extension homemaker; natural resources (e.g., wildlife, forestry, conservation); media (e.g., radio, newspaper, television); and youth services (e.g., community center, youth organizations). In addition to these criteria, Extension agents were also asked to identify individuals within the fifteen categories who were representative of the gender, racial, ethnic, and socioeconomic demographic make-up of the counties.

For UAPB, stakeholder input is a core component of all 1890 research and Extension programs. Means for acquiring input varies depending upon the nature of the research or Extension program and the diversity of relevant stakeholders. These include local and state agencies, community groups, producers and other targeted audiences, as well as business and industry groups. Producer meetings, advisory groups, conferences, and focus group discussions are major means for gaining input. Our stakeholder input process is structured individually by departments/schools to represent the differences in audiences served. This approach is taken because the clientele's needs for research and Extension assistance in programs other than aquaculture are broad in scope, local in nature and geographically limited. While the Aquaculture Program provides research and Extension support for all aquaculture producers in the state, other programs support under-served and diverse audiences.

The Agriculture Research and Extension Advisory Council (AREAC)
Members will serve on the Counsel for a three year rotating basis. Membership includes seven (7) producers engaged in a variety of agricultural enterprises (i.e. alternative crops, row crops, livestock,

etc.) one (1) retired Extension professional (from 1862 system) two (2) federal agency (NRCS, FSA) representatives, four state agency (Arkansas Department of Environmental Quality, Rural Development, Arkansas Land and Farm Development, and Arkansas Natural Resources Commission) representatives and two (2) industry (Monsanto, Delta Yams) representatives. The broad based representation of Council membership provides a broadened perspective of challenges facing producers and promotes the creation of partnerships to address the challenges.

The Aquaculture-Fisheries Center of Excellence Advisory Committee
Historically, the primary advisory committee that provided feedback and input into the UAPB Aquaculture/Fisheries Program has been the National Aquaculture/Fisheries Advisory Council. This program is under new leadership, and we are reconstituting our advisory Board. As before, it will include representation from catfish, baitfish, and sport fish farms, feed mills, Arkansas Game and Fish Commission, U.S. Fish and Wildlife Service, and other state university programs. Some committee members also serve as representatives for other state and national aquaculture industry organizations, so that these individuals contribute a much broader perspective to advisory committee meetings than their formal capacity might otherwise suggest. The new Committee will contain a more balanced selection of members from the different stakeholder groups.

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
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public
- Other (Meeting with regulatory groups, state agencies, & commodity prom)

Brief explanation.

During the summer of 2016, Division of Agriculture Extension faculty met with county council members and program sub-committees to identify local needs for the program planning year beginning October first. County profiles developed by state faculty were utilized to examine the diversity of needs and to understand the changing demographics within each county. Stakeholder developed materials, such as the Farm Bureau policy development process was used to identify research needs. Several priority-setting activities were scheduled during 2016 with specific commodity and stakeholder groups to seek input on the research planning process.
In addition to the standard methods of obtaining stakeholder input described above, in 2010, the University of Arkansas System Division of Agriculture updated its strategic plan. The 2011-2015 strategic plan for the Division included input from internal and external stakeholders statewide. A total of 780 internal and external stakeholders participated in these processes. Specific surveys were conducted with individuals representing underserved or under-represented groups, women in agriculture and small farm operation producers. With the expiration of the current strategic plan, the University of Arkansas System Division of Agriculture is in the progress of creating a new strategic plan. The new strategic plan was not completed before the beginning of the 2017 program year, thus the previous strategic plan continued to be utilized.
For UAPB Extension and Research, informal input from stakeholders is presented and discussed at

formal meetings with research faculty and staff. Strategies are developed to address identified concerns as appropriate. Faculty are represented on all structured committees for purposes of participating in the discussion and gathering the input from stakeholders that will later be presented back to faculty and staff.

The most recent stakeholder meeting resulted in suggestions by the group for conducting research that will provide a foundation for introducing additional herbicides for weed control in sweet potato production. Both graduate research projects and a faculty research program have been developed to address this stakeholder issue. Conversely, an individual stakeholder suggested that the research we currently conduct with straight head disease in rice was not important for our clientele. This is an instance where the Director must weigh the comments of the individual with the needs of the overall state and other agricultural clientele. Other suggestions included holding additional meetings each year during Agriculture Field Days, and taking care not to shift a disproportionate amount of the attention to the new foundation sweet potato seed program to the detriment of other 1890 agricultural programs.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Action Plans
- To Set Priorities
- Other (Strategic Planning)

Brief explanation.

Division of Agriculture Research and Extension faculty and scientists met with administration to discuss stakeholder needs solicited at meetings throughout the year. Identified needs were integrated into the Extension and research planning process to ensure program relevance. Several departments and many of our institutes and centers maintain external advisory boards that provide direct feedback to the unit on the specific research or educational program. Stakeholder representatives served on most policy-setting groups or program reviews to ensure that the public has a voice in the decision-making process and in program evaluation. Special meetings were held as needed to address major issues impacting any stakeholder group. Stakeholder input remains vital to ensuring program relevance, and each year programs are adjusted to address identified needs.

For UAPB Extension and Research, the input from stakeholders has been incorporated into outreach efforts with sweet potato outreach programs and enhanced technical support for value-added processing with various agricultural commodities. The most recent stakeholder meeting resulted in suggestions by the group for conducting research that will provide a foundation for introducing additional herbicides for use in sweet potato production. Both graduate research projects and faculty research programs have been developed to address this stakeholder issue. Aquaculture and Fisheries has also incorporated stakeholder input into research proposals and into extension workshops and other extension efforts.

Brief Explanation of what you learned from your Stakeholders

Stakeholders want to be involved. Due to the size and scope of the University of Arkansas System Division of Agriculture and UAPB, reporting all specific stakeholder feedback would exceed the space allocation for this item. Stakeholders are involved in identification of Extension and research needs and priorities.

For UAPB Extension and Research, input from stakeholders through the agricultural Extension

agents and program assistants in the field continue to play a major part in program development. Farmers and packing house operators continue to voice the need to support increasing sweet potato production in Arkansas. Sweet potato research was expanded in the area of product development and the Extension program has given increased attention to farmer production problems.
Aquaculture-Fisheries uses feedback from Producer groups and Arkansas Game and Fish Commission to help plan research and Extension programs. Particular interests center around developing techniques for producing food fish more economically, and to address the effects of invasive species on natural fisheries.
Division of Agriculture stakeholders participate in establishing annual Cooperative Extension program priorities for each of the 75 counties in Arkansas. During the statewide listening sessions in support of the Division of Agriculture five-year strategic plan, 172 policy makers and key community and state organizational leaders considered critical and emerging needs within our state, and the role of the Division in addressing those needs. This group voiced their concerns about population changes across the state and challenges facing communities in a competitive economy. We heard comments concerning the different issues Arkansans must struggle with every day, including maintaining a competitive edge in agriculture and childhood health and obesity.
The following emphasis areas were identified for 2011-2015:
• Agricultural Production and Processing
• Environment, Energy and Climate
• Access to Safe and Nutritious Food
• Increasing Opportunities for Families and Youth
• Economic and Community Development
The Division of Agriculture's 2011-2015 Strategic Plan outlines the specific objectives for each area and is based on what we learned from our stakeholders. The 2011-2015 strategic plan was extended, while the 2017-2022 strategic plan was being developed. The 2017-2022 strategic plan was not completed until after the beginning of the 2017 program year, thus the previous strategic plan continued to be used.

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	4455007	2076963	4275443	2494668
Actual Matching	5995552	1966762	55543056	1878520
Actual All Other	46645936	0	5894739	0
Total Actual Expended	57096495	4043725	65713238	4373188

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	4455007	193875	52080	490633

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural Production & Processing

☑ 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	13%	0%	10%	0%
111	Conservation and Efficient Use of Water	4%	0%	5%	0%
112	Watershed Protection and Management	4%	0%	6%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	4%	0%	10%	5%
204	Plant Product Quality and Utility (Preharvest)	6%	17%	9%	8%
205	Plant Management Systems	20%	27%	1%	15%
206	Basic Plant Biology	0%	0%	2%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	1%	0%	2%	0%
212	Pathogens and Nematodes Affecting Plants	1%	0%	1%	0%
213	Weeds Affecting Plants	7%	0%	9%	0%
216	Integrated Pest Management Systems	20%	0%	4%	0%
301	Reproductive Performance of Animals	2%	0%	4%	0%
302	Nutrient Utilization in Animals	2%	0%	7%	8%
303	Genetic Improvement of Animals	2%	0%	4%	0%
306	Environmental Stress in Animals	4%	0%	8%	0%
307	Animal Management Systems	2%	37%	5%	39%
311	Animal Diseases	4%	16%	7%	5%
601	Economics of Agricultural Production and Farm Management	4%	2%	6%	9%
603	Market Economics	0%	1%	0%	8%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%	0%	0%	3%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	110.3	17.0	263.0	20.0
Actual Paid	119.8	13.4	262.6	22.6
Actual Volunteer	44.2	0.0	3.1	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**
1800706	1459224	2649728	2198526
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2423391	1306032	35701460	1485822
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
18854200	0	2647475	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Arkansas has abundant natural resources which drive a vibrant agricultural sector. There exists a host of economic, social and environmental motivations to maintain and protect those resources which are sometimes in competition. Balancing socioeconomic development with environmental protection is a complex, dynamic integrated system. The challenges of unique water demands, changing land ownership patterns, scrutinized regulations, and an often diverse public perception requires heightened scientific understanding and demonstration of sustainability issues.

Arkansas' agriculture and food sector, when expressed as a percentage of total GDP, is much greater (11% of Arkansas' GDP) than for any of the contiguous states, and is 2.7 times higher than for the U.S. as a whole. Animal production cash receipts (which measure income and sales from marketing) in Arkansas saw an increase from $5.1B in 1997 to $5.3B in 2014, representing a 4.6% gain in value.

Educational programming and on-farm demonstration has been used to promote the adoption of irrigation water management practices (IWM) in Arkansas and the region. Specifically the target audience has been trained to use the following IWM practices: 1) measurement of irrigation water flow and proper use of flow meters, 2) computerized hole selection for lay flat poly pipe which is a conservation practice that improves distribution uniformity in furrow irrigation, 3) surge irrigation a practices that improves irrigation efficiency and uniformity, 4) soil moisture monitoring, a practice that improves irrigation management and irrigation timing, 5) ET-based scheduling techniques which improve irrigation timing, and 6) pumping plant performance which improves water management and improves energy efficiency. The programs provide education through one-on-one work with the target audiences, on-farm demonstration, meetings and conferences. To date there are over 250 registered users of the app that have set up 309 farms and 510 individual fields. Over 4,600 levees were created by users compromising 47,000 acres or MIRI rice. Over 143 miles of lay flat pipe poly pipe have been planned in the app. Educational efforts on Pipe Planner alone have led to increased adoption of computerized hole selection to now over 1 Million acres. Pipe Planner has reported that this is a 65% increase in fields enrolled in the last year alone. Multiple Inlet Rice

Irrigation (MIRI) has increased to nearly half of our rice acres. In 2017, MIRI was introduced to the first commercial Rice field ever successfully grown in Arkansas in 1901. After one season the family has decided that MIRI is the only way to irrigate Rice and were thrilled with the results. They typically pump around 30 acre inches according to their farms historical records, yet pumped only 15 acre inches this season using MIRI, surface water, and AWD (Alternate Wetting and Drying). That's a 50% reduction in irrigation water pumped and he spent $27.34 per acre. In comparison, using a deep well and pumping 30 acre inches their cost was $74 per acre. That's $46.66 less input per acre and an astounding 63% savings over his normal energy bill. Irrigation Moisture Sensors have been used in several demonstrations across the state and are slowly becoming the trend in irrigation scheduling. A producer in the central part of the state reported corn yields at or better than normal with 1 to 3 irrigation events instead of his normal 8-12 range because of the moisture sensors and abundant rainfall received during the growing season. Our collaborative irrigation efforts on Irrigation Water Management are making substantial economic impacts and leading to long-term sustainability of our aquifers and other natural resources.

The Blackberry School resulted in 13 recorded talks and 4 "How-to" videos were used to conduct a webinar series with county agents from across the SE. The webinars were held in 4 sessions on consecutive Thursdays over 4 weeks in late October to mid-November. Each class consisted of a mixture of 3-4 recorded lectures and one "How-to" video to demonstrate a specific skill or concept. For each class the recorded talks were played and then followed by 5 minutes of a Q&A session live with each speaker. Each class was 2 hours long and a 5 minute break was held around half-way through. On average we trained 43 county agents per each 2 hour long session, with a total of 71 agents trained in at least one session. Thirteen agents from University of Arkansas CES were trained. We set up the course in LEARN so that CES agents would get in-service training credits for attending. County agents were also asked to complete pre-tests prior to the webinar and a post-test after the webinar to evaluate the effectiveness of our teaching style via the web-based medium. The recorded videos, and slide hand-outs were posted to the SRSFC website immediately following the live webinar. The videos are posted on the SRSFC website at: www. www.Smallfruits.org/blackberryschool and on the University of Arkansas Cooperative Extension Service website at www.uaex.edu/blackberryschool.

Twenty-nine percent of the rice grown in Arkansas in 2017 was comprised of varieties developed in the Arkansas rice variety improvement program. When the program was started in 1980, the average rough rice yield in Arkansas was only 4,110 lbs/acre compared to an estimated 7400 lbs/acre in 2017. Assigning a conservative value of 60 percent of this 3290 lbs/acre yield increase to Arkansas varieties, the average monetary gain in 2017 over 1980, at a rough rice price of $11.98/cwt, would be $236/acre or $258 million for the 1.093 million acres harvested in Arkansas in 2017, of which $75 million is due to the improvement of Arkansas varieties.

The University of Arkansas Division of Agriculture's soil fertility team began looking at the Greenseeker handheld for midseason N management in rice production systems in Arkansas. As many as 45 N response trials have been located across the Delta region of Arkansas on both silt loam and clay soils to help develop N management tools for Arkansas rice producers. Initial results indicated that by using a High nitrogen check plot that has adequate N in each field, producers can compare their field level nitrogen program to that of the High nitrogen reference plot to determine if they will benefit from additional nitrogen at midseason. Currently the recommendation involves a response index (RI) where a value greater than 1.2 indicates a 100% chance of yield increase from midseason. A RI of 1.15 results in a 50% yield increase from midseason nitrogen and a RI of 1.10 means you will get a yield increase less than 10% of the time. The work conducted by our program will allow producers to gauge if their rice crop will benefit from additional nitrogen at midseason without the risk of yield loss from over- or under-fertilization. When you consider the cost of nitrogen fertilizer and application costs, at a minimum producers that don't need midseason nitrogen fertilizer can save as much as $30 per acre. For producers that are potentially leaving yield on the table or lose yield due to over fertilization the benefits can reach or exceed $100 per acre.

Since the inception of the Soybean Research Verification Program (SRVP), over 600 commercial soybean fields in 41 of the 75 counties in Arkansas have been enrolled in the program. In 2017, 19 fields in Arkansas, Ashley, Clark, Clay, Conway, Crawford, Crittenden, Cross, Desha, Jefferson, Lincoln, Lonoke, Miller, Phillips, Prairie, Pulaski, Randolph, St. Francis, and Washington County were enrolled in the

SRVP. These fields averaged 62.4 bushel per acre, compared to the State average of 50 bushels per acre. Many producers that have participated in the SRVP have indicated that the program has made them more aware of the need for timely production practices. Some of these practices include timely irrigations and the use of new technologies to improve irrigation efficiency, timely pesticide applications to control weeds, insects, and diseases, and proper variety selection. Every summer, all of the row crop commodity Verification Programs are showcased with a field tour. In 2017, this field tour was conducted in the Arkansas River Valley with over 40 producers, consultants, industry personnel, and Division faculty and staff attending the tour.
UA Division of Agriculture collaborated with Arkansas Department of Health and Human Services and Arkansas Farmers Market Association (AFMA) to promote opportunities and benefits for vendors, farmers and farmers markets, to sign up as a SNAP vendor. For the last five years, focused activities using Arkansas Market Maker and the AFMA annual meeting were used to train potential vendors on the program sign-up process and potential business benefits including accepting Electronic Benefits Transfer (EBT) transactions and SNAP incentives like Double Up Food Bucks--a program that matches SNAP dollars spent at farmers markets. SNAP benefit programs have become an annual feature of the statewide AFMA annual meetings held in January. SNAP/EBT acceptance has been a feature highlighted within the MarketMaker program. In 2017, Arkansas became the first state among the MarketMaker state partners to highlight SNAP vendor as a searchable "affiliate" using a designate SNAP logo. This feature allows for consumers to easily identify farm and farmers market locations that accept SNAP benefits using the online resource. Arkansas MarketMaker staff and program effectively built and leveraged relationships with HHS and AFMA to directly engage farmers and market managers. Arkansas Department of Health and Human Services data reveal that in 2016, farmers markets accepted SNAP benefits at forty (40) locations with benefit sales of $50,320. These figures represent an increase of 150% in the number of markets accepting SNAP benefits and a 59% increase in sales (redemptions) since 2012. The department reported 36 individual farmers been approved SNAP vendors for 2016 which represents an increase of 35 farmers.
Twenty (20) Socially Disadvantaged Livestock Producers (SDLPs)received $200,000 in EQIP funding to help them install conservation practices (water wells, water troughs, underground pipeline, cross fencing to practice rotational grazing, gravel around feeding and water troughs (heavy use areas) to prevent erosion and mudding. The rotational grazing helped SDLPs increase their grazing efficiency by 10%. The installation of water wells and water troughs helped SDPLs decrease their labor cost. The enhancement practices required by the CSP Program (Bush-hogging, moving mineral blocks) made their pastures look much better and each SDLPs received $1500 or more in annual payments. A SDLPs cluster (3 or farmers) was formed when 5 SDLPs cut and baled hay together. The cluster member also vaccinated their cows using one squeeze chutes purchased by a group member. Consequently, some SDLPs are working together.
UAPB assisted approximately 50 SDPs who diversified or added vegetables to their operations. Many of these producers used the NRCS Environmental Quality Incentive Program (EQIP) to obtain $150,000 in EQIP Funds to add high tunnels and irrigation wells to their operations. SDPs in northeastern AR were assisted by EAEC in selling 223,517 pounds of fresh vegetables to local schools. And, the UAPB Extension Associate in central AR assisted SDPs in identifying local retail markets. SDPs were also assisted in obtaining $100,000 in USDA loan funds and 12 SDPs were assisted in signing up for the Noninsured Assistance Program (NAP) or basic catastrophic insurance for their vegetable crops.

2. Brief description of the target audience

Small and Socially Disadvantaged Farmers (SSDF)
Agricultural food crop growers/producers/consultants
Livestock producers
Non-traditional and small flock poultry producers

Commercial poultry producers
Commercial poultry company personnel
Aquaculture and aquaponics producers/consultants
Beekeepers
Local, niche producers
Farm Pond Owners
Non-farm private landowners
Agricultural consultants
Agribusiness/allied
Industry personnel
Horticulture production and service business personnel
Local, state and federal agency personnel
Master gardeners
4-H youth and volunteers
Community leaders
Policy and decision makers
Low-income families with children
Low-income older adults
Hispanic/Latino families
African-American families
Female producers
Veterans
First responder emergency personnel
Research funders
General public
Policy makers
Water and Natural Resource personnel
Supply chain managers
Processors
Biotech industry
Value-added industry
Community Based Organizations

3. How was eXtension used?

eXtension was used by three specialists to act as experts and to consult with colleagues.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1257965	4778212	64214	125129

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

Year:	2017
Actual:	4

Patents listed

US 9,752,099.Conjugated Linoleic Acid Rich Vegetable Oil Production using Heterogenous Catalysis. 9/5/17. Andrew Proctor.

Blueberry plant named 'Norman'. 10/10/17. JohnClark, et.al.

US 9,603,915. Compositions and Methods of Enhancing Immune Responses to Eimeria Limiting Eimeria Infection. 3/28/17. Billy Hargis, et.al.

Soybean UA5814HP Patent number: 9,622,444 issued 4/18/17 Inventor P. Chen

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	27	231	258

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of agricultural production education meetings related to food, fiber and non-food plant and animal production

Year	Actual
2017	681

Output #2

Output Measure

- # of demonstrations/on-farm research related to food, fiber and non-food plant and animal production

Year	Actual
2017	1761

Output #3

Output Measure

- # of farm visits related to food, fiber and non-food plant and animal production

Year	Actual

2017	4075

Output #4

Output Measure

- # of field days related to food, fiber and non-food plant and animal production

Year	Actual
2017	137

Output #5

Output Measure

- # of educational materials distributed related to food, fiber and non-food plant and animal production

Year	Actual
2017	40760

Output #6

Output Measure

- # of website visitors and downloads related to food, fiber and non-food plant and animal production

Year	Actual
2017	611943

Output #7

Output Measure

- # of diagnostic samples related to food, fiber and non-food plant and animal production

Year	Actual
2017	244566

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of clientele using improved crop best management practices.
2	# of clientele using improved fish farming best management practices
3	# of livestock producers using best management practices.
4	# of poultry producers using best management practices.
5	# of crop varieties or germplasm lines released.
6	# of producers using improved biosecurity practices
7	# of diagnostic plant health and nematode samples submitted.
8	# of fish samples submitted for disease testing.
9	# of fish samples submitted for disease-free certification.
10	# of samples submitted for exotic animal or poultry disease testing.
11	# of small and socially disadvantaged farmers reporting increased profitability
12	# of clientele who initiated specialty food-related enterprises
13	# of producers adopting herbicide resistance best management practices.
14	# of pesticide applicator training participants certified or re-certified
15	# of small or socially disadvantaged farmers adopting crop best management practices
16	# of Master Gardener participants trained, certified and re-certified.
17	# of small or socially disadvantaged farmers adopting more diverse crops

18	# of small or socially disadvantaged farmers adopting livestock best management practices
19	# of new ideas/concepts for textile structures/end products from bio-fibers
20	# of acres using improved crop best management practices.
21	# of clientele adopting non-food plant best management practices

Outcome #1

1. Outcome Measures

# of clientele using improved crop best management practices.

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
2017	190677

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
During 2017, Arkansas ranked 11th nationally with 3,530,000 acres of soybean planted, and a state average yield of 50 bushels per acre which would be a new state record. Over the past several years, some of the production challenges that Arkansas soybean producers have faced are populations of Palmer amaranth that are resistant to glyphosate and the PPO chemistry, strobilurin-resistant frogeye leaf spot, increased numbers of corn earworms, more production fields exhibiting elevated chloride concentrations, proper irrigation practices, and new herbicide technologies.

What has been done
To educate soybean producers on current Division of Agriculture production recommendations for soybean production, producers can enroll in the Soybean Research Verification Program (SRVP). The 2017 growing season was the thirty-third year for the SRVP. The SRVP is an

interdisciplinary effort between producers, county Extension agents, Division of Agriculture specialist, and researchers. The SRVP is an on-farm demonstration of all the research-based recommendations required to produce soybean profitably in Arkansas.

Results

Since the inception of the SRVP, over 600 commercial soybean fields in 41 of the 75 counties in Arkansas have been enrolled in the program. These fields averaged 62.4 bushel per acre, compared to the State average of 50 bushels per acre. Many producers that have participated in the SRVP have indicated that the program has made them more aware of the need for timely production practices. Some of these practices include timely irrigations and the use of new technologies to improve irrigation efficiency, timely pesticide applications to control weeds, insects, and diseases, and proper variety selection. Every summer, all of the row crop commodity Verification Programs are showcased with a field tour.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

# of clientele using improved fish farming best management practices

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	39

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Triploid grass carp inspection containing no diploids must be passed before shipments of triploid grass carp can be made. The current triploid grass carp inspection program was implemented by USFWS in January 2010. In this program, 120 randomly selected fish are required for triploid inspection for every 1500 triploid grass carp to be certified. Before 2010, every 10,000 fish to be certified required a sample of 120 fish to be inspected. After 2010, a more stringent rule (a tough standard) is implemented in the program. Is this increase of sample size necessary? Research is needed to address this issue related to triploid grass carp inspection.

What has been done
Data was collected from Arkansas grass carp fish farms from 2010-2011. The incidence rate (the probability of finding diploids among triploids) ranged from 0 to 0.065 among the five inspected lots. There was no significant difference in incidence rates among the five lot sizes. Therefore, incidence rates can be pooled over the five lot sizes. The overall mean incidence rate is 0.0391. Simple proportion studies showed that a sample of 102 and 103 for large population sizes of 10,000 and 100,000,000, respectively, are required to be accurate to within 0.03 with 95% confidence.. A total of 97 fish are required for a small group of 1500 triploid grass carp to be certified. The requirement of 120 randomly selected fish for triploid inspection for every 1500 triploid grass carp to be certified is overestimated based on the historical data

Results
The use of all diploid grass carp is prohibited except for permitted diploid brood stock at appropriately licensed facilities. Triploid grass carp inspection must reveal no diploids before the fish can be shipped. An automated particle sizer is the standard method used today to differentiate diploid and triploid blood cells. Producers will have to individually check the group of grass carp for ploidy prior to the inspection by USFWS inspector.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

of livestock producers using best management practices.

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
2017	4253

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas livestock producers face escalating production costs of feed, fertilizer, and fuel. Feeding expenses, both hay and supplements, are the biggest single cost of livestock production. The typical winter hay feeding season in Arkansas is about 135 days and feeding also occurs during drought. Time required for producing, harvesting, and feeding hay is a tremendous expense that reduces farm profitability. This program is designed to show cost-effective forage management practices and to find areas to reduce time spent harvesting and feeding hay to improve profitability.

What has been done
Producers that used the Arkansas 300 Days Grazing system reduced their winter feeding period and associated expenses and time significantly. Educational programs were combined with on-farm demonstrations of key management practices to measure cost savings and time savings compared to hay feeding and typical management. The management practices were 1) stockpiling forages, 2) growing winter annual forage, 3) improving grazing management, 4) improving hay storage and feeding.

Results
Previous surveys indicate that 60% of producers either use stockpiled forages to reduce winter hay feeding or they plant winter annual forages to reduce winter feeding. There are 23,442 beef producers in Arkansas (2012 USDA Ag Census). At a savings rate determined from our demonstrations, the total amount of positive statewide impact is $27,891,000 from improved forage practices associated with extension forage education.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals

303	Genetic Improvement of Animals
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

# of poultry producers using best management practices.

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
2017	547

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Avian Influenza continues to be of concern to the US and world poultry industries and public health officials. The two avian strains of greatest concern are the H5 and H7 types. In addition another strain the Swine flu variant of H3N2 has been seen in county fair pigs and has caused illness in people.

In 2014- 015 an outbreak of High Path H5N1 Avian Influenza (AI), was the largest animal health emergency in the history of the United States; affecting multiple states, including Arkansas. The disease outbreak caused the death and destruction of over 49 million+ birds with federal costs in disease control and indemnity exceeding 1 billion US dollars. H5N1 (Asian strain) continues to be a problem in China, Africa, and Europe.

What has been done
Dr. Clark serves as an educational resource and provides information and trainings on disease recognition, poultry diseases, and Biosecurity practices to the commercial poultry industry, hobbyists, poultry producers, animal owners, veterinarians, etc.

This was accomplished by the following:
-farm/premise visits
-Disease diagnosis by phone, e-mail, or visits
-Distribution of Extension Fact Sheets, information on AI, and copies of DVDs
-staffed displays
-Information on the Extension website and distributed information to county agents
-Information packets to the 4H pullet chain participants
-Presentations
-Biosecurity information/presence at the Arkansas state fair, AR-OK state fair, district fairs, and Arkansas county fairs
-Short courses on Avian Influenza and poultry for the USDA/APHIS/VS employees

Results
Continued educational outreach to growers in the poultry industry and hobby and small flock owners are a vital link in Biosecurity efforts to prevent an outbreak of AI or any disease. Commercial poultry growers continue to be vigilant with Biosecurity efforts to prevent disease in their flocks. The hobby of keeping poultry continues to increase and the seminars conducted with small flock owners have been successful and shown them that they have a source of information available to them that can help them, the Arkansas Cooperative Extension Service

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #5

1. Outcome Measures

# of crop varieties or germplasm lines released.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Transgenic cotton varieties were introduced into Arkansas in 1995, and now occupy more than 95% of acreage each year. The advent of glyphosate-resistant weeds and the availability of improved insecticides have renewed interest in conventional varieties. A competitively high yielding, early maturing, conventional variety is needed as an alternative for producers wanting to reduce seed technology costs. Since the varieties best adapted to Arkansas generally lack outstanding fiber quality, marketing of Delta-grown cotton suffers in tight market conditions. By improving fiber quality, Arkansas cotton producers will have a competitive edge over other cotton production areas.

What has been done
The Arkansas Agricultural Experiment Station (AAES) released "UA48" in 2010, "UA103" and "UA222" in 2011, and "UA107" and "UA114" in 2017. All five are conventional early maturing cotton varieties which produce competitive yields in Arkansas and possess improved fiber quality. The stable length (1.29 inches), length uniformity (87%) and strength (35.5 g/tex) of UA48 established new fiber quality standards for Upland cottons.

Results
UA48, UA103, UA107, UA114 and UA222 provide alternatives for producers who wish to grow a conventional cotton variety. The performances of these varieties demonstrate that early maturation and enhanced fiber quality can be combined into well-adapted cotton varieties for Arkansas. By setting new standards for combining early maturation, competitive yields and improved fiber quality, these varieties have encouraged the development of additional varieties that has enhanced the competitiveness of Arkansas-grown cotton.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

of producers using improved biosecurity practices

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
2017	2607

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Arkansas poultry industry is the leader in the agriculture industry of Arkansas. The largest portion of the industry is broilers with Arkansas ranking third in the nation in broiler production. In Arkansas broilers are produced in 58 of the 75 counties with the counties of Washington and Benton producing the most. The state also ranks third in the nation in turkey production and third in the value of egg production. Over 136,000 jobs are provided to the citizens of Arkansas by the poultry industry. The 2014-2015 outbreak of High Path H5N1 Avian Influenza (AI), was the largest animal health emergency in the history of the United States; affecting multiple states, including Arkansas.

What has been done
Presentations on Biosecurity practices and disease recognition procedures and dissemination of Biosecurity information to individuals at seminars, county fairs, the Arkansas and Arkansas/Oklahoma state fair, short courses, 4H pullet chain delivery, e-mail, farm visits, reports, and through phone consultations was done. In addition, the impact of a disease outbreak such as Avian Influenza, Exotic Newcastle disease and other diseases on the Arkansas poultry industry and state economy was discussed. Presentations and information was also disseminated regarding Salmonella and the public health significance of the disease using the various above methods. Participants were informally surveyed and questioned as to increase in Biosecurity knowledge, their current Biosecurity practices, and intent to implement additional or more stringent practices. All participants practiced Biosecurity to some degree with their birds.

Results

Key items evaluated were the understanding of Biosecurity protocols by participants. Evaluations of on farm Biosecurity practices currently in place and discussion with owners of additional practices that could be implemented. Education is a key component of Biosecurity practices to understand the "whys" and "whats" involved in disease prevention. All 4H participants in the poultry chain had to receive Biosecurity training prior to receipt of the baby chicks, this was conducted in the county with participants signing in at the meeting(s). Another item evaluated was education of agents in Biosecurity practices to be conducted at the time of chick delivery for the 4H pullet chain. All agents practiced Biosecurity at the time of pickup and delivery of chicks. Participants in the "Backyard Poultry" on line course were evaluated as to knowledge obtained via a quiz at the end of each of the 5 modules. A certificate of participation was available to participants that successfully completed all 5 modules. Information was available at all county fairs and Extension personnel were available at most county and state fairs to discuss Biosecurity and be sure that some degree of Biosecurity was practiced. Information regarding Biosecurity and disease prevention was sent with water analyses reports and/ or reported electronically and/or via phone to provide training to growers of poultry how to prevent bacterial or mineral contamination of the water used on their farm for poultry by use of Biosecurity practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
307	Animal Management Systems
311	Animal Diseases
603	Market Economics

Outcome #7

1. Outcome Measures

# of diagnostic plant health and nematode samples submitted.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017 5367

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plant Diagnostics continue to be the major component of this position. The Plant Health Clinic program focuses on diagnoses, in addition to written information, presentations, and workshops. Outreach efforts through newsletters, displays, and presentations focus on education of Extension personnel, homeowners, growers, and professional nurserymen and Master Gardeners. This program is designed to educate, support, and assist Extension personnel, the citizens of Arkansas, and agriculture through diagnostic services and education on those topics relating to plant diseases.

What has been done
Program goals are achieved through county and state educational programs such as demonstrations, applied research, education booths, presentations, publications, newsletters, web pages, in-service training of county faculty, and news releases

Results
The Plant Health Clinic significantly impacted both Arkansas growers and Extension personnel through our diagnostic services, training sessions, and public outreach. The Clinic serves as a valuable aid to county agents in solving problems connected with Extension clients and shareholders. The Clinic collaborates with the Southern Plant Diagnostic Network, the National Plant Diagnostic Network, and the Arkansas State Plant Board to alert and train shareholders about developing threats to the agricultural and horticultural industries. Additionally, thousands of homeowners were benefited through our diagnostic services, and one-to-one personal attention to their problems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants

Outcome #8

1. Outcome Measures

of fish samples submitted for disease testing.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1670

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Detection of diseases in farmed raised fish is not as readily visible as in other terrestrial livestock species. Fish are raised in aquatic environments and are not easily visible to the farmer. Proper diagnosis of fish diseases prevents catastrophic losses to the producer. Healthy fish used as foodfish, baitfish, or for stocking waters for recreational fishing ensures the safety of seafood for human consumption and prevents the spread of diseases to other aquatic systems.

What has been done
The UAPB Fish Health Inspection lab in Lonoke, AR, conducts routine health inspections; issues health certificates for fish being shipped to other states and countries, conducts inspections for the baitfish certification program in Arkansas, analyzes water quality, and identifies aquatic weeds. The Lonoke Fish Health Inspection Lab is one of 11 APHIS approved laboratories in the US for aquatic organisms. The Pine Bluff fish health lab also conducts routine fish diagnostics and water quality analysis.

Results
In 2017, personnel at the Lonoke and Pine Bluff labs conducted 342 disease diagnostic cases (1670 fish total and 414 water quality/aquatic weed identification cases.

4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals
307	Animal Management Systems
311	Animal Diseases

Outcome #9

1. Outcome Measures

of fish samples submitted for disease-free certification.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	22225

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It is important to ensure that healthy fish are used as foodfish, baitfish, or for stocking waters for recreational fishing to ensure the safety of seafood for human consumption and to prevent the spread of diseases to other aquatic systems. The baitfish certification program at the UAPB Fish Health Inspection lab in Lonoke enables producers to be more competitive, as farmers have documentation that their fish are free of particular pathogens. This increases the number of potential markets for our farmers.

What has been done
The UAPB Fish Health Inspection lab in Lonoke, AR, issues health certificates for fish being shipped to other states and countries, and conducts inspections for the baitfish certification program in Arkansas. The Lonoke Fish Health Inspection Lab is one of 11 APHIS approved laboratories in the US for aquatic organisms.

Results
In 2017, personnel at the Lonoke lab examined over 20,000 fish to provide certification for farmers to meet the specifications of different domestic and international markets for baitfish.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #10

1. Outcome Measures

# of samples submitted for exotic animal or poultry disease testing.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	342

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #11

1. Outcome Measures

# of small and socially disadvantaged farmers reporting increased profitability

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	34

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many retired Socially Disadvantaged Producers (SDPs) are returning to eastern Arkansas to farm vegetables. However, they have no experience in growing or marketing commercial vegetables. Likewise, many former Socially Disadvantaged Row Crop farmers have decided to grow a few

acres of vegetables and they too lack experience. Information on vegetable production is limited is limited in this area due to the area being a major row crop area dominated by large (3000 acres) row crop farms.

What has been done

To assist SDPs, the University of Arkansas at Pine Bluff (UAPB) partnered with the Lee County Cooperative Extension Service (CES) and East Arkansas Enterprise Community (EAEC), to provide educational workshops and marketing assistance to SDPs. UAPB also provided local agents at the CES and the EAEC Offices to work directly with SDPs in vegetable production. Also, UAPB partnered with USDA's Natural Resources Conservation Service (NRCS) to help SDPs get irrigation systems, high tunnels, and other conservation practices installed.

Results

UAPB assisted approximately 50 SDPs who diversified or added vegetables to their operations. Many of these producers used the NRCS Environmental Quality Incentive Program (EQIP) to obtain $150,000 in EQIP Funds to add high tunnels and irrigation wells to their operations. SDPs in northeastern AR were assisted by EAEC in selling 223,517 pounds of fresh vegetables to local schools. And, the UAPB Extension Associate in central AR assisted SDPs in identifying local retail markets. SDPs were also assisted in obtaining $100,000 in USDA loan funds and 12 SDPs were assisted in signing up for the Noninsured Assistance Program (NAP) or basic catastrophic insurance for their vegetable crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #12

1. Outcome Measures

# of clientele who initiated specialty food-related enterprises

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
2017	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas' specialty crop production landscape has long been characterized by having a few relatively large commercial operators combined with numerous small farms that primarily focus on direct marketing channels. Sustained growth of "local food systems" has fueled interest in new business entry and expansion in the specialty crop production and value added processing areas. An identified primary concern is estimated profit potential and appropriate production systems for the numerous of crops that are included within this sector.

What has been done
UA Division of Agriculture economic and horticulture faculty worked to develop a series of specialty crop enterprise budgets. These budgets represent the first significant Division investment of time and resources in the specialty crop area in over a decade. The specialty crops enterprise budget website was developed to house the resources and highlight the development of additional business planning resources to serve the sector, https://www.uaex.edu/farm-ranch/economics-marketing/farm-planning/budgets/ specialty-crops-budgets.aspx.

Results
A series of specialty crop enterprise budgets have been released on the website with promotion and dissemination of the resources sent to Cooperative Extension Service faculty, industry stakeholders and grower organizations. The resources provide farmers, financial institutions and government program managers with transparent tools to understand and evaluate production opportunities. The budgets also provide primers to aid a new and/or beginning grower with understanding the resource needs including labor, timeline, costs, and potential revenue for a collection of specialty crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #13

1. Outcome Measures

of producers adopting herbicide resistance best management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	191228

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Palmer amaranth is the driver weed that determines herbicide programs in most corn, cotton, grain sorghum and soybean acres across the Midsouth region. Recently (2015) populations of Palmer amaranth were found to be resistant to WSSA group 14 protoporphyrinogen oxidase (PPO) inhibiting herbicides. These herbicides have been the answer to glyphosate-resistant Palmer amaranth control since the widespread outbreak in 2007. However, in 2015 there were fields that were abandoned due to the occurrence of pigweed that became resistant to the PPO class of chemistry

What has been done
In 2016 and 2017, numerous herbicide efficacy studies were conducted on-farm at 3 locations in Crittenden and Woodruff counties on known PPO-resistant populations. Ten site years of data were accumulated in 2016 alone and a regional meeting (Pigposium 3) was conducted in 2017 to focus one full day on control and management options for PPO-resistant Palmer amaranth.

Results
Results from the field trials indicate that 2 effective herbicide mode of actions are needed at crop planting for management of PPO-resistant pigweed populations. These options should include metolachlor, metribuzin and pyroxasulfone preemerge. Additionally technology such as Liberty Link, Enlist or Xtend should be planted in cotton and soybean crops in order to manage escapes that will occur after crop emergence. Numerous field days were held during the summer of 2016 and 2017 at these on-farm locations and more than 500 clientele were present each year. Pigposium III was held on February 28, 2017 at Forrest City, AR. Weed Scientists from Missouri, Mississippi, Tennessee and Arkansas were included on the program. Funds were raised in the amount of $5,000 to cover the costs associated with the day-long event. Pigposium III was attended by more than 411 clientele representing over 1.2 million acres based on surveys.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
206	Basic Plant Biology

213 Weeds Affecting Plants

601 Economics of Agricultural Production and Farm Management

Outcome #14

1. Outcome Measures

# of pesticide applicator training participants certified or re-certified

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3680

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The IPM program educates producers, county faculty, consultants and crop scouts, about integrated management of insects, weeds and diseases. Recent activities have addressed integration of genetically modified crops into IPM; delaying resistance to pesticides; and new pests and diseases in the state. Educated growers can assess information from consultants to make better pest management decisions and optimize IPM tactics. Trained crop consultants and crop scouts are more confident and less likely to recommend use of pesticides if they recognize pests, diseases and weeds and understand the importance and use of economic thresholds.

What has been done
1. Row Crop - Growers using IPM realized a cost savings of $29/acre in corn up to $42/acre in soybeans. Southwestern corn borer populations were isolated to 3 counties in 2017 with the majority of the state needing no insecticides. Growers made insecticide applications in those counties avoiding potential yield losses.

2. Animal - Presentations on fly management and bermudagrass stem maggot were made at 10 county meetings. 8 newsletters were published

3. Specialty Crop - Presentations on fruit and nut pests and results of demonstrations were made at 8 county meetings and 2 field days

Results
Results were communicated to more than 1200 AR row crop growers and consultants at 19 IPM meetings during the growing season. Many expressed a sincere interest in gaining knowledge of the final outcome of the studies and the potential savings they may realize in the future by

adopting IPM-based treatment decisions.

Results of the corn borer monitoring were communicated to more than 250 AR corn growers and crop consultants at 19 IPM meetings during the growing season. Trap catches triggered a recommendation for treatment in 3 counties, growers outside these areas were encouraged by Extension agents to avoid making an unnecessary insecticide application for corn borer. Those growers that did adopt this recommendation saved $29/acre in application costs.

200 fruit/nut growers in the state were educated on current pest status and IPM at 5 county meetings and 3 research field days.

39 newletters addressing issues sent in to the diagnostic lab were published and >500 clientele were introduced to the diagnostic lab through us of the portable lab at field days/trade shows.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

# of small or socially disadvantaged farmers adopting crop best management practices

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
2017	136

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sweet potato growers in Arkansas are faced with challenges related to a decline in soil quality because the crop requires tillage for seedbed establishment, transplanting and production. Also, plant residues are removed for harvesting. These practices can quickly lead to poor soil health and a decline in soil quality due to soil erosion, runoff, and reduction in soil organic matter. One way to reduce the impact of these negative factors of sweet potato production is to include cover crops in the rotation.

What has been done

Beauregard sweet potatoes were planted following fallow and winter cover cropping schemes (Austrian peas, rye, wheat, daikon radish,rye and wheat mixed with Austrian peas or daikon radish). Before sweet potato harvest, soil samples were collected, dry frozen and analyzed for phospholipid fatty acids.The soil samples contained gram-positive and gram-negative bacteria, unclassified bacteria, actinomycetes, saprotrophic fungi, arbuscular mycorrhizal fungi and protozoa. Soil microbial types and microbial ratios were determined for each group.

Results

Total microbial biomass tended to be higher in the Austrian peas-wheat mixture with total bacterial and gram-positive phospholipid fatty acids being on average 9% higher than in the fallow treatment. Likewise, the percentage of soil fungi to actinomycetes increased by an average of 6%. The Fungi/Bacteria ratio was < 1 indicating the dominance of bacteria to fungi and was also higher in Austrian peas-wheat mixture than with wheat or Austrian peas alone. Arbuscular mycorrhiza fungi were lower under fallow and wheat-radish mixtures while Non-arbuscular mycorrhiza fungi were positively associated with the Austrian peas-wheat mixtures. Eukaryotes and arbuscular mycorrhiza fungi were in the range of 2% of the total biomass with no influence from the cover crops.

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

Outcome #16

1. Outcome Measures

of Master Gardener participants trained, certified and re-certified.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3437

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Gardening continues to be a growing interest with Arkansans. Be it vegetable gardening or landscaping around the home, our stakeholders are looking for sound information in the consumer horticulture area. An issue that continues to be of concern is the lack of scientific based information found from the internet or the lack of how to search for scientific based information. Our program teaches volunteers to look for extension and research based information on the internet.

What has been done
The consumer horticulture program has improved the skills of our Master Gardeners, who help keep our science-based web pages current. Master Gardeners are engaged in state and county horticulture events in order to keep up to date on new research and plants. Master Gardener Appreciation Day was held at the South Arkansas Arboretum to encourage interaction with a broad range of experts. We have increased our blog activity and displays at educational events to engage more consumers interested in research based gardening. Our Facebook page has grown to over 2400 likes as we share horticulture as well as Master Gardener information.

Results
The Master Gardener program has grown to 3437 trained volunteers who reported 170,234 volunteer hours as well as 94,731 educational hours for 2017. The yearly Master Gardener Conference was held in Pulaski County with 602 members in attendance. Over 300 members attended the annual Master Gardener Appreciation Day at South Arkansas Arboretum in El Dorado and increased their knowledge of horticulture topics covered. Our website pages continue to receive a high number of visits (526,563) showing that gardening is continuing to be a high topic of interest. Our blog followers increased to 3077. Posts are made to the blog three to seven times per week. ANR staff, county extension agents, Master Gardeners, and state horticulture staff hosted the extension educational display at the annual Flower and Garden Show held in Little Rock during February with 9965 visitors over a three day period. Gardening and food interest continue to increase as does the need for research based information.

4. Associated Knowledge Areas

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

205 Plant Management Systems

206 Basic Plant Biology

216 Integrated Pest Management Systems

Outcome #17

1. Outcome Measures

# of small or socially disadvantaged farmers adopting more diverse crops

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fresh cowpea seed (fresh-pea) production and marketing has emerged as a profitable agribusiness among small-scale and limited-resource farmers. Correspondingly, many fresh fresh-pea producers have transitioned from hand/manual harvesting to machine/mechanical harvesting. With this transition has arisen the need to breed new varieties that are suitable for mechanical harvesting. Furthermore, consumer choice preference for some and not for other seed colors/types has become increasingly important.

What has been done
About 441 accessions of cowpeas were evaluated in the field. They were only characterized on agro-morphological traits and pod traits. These accessions have been grouped into eight gene pools (AB; AC; A; B; C; D; F; P) based on plant canopy phenotypic characteristics in the field. Due to late planting and harvest in 2017, samples have not been completely characterized. The accessions will be evaluated on seed traits (color, size, and texture).

Results
A diversity-base of germplasm (191 selections) was developed and improved for subsequent use in the breeding program to develop new varieties in an accelerated manner. Eight gene pools of selections are ready for direct-use in breeding varieties, some of which will be suitable for machine or mechanical harvesting.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #18

1. Outcome Measures

# of small or socially disadvantaged farmers adopting livestock best management practices

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Socially Disadvantaged Livestock Producers (SDLPs) have never fully participated in the educational programs of the Cooperative Extension Service (CES) or the Conservation Programs of the Natural Resource Conservation Service (NRCS). SDLPs were not aware of these agencies or the services they provided. The failure to participate with these agencies caused SDLPs to miss out on educational information that could be used to improve their herds as well as conservation programs that provide financial incentives to improve their enterprise.

What has been done
An extension associate (EA) was hired to work with SDLPs in south-eastern AR. The EA introduced the SDLPs to Staff members in their local NRCS Office where they signed up for the Environmental Quality Incentive Program (EQIP) and the Conservation Stewardship Program (CSP). Producers tested their pasture soil and obtained a Restricted Pesticide Use License. They also received the CES monthly Beef Tips Newsletter and manuals for vaccination and Pasture Weed Control. The UAPB livestock specialist conducted production meetings in the area.

Results
Twenty (20) SDLP received $200,000 in EQIP funding to help install conservation practices (water wells, water troughs, underground pipe-line, cross fencing, and gravel around feeding and water troughs). The cross fencing helped SDLPs increase their grazing efficiency by 10%. The

installation of water wells and water troughs helped SDPLs decrease their labor cost. The enhancement practices required by the CSP Program (Bush-hogging, moving mineral blocks) made their pastures look much better and each SDLPs received $1500 or more in annual payments. A SDLPs cluster (3 or farmers) was formed when 5 SDLPs cut and baled hay together. The cluster member also vaccinated their cows using one squeeze chutes purchased by a group member. Consequently, some SDLPs are working together.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #19

1. Outcome Measures

# of new ideas/concepts for textile structures/end products from bio-fibers

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Consumers seeking fibers in textile products with improved environ-mental sustainability seek alternative fibers. Alpaca fiber is an eco-friendly fiber but it is too expensive to be a major alternative. Industrial hemp is often blended with other fibers but it has issues in recycling. Strides continue to be made in improving sustainability of cotton fibers and regenerated cellulosics i.e. Modal and Tencel. Economic feasibility of nylon and polyester produced from regenerated bottle polymers has declined due to cheaper oil used in virgin polymers.

What has been done
The alpaca fiber production and processing market was analyzed. Alpacas yield only a few pounds (3-5 pounds) of fiber per year. There is little marketing effort to educate consumers and

the marketplace. The status of other possible sustainable fibers was updated including industrial hemp, spider silk, and regenerated cellulosics.

Results

Alpaca production has expanded in AR and other states; however due to high costs it has not had a major impact on providing sustainable fiber for the marketplace. Yarn blending is frequently done but it contains wide variations in fiber micron size; this results in uneven yarn quality. Other supply chain issues include lack of textile mills in the U.S. especially for high end production. Therefore, much of the domestically produced fiber goes into yarns sold at specialty retailers that supply hand-weavers and knitters. Industrial hemp fabrics have a nice hand but have major issues with excess shrinkage of woven textiles and excess stretching due to low resiliency of knits. Industrial hemp blends are now appearing in work-wear; however when it is blended with synthetic fibers the recyclability is negatively impacted.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #20

1. Outcome Measures

# of acres using improved crop best management practices.

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
2017	4719286

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to data from the National Agricultural Statistics Service, Arkansas Soybeans yielded 33% higher with irrigation than non-irrigated soybeans in 2016. This trend of increased yield with irrigation continues across all row crops and growing seasons. This easily explains why the average value of irrigated cropland in Arkansas is $1300 per acre more than non-irrigated cropland. This has led many of our growers and farm managers to increase irrigation efforts to widen the gap and profit margin between irrigated and non-irrigated crops. Not only are non-irrigated acres disappearing drastically over the past 50 years but also irrigation frequency has intensified. Thus, a calendar irrigation system has replaced our checkbook irrigation efforts and led to saturated soils and in some instances decreased irrigated yields.

What has been done

A collaborative effort between employees from the University of Arkansas Division of Agriculture Cooperative Extension Service, the Natural Resource Conservation Service, and the County Conservation Districts has increased the educational efforts on Irrigation Water Management (IWM) practices. Educational efforts concerning the stage of crop development, rooting depth, and environmental conditions can play a major role in the timing of irrigations. The environmental conditions around irrigation practices can also affect fertilizer uptake, herbicide activity, disease pressure, and overall crop health were included in our educational efforts.

Results

Educational efforts on Pipe Planner alone have led to increased adoption of computerized hole selection to now over 1 Million acres. Pipe Planner has reported that this is a 65% increase in fields enrolled in the last year alone. Multiple Inlet Rice Irrigation (MIRI) has increased to nearly half of our rice acres. In 2017, MIRI was introduced to the first commercial Rice field ever successfully grown in Arkansas in 1901. After one season the family has decided that MIRI is the only way to irrigate Rice and were thrilled with the results. They typically pump around 30 acre inches according to their farms historical records, yet pumped only 15 acre inches this season using MIRI, surface water, and AWD (Alternate Wetting and Drying). That's a 50% reduction in irrigation water pumped and he spent $27.34 per acre. In comparison, using a deep well and pumping 30 acre inches their cost was $74 per acre. That's $46.66 less input per acre and a 63% savings over their normal energy bill.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #21

1. Outcome Measures

# of clientele adopting non-food plant best management practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	120289

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Conventionally and reduced tilled silt loam soils in Arkansas exhibit little soil structure. The lack of soil structure is often the underlying cause of many of our water and nutrient issues. Using cover crops to provide living material for soil microbes to feed on as many months of the year as possible contribute greatly to improving soil health. Soil microbes give off compounds that act as glue to help build soil structure. Microbes also provide a food source for yet larger organisms in the soil. Earthworms are perhaps the easiest to see and identify indicator of soil health. Establishing a robust population of soil microbes is the first step to building populations of earthworms.

What has been done
A modified cotton strip test using underwear as the cotton source is an effective demonstration to illustrate the greatly improved level of microbe activity in the soil where cover crops were grown compared to the producer standard. Microbes often degrade the cotton completely in a five week period where cover crop were used compared to little if any degradation in the producer standard.

Results
This demonstration has been used to educate over 1,025 producers, consultants, and other professionals about soil health and sustainability at 9 meetings. Producer groups including Cotton Incorporated, Cotton Board, and the National Cotton Council as well as NRCS and other organizations and individuals have posted, shared and tweeted this information.

4. Associated Knowledge Areas

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

205	Plant Management Systems
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

A wet spring with severe flooding turning into a severe drought described the past growing season. Late planting and late crop stress impact all agriculture producers. The biggest impact on producer and educational programs was dicamba applications that moved off site. Legal and illegal applications affected research and demonstrations. Compete test locations were lost. Multiple field locations saved many tests but there was a cost to the application. The effort to meet many priority needs is hampered from lack of funding. **State** budgets have been flat for 10 years which has created a climate that makes funding, hiring, and keeping **employees** difficult. Cost savings and attrition has kept key research and extension programs continuing but at the cost of meeting other needs. Wheat, cotton, and grain sorghum acres have declined due to market conditions and the commodity supported research has declined in these areas.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Data was collected from Arkansas grass carp fish farm from 2010-2011. The incidence rate (the probability of finding diploids among triploids) ranged from 0 to 0.065 among the five inspected lots. There was no significant difference in incidence rates among the five lot sizes. Therefore, incidence rates can be pooled over the five lot sizes. The overall mean incidence rate is 0.0391. Simple proportion studies showed that a sample of 102 and 103 for large population sizes of 10,000 and 100,000,000, respectively, are required to be accurate to within 0.03 with 95% confidence.. A total of 97 fish are required for a small group of 1500 triploid grass carp to be certified. The requirement of 120 randomly selected fish for triploid inspection for every 1500 triploid grass carp to be certified is overestimated based on the historical data. (Lin Xie)

Four States Cattle Conference - Producers attending the fall 2016 Four States Cattle Conference (AR, LA, TX, and OK) received information regarding 2017 cattle markets, supplemental feeding strategies, mineral supplementation, and improved animal selection methods. Speakers included university research and Extension faculty as well as a producer

panel. Seventy-one percent indicated cattle marketing information would make marketing decisions easier, 94% increased knowledge of beef cattle nutrition, while 85% increased knowledge of mineral program evaluation. Ninety-six percent increased their knowledge of trait selection. At least forty percent of participants planned to adopt what was learned from nutrition and animal selection knowledge gained.

Little Red River Cattle Conference - Producers attending the 2017 conference toured cattle ranches that included a purebred Brangus operation, commercial bull development facility, and farm raised beef - cattle operation. All participants found the tour valuable or very valuable and 100% indicated this type of education would be recommendable. Participants survey response indicated they learned different methods of raising beef cattle, individual ideas regarding various enterprises, and differences in how farms work.

River Valley Cattle Conference - Producers attending the 2017 conference received information pertaining to supplemental feeding, beef cow-calf enterprise economics, and genetic selection. Fifty-two percent greatly increased knowledge of supplemental feed, 73% greatly increased knowledge of practices that add income or reduce cost of production, and 76% greatly increased knowledge of using EPD's and genomic testing.

Animal Control Officials Training - Animal control officials attending the 2017 training were provide education in the areas of livestock handling, welfare, and body condition assessment for different livestock species. Nineteen attendees reported an increase in knowledge from 16% to 78%. The greatest increase in knowledge gained was associated with animal movement concepts including flight zones and point of balance. Also, test results indicated the trainees were least familiar with sheep goats and dairy cattle and most familiar with beef cattle and horses.
Presentations on Biosecurity practices and disease recognition procedures and dissemination of Biosecurity information to individuals at seminars, county fairs, the Arkansas and Arkansas/Oklahoma state fair, short courses, 4H pullet chain delivery, e-mail, farm visits, reports, and through phone consultations was done. In addition, the impact of a disease outbreak such as Avian Influenza, Exotic Newcastle disease and other diseases on the Arkansas poultry industry and state economy was discussed. Presentations and information was also disseminated regarding Salmonella and the public health significance of the disease using the various above methods. Participants were informally surveyed and questioned as to increase in Biosecurity knowledge, their current Biosecurity practices, and intent to implement additional or more stringent practices. All participants practiced Biosecurity to some degree with their birds. However, new information made available allowed a greater understanding by participants of Biosecurity practices. Farm visits and observation of poultry exhibited at county and state fairs with discussions with the owners allowed an assessment of practices utilized. 100% of the farms and exhibitors practiced Biosecurity at some level. A key component of the Biosecurity practices taught was providing information as to a source of assistance. Again, this year all participants in the 4H pullet chain had to receive some type of training in Biosecurity practices. All 1350+ participants had to complete the training conducted by the county agent prior to their receiving their pullet chicks. Zoom conferences were held to provide information to the county agents and information regarding Biosecurity, proper husbandry, and welfare for the chicks was provided to youth upon receipt of the pullet chicks. This year the course" Backyard Biosecurity" was available through the Extension on-line course website. This course was free of charge and consisted of modules regarding proper poultry care, husbandry, welfare, diseases, and Biosecurity. Numerous water samples were submitted to

the water lab in the Poultry Science department for evaluation of potential disease causing bacteria, overall sanitation, and mineral content.

Key Items of Evaluation

The use of all diploid grass carp is prohibited except for permitted diploid brood stock at appropriately licensed facilities. Triploid grass carp inspection must reveal no diploids before the fish can be shipped. An automated particle sizer is the standard method used today to differentiate diploid and triploid blood cells. Producers will have to individually check the group of grass carp for ploidy prior to the inspection by USFWS inspector.
Four cattle conferences were conducted with over 95% of the attendees saying they increased their knowledge of herd management.
Key items evaluated were the understanding of Biosecurity protocols by participants. Evaluations of on farm Biosecurity practices currently in place and discussion with owners of additional practices that could be implemented. Education is a key component of Biosecurity practices to understand the "whys" and "whats" involved in disease prevention. All 4H participants in the poultry chain had to receive Biosecurity training prior to receipt of the baby chicks, this was conducted in the county with participants signing in at the meeting(s). Another item evaluated was education of agents in Biosecurity practices to be conducted at the time of chick delivery for the 4H pullet chain. All agents practiced Biosecurity at the time of pickup and delivery of chicks. Participants in the "Backyard Poultry" on line course were evaluated as to knowledge obtained via a quiz at the end of each of the 5 modules. A certificate of participation was available to participants that successfully completed all 5 modules. Information was available at all county fairs and Extension personnel were available at most county and state fairs to discuss Biosecurity and be sure that some degree of Biosecurity was practiced. Information regarding Biosecurity and disease prevention was sent with water analyses reports and/ or reported electronically and/or via phone to provide training to growers of poultry how to prevent bacterial or mineral contamination of the water used on their farm for poultry by use of Biosecurity practices.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Environment, Energy & Climate

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%	0%	4%	0%
102	Soil, Plant, Water, Nutrient Relationships	12%	0%	15%	0%
111	Conservation and Efficient Use of Water	8%	25%	5%	20%
112	Watershed Protection and Management	8%	25%	8%	15%
123	Management and Sustainability of Forest Resources	15%	0%	5%	0%
133	Pollution Prevention and Mitigation	6%	25%	5%	15%
134	Outdoor Recreation	0%	10%	0%	10%
136	Conservation of Biological Diversity	2%	0%	2%	0%
141	Air Resource Protection and Management	2%	0%	1%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	10%	10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	21%	0%
204	Plant Product Quality and Utility (Preharvest)	5%	0%	6%	10%
402	Engineering Systems and Equipment	5%	0%	3%	0%
403	Waste Disposal, Recycling, and Reuse	3%	15%	1%	20%
511	New and Improved Non-Food Products and Processes	5%	0%	5%	0%
601	Economics of Agricultural Production and Farm Management	9%	0%	7%	0%
605	Natural Resource and Environmental Economics	5%	0%	2%	0%
610	Domestic Policy Analysis	5%	0%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	18.3	1.3	128.3	2.9
Actual Paid	16.4	1.7	144.4	0.6
Actual Volunteer	2.1	0.0	1.3	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**
228084	233570	838208	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
306956	110006	12786183	78353
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2388144	0	1999407	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In the area of Conserving Water Resources, the Div of Ag and UAPB conducted research and educational programs to improve efficient use and conservation of water resources through research and education, educate Arkansans about competing demands for water quantity and quality for agricultural, residential, recreational, wildlife, industrial and municipal needs.
We also inform decision makers with science based information on water quantity and quality, collaborate with state and federal agencies to sustain water resources and provide the science--based information needed to understand changing environmental regulations.
We develop research-based Best Practices and assist landowners with implementing these practices for managing soil nutrients and animal manures.

In the area of Alternative Energy & Conservation, the Div of Ag and UAPB provided science--based information to guide public understanding of alternative energy sources, collaborated with state and federal agencies on assessing alternative energy options and measuring impacts.

Faculty make contributions to alternative residue and water management, trace gas emissions to the atmosphere, poultry production and poultry waste management, and riparian zone economics. Since agricultural management practices are closely tied to the perception of long-term sustainability, the effects of alternative residue and water management practices on soil properties and processes and crop production in a wheat-soybean double-crop production system on a silt-loam soil are being investigated. The effects of nutrient source, cultivar, soil texture, crop rotation, and water management scheme on methane and nitrous oxide emissions from rice are being investigated. The economics associated with riparian zones in the Ozark Highlands region of northwest Arkansas have also been evaluated. Work continues to improve feed efficiency in animal breeding stocks to maintaining viable and sustainable poultry and livestock industries. Research continues on poultry litter treatment using liquid anaerobic digestion technology to help poultry producers grow their production by minimizing the nutrient issues

associated with poultry litter, to prevent pollution to surface and ground water resources due to nutrient leaching and runoff from land and soil receiving poultry litter application, and to help poultry producers transition to sustainable production practices. A part of the Arkansas Discovery farm effort has been and investigation and quantification of the sustainability of cotton production. We continues to provide nutrient management planner, nutrient applicator, mortality management education. A particulate area is the development of online educational courses to provide required certification training for nutrient planners and applicators. A separate but overlapping component is the providing and maintenance of the nutrient management plan development tool that is used by most of the state's certified nutrient planners.

In the area of Climate Variations and Policy, the Div of Ag and UAPB has programs
that help Arkansas's communities and agricultural sector adapt to climate variations and extreme weather or climate-
-related events, analyze and explain local impact of national and international climate policies. We provide unbiased information aimed to mitigate agricultural production practices to
reduce greenhouse gas emissions and sequester carbon. We annually update the aquatic herbicide section of the cooperative extension publication MP44, Recommended Chemicals for Weed and Brush Control, old annual weed and pond in-service for cooperative extension agents. We develop and provide research-based information to the public through county extension faculty and direct contacts, and through newsletter articles, extension materials, and presentations at meetings and workshops.

• UAPB faculty assess populations of important fisheries in Arkansas as well as the contribution of hatchery fish stocked into various aquatic systems.
Thousands of Arkansas farmers and hunters have been taught how to successfully trap feral hogs using direct and indirect educational methods to help reduce crop and habitat loss, soil erosion, and water pollution attributed to this invasive pest.

As access to technology expands the program will also be delivered via the web, satellite, and other electronic media. County agents are located in each county and are supported in the development and delivery of meetings, workshops, and field days focused on issues important to their local clientele and leadership. State Extension faculty work closely with county level programs as well as with stakeholders at the State level including the Arkansas Forestry Commission, the Arkansas Forestry Association, the Arkansas Game & Fish Commission, Arkansas Association of Conservation Districts, and other key natural resource groups to deliver the program and make key changes when new unforeseen issues arise. The program therefore, uses a board array of resources, strategies, and approaches aimed at promoting the sustainable and wise use of Arkansas' natural resources..

2. Brief description of the target audience

Youth
Agri Business
Row Crop Agricultural Producers
Small and limited-resource Farmers
Consultants
Forest Landowner Groups
Forest Industry
Loggers
Natural Resource Professionals
Geologists, US Geological Survey
Landowners
Educators
Agency personnel
Livestock producers

Watershed and other Not-for-profit organizations
General public
Researchers
Policy makers
Research funding personnel and agencies
Pond Owners
Fisheries Biologists with Arkansas Game & Fish Commission
Government agencies
Scientists/researchers
Students
Extension agents/specialists
Rice producers
Ecologists
Remediation/phytoremediation researchers/specialists/practitioners
Outdoor enthusiasts
Hunters
Master Gardeners

3. How was eXtension used?

Reference material from eXtension is linked to webpages for addressing nuisance wildlife problems.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	71965	271105	2880	1926

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

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	19	64	83

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of educational programs and events held related to Environment, Energy & Climate.

Year	Actual
2017	1675

Output #2

Output Measure

- Number of field days related to Environment, Energy & Climate.

Year	Actual
2017	107

Output #3

Output Measure

- Number of educational materials, curricula, newsletters, web-based modules and fact sheets developed, produced and delivered related to Environment, Energy & Climate.

Year	Actual
2017	23690

Output #4

Output Measure

- Number of research-based, non-refereed publications published related to Environment, Energy & Climate.

Year	Actual
2017	172

Output #5

Output Measure

- Number of research-based scientific presentations at scientific or professional meetings related to Environment, Energy & Climate.

Year	Actual
2017	351

Output #6

Output Measure

- Number of research projects on biomass crops conducted in Arkansas.

Year	Actual
2017	1

Output #7

Output Measure

- Number of research projects on biofuels performance and emissions conducted in Arkansas.

Year	Actual
2017	1

Output #8

Output Measure

- Funded research amounts (in dollars) related to Environment, Energy & Climate.

Year	Actual
2017	5720726

Output #9

Output Measure

- Number of current year Environment, Energy & Climate relevant research programs.

Year	Actual
2017	52

Output #10

Output Measure

- Number of current year Environment, Energy & Climate relevant educational programs.

Year	Actual
2017	361

Output #11

Output Measure

- Number of research projects on populations of important fisheries in Arkansas.

Year	Actual
2017	7

Output #12

Output Measure

- Funded Extension amounts (in dollars) related to Environment Energy & Climate

Year	Actual
2017	378000

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Life cycle inventory methodology and data for row crops for greenhouse gases.
2	Number of N-StaR samples processed.
3	Number of new assessment and management tools developed, including models and measurements of greenhouse gas emmisions
4	Number of current year citations of climate related publications.
5	Number of program participants who indicate a change in behavior, based on lessons learned during Environment, Energy & Climate programs.
6	Number of participants (both youth and adult) indicating new knowledge gained as a result of Environment, Energy & Climate programs.
7	Number of program participants indicating new knowledge of water quality and conservation best management practices
8	Number of producers who changed or adopted new production and/or conservation management practices or technologies
9	Number of program participants indicating the adoption or implementation of new water quality and conservation best management practices.
10	Number of farm pond owners who indicate new knowledge of pond management
11	Number of fisheries biologists indicating new knowledge of populations of important Arkansas fisheries
12	Number of Nutrient Management Tools Developed
13	Number of watershed management assessments
14	Number of tillage, burning, and residue level management assessments
15	Number of assessments of drug resistant bacteria in the environment
16	Number of assessments of fish survival rates
17	Number of fish conservation assessments

18	Number of registered foresters who maintained their state certification as a result of programs
19	Amount of GHG emissions reduced in cotton (metric tons)
20	Increase in Cotton water use efficiency (in million gallons)
21	Number of landowners trained in feral hog control
22	Number of Biofuels management assessments

Outcome #1

1. Outcome Measures

Life cycle inventory methodology and data for row crops for greenhouse gases.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Methane (CH4) is one of the major greenhouse gases and has a global warming potential many times greater than carbon dioxide. Methane production occurs under anaerobic soil conditions, such as those associated with rice production (Oryza sativa L.). Due to the anaerobic conditions that develop in soils used for flooded rice production, along with the large global extent of rice production, it is estimated that rice cultivation is responsible for 11% of global anthropogenic CH4 emissions. The current U.S. estimates of CH4 emissions from rice are based on data from all of the major rice-growing regions, however, there is a general lack of data representing Arkansas' cultural practices. In Arkansas, rice is grown on a variety of soil textures, in several common rotations, using pure-line and hybrid cultivars, under various water management regimes, and under conventional and no-tillage practices.

What has been done

Field studies were conducted in 2017 at the Rice Research and Extension Center in Stuttgart on a DeWitt silt-loam soil to quantify season-long methane emissions from a pure-line and hybrid rice variety grown following soybean under a full-season-flood or an intermittent-flood water management scheme. A chamber-based gas sampling procedure was used to directly quantify methane fluxes on a weekly basis over the growing season from flooding to after harvest.

Results

Season-long methane emissions were lower from the hybrid than from the pure-line cultivar and lower from the intermittent-flood than from the full-season-flood water management regime. Results indicate that methane emissions can be lower using hybrid cultivars and intermittent flooding compared to pure-line cultivars and full-season flooding of rice.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity

Outcome #2

1. Outcome Measures

Number of N-StaR samples processed.

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
2017	2455

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rice fertilization recommendations have historically arisen from response curves developed on various soil types. These recommendations may not accurately account for soil residual Nitrogen due to crop rotation or other field-specific situations. Thus, overprescribing or under-prescribing N rates is a possibility. Division of Agriculture researchers developed N-STaR, the first field-specific, soil-based N test for rice in the world. The purpose of N-STaR is to get the correct N rate for a field regardless of soil texture or crop rotation.

What has been done
Since 2012, the N-STaR lab has processed >20,000 soil samples representing over 350,000 rice acres in Arkansas. Specific Nitrogen recommendations have been prescribed for all of the N-STaR fields enrolled in the program.

Results
N rates were reduced 30 units N per acre for ~76% of the silt loam soils submitted in 2017 and N rates were reduced 50 units N per acre for 100% of the clay soils submitted in 2017. On average N-STaR N rate recommendations reduce the N rate needed to achieve maximal rice yields on 91% of the samples submitted in 2017. Producers using the N-STaR program see an average input cost savings of $18.50 per acre, but an overall increase in profitability of $26.00 per acre. Work is ongoing to expand develop and expand N-STaR for wheat and corn production in Arkansas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Number of new assessment and management tools developed, including models and measurements of greenhouse gas emmisions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Water use for irrigated row crops, particularly corn, soybean, and rice, has caused increasing groundwater depletion in the Alluvial Aquifer in the Lower Mississippi River Delta region of eastern Arkansas. Furthermore, the long history of cultivated agriculture in the Delta region of eastern Arkansas has depleted soil organic matter and negatively impacted other near-surface soil physical properties, namely soil structure, to the point that much of the agricultural land area in the Delta has minimal infiltration capacity. Consequently, much of the rainfall encountered in area is prone to runoff, which perpetuates soil erosion and sedimentation on local surface water bodies. To avoid further depletion of the Alluvial Aquifer and minimize runoff and soil erosion, ways to increase groundwater recharge must be discovered and adopted. One method of increasing Alluvial Aquifer recharge would be to adopt soil management practices that promote and increase infiltration and decrease runoff, which would increase the amount of water that could potentially recharge the aquifer.

What has been done

Infiltration measurements were conducted in multiple landuses throughout the Lower Mississippi River Delta region of eastern Arkansas. The landuses evaluated included native prairie, Conservation-Reserve-Program (CRP) managed grassland, deciduous and coniferous forest, and cultivated no-tillage row-crop agriculture. A double-ring infiltrometer was used to measure infiltration at various time intervals over a period of 20 minutes. Following the infiltration measurements, soil samples were collected from the top 10 cm to assess soil physical and chemical property differences, namely soil particle size, extractable soil nutrients, soil organic matter, and total soil carbon and nitrogen. Landuse effects on various infiltration characteristics were statistically evaluated. Correlations were performed to evaluate the relationship between various infiltration characteristics and measured soil physical and chemical properties.

Results

Results show that landuse significantly affects surface infiltration in loessial and alluvial soils in the Delta region of eastern Arkansas, which suggests careful consideration of landuse change may need to occur. Less land area devoted to extensively managed and soil-disturbing landuses, such as conventionally cultivated agriculture, may lead to less runoff, soil erosion, and sedimentation of local surface waters and greater surface water infiltration, soil water storage, and groundwater recharge. If minimally agriculturally productive lands shifted to landuses that used soil management practices that promoted physical and chemical characteristics of less-disturbed landuses, such as native prairie, CRP-managed grasslands, and deciduous forest, the current rates of unsustainable groundwater withdrawals could be decreased if more land area in the Delta region of eastern Arkansas contributed to groundwater recharge.

4. Associated Knowledge Areas

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

601 Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Number of current year citations of climate related publications.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of program participants who indicate a change in behavior, based on lessons learned during Environment, Energy & Climate programs.

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
2017	249

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas forest and natural resources are critical to the State's economy and to the well-being of its citizens: we are known as "The Natural State". The standing timber in Arkansas' forests has a value of more than $12.6 billion - that's in addition to the value of outdoor recreation and tourism. Raw materials from the State's forests support a vibrant forest products industry. The forest industry direct impact on the State's economy is tremendous. In 2015, this industry provided jobs directly to 27,827 employees, representing a labor income of $1.5 billion in employee compensation and contributing over $3 billion in value added dollars to state's economy. More than half of the State's 18.5 million acres of forestland is owned by private non-industrial forest landowners. This important landowner group is extremely diverse and includes farmers, ranchers, homeowners, teachers, factory workers, professionals, and retirees. The demand for benefits from the State's forests, including wildlife habitat and forest products, must increasingly be met by these private forest landowners. However, many of these landowners are unfamiliar

with sustainable forest management practices, timber marketing, habitat restoration, reforestation incentives, and other vital information critical to sustaining forest lands. Most of them also hold their forest lands for reasons other than timber management. The future supply of timber therefore, might not be secure unless harvesting forest products fulfills the landowner's objectives and needs. Further complicating this issue in consumer demand for sustainable products. The consumer demand for sustainable paper is changing the manner in which wood products are sold. Wood product industries, especially those producing paper products, must meet the demand for sustainable products by ensuring that the source of the wood is derived from sustainably harvested forests. The burden to provide this wood is borne by private landowners. Marketing and selling wood products, especially pulpwood, is therefore becoming increasingly difficult for private forest landowners unless they participate in certification programs like the Tree Farm System.

What has been done

To help landowners, county agents, and registered foresters understand the potential challenges in marketing timber, faculty of the UA Division of Agriculture Arkansas Forest Resources Center: Presented marketing and certification information two professional trainings: 1) County Agent & Arkansas Forestry Commission training; and 2) Registered Foresters Continuing Education Workshop.

we also conducted a workshop for landowners, including minority landowners, at the SWREC. Topics included certification systems, timber valuation, and the importance of consulting foresters. More than 60 landowners representing 12,869 acres of forestland attended the workshop. Over 50% of the attendees plan on changing the way they market timber and 38% stated that they will work towards certifying their forest land. Twenty-five percent reported an increase in knowledge of estimating timber value and conducting timber sales.

Results

At a peer-to-peer Women Owning Woodlands event, sixteen landowners, 14 of whom were women, attended the informal "walk in the woods" led by the landowner hosts. Of these, 100% reported an increase in knowledge of certification requirements for marketing timber.

The Timber Market Reports pages, which were developed and posted, were visited some 7,000 times annually.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity
403	Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Measures

Number of participants (both youth and adult) indicating new knowledge gained as a result of Environment, Energy & Climate programs.

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
2017	10328

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water resource concerns (both quality and quantity) from agricultural nonpoint source pollution continue to prompt voluntary, regulatory and judiciary actions in Arkansas. Livestock agriculture continues to face scrutiny amid concerns of nutrient losses to waterbodies from land application of manures while row crop agriculture in Arkansas is under increasing pressure to reduce any nutrient and sediment inputs to help minimize the hypoxia in the Gulf of Mexico. In urban areas, many communities are dealing with the implementation of storm water regulations. In Eastern Arkansas, there is increasing concern about the sustainability of groundwater to meet future irrigation demand for row crops and the expansion of poultry production in Northeastern Arkansas. This may create severe constraints to remaining economically viable and competitive in today's global market place. With this plethora of activity in addressing nonpoint source pollution and water quantity, it has left landowners and others confused and concerned about what may be required of them.

What has been done
The Arkansas Discovery Farm program uses edge-of-field monitoring of both the quantity and quality of precipitation and irrigation and runoff from fields on real, working farms. Data is being collected to quantify nutrient and sediment losses to determine off-farm environmental impacts and to address long-term sustainability and profitability. There are currently twelve Discovery Farms strategically placed across the State to represent the predominant livestock and row crop enterprises. Discovery Farms are utilized to promote stewardship through our website, at field

days and tours and through oral presentations throughout the State at various events. Our Discovery Farmers are using the data to make management changes and to educate others by making presentation at agricultural practices at both the State, regional and national levels.

Results

The U of A Division of Agriculture continues to provide nutrient management certification training to plan writers and nutrient applicators on behalf of the state per ANRC Title XXII. We also worked with conservation partners to revise the Arkansas P-Index for pastures as well as nutrient management standard 590. We have transferred our training curriculum to an on-line educational platform.

We continue to provide education to agricultural producers on soil and water conservation by evaluating and demonstrating conservation practices and promoting USDA-ARS financial assistance programs such as EQIP and the Mississippi River Healthy River Basin (MRBI) initiative. Three of our Discovery Farms provide the edge-of-field monitoring for MRBI project areas. Conservation outreach is achieved via a website, watersustainability.wordpress.com, fact sheets, oral presentations, field demonstrations, field days and tours.

Impact - The Arkansas Discovery Farm is only in its sixth year of on-farm data collection, however, it is already garnering national interest and is being financially supported at nearly $2 million by 15 different sources, which indicates universal appeal. One important aspect is the ownership being taken by the stakeholders and farmers who guide and direct this program. The Arkansas Discovery Farm Program has helped Arkansas become the leader of 13 states in the NRCS MRBI program area in terms of approved project areas and dollars that go directly to Arkansas farmers as financial assistance to install soil and water conservation practices.

After 4 to five years of monitoring several row crop fields across the State, so results include:

Nutrient Losses, both N and P, in runoff at the edge-of field average less than 5% of that applied as fertilizer, indicating much lower losses than modelled results performed to study water quality-nutrient trading scenarios

Computerized-hole selection and other irrigation water management strategies such as the use of surge valves have increased irrigation efficiency by 20% by reducing tail water losses. On the Stevens Discovery farm in Desha County after four years of cover crops, tail water losses have been reduced to only 10%. Reducing tail water losses reduces nutrient losses as well. We have also demonstrated that rice acts as a constructed wetland and reduces nutrient losses and that cover crops are effective means of reducing sediment losses.

The Discovery Farm program is garnering international interest as a voluntary approach for engaging farmers in addressing natural resource concerns as well as improving profitability by reducing nutrient losses and conserving irrigation water which reduce energy costs. The program primarily documents water quality but many of our farmers are asking for support in documenting benefits of conservation practices on soil health. We have received funding to start documenting soil health on Discovery Farms and on selected soil health observation farms.

It is a difficult task to quantify the impacts of our educational programs on either the natural resources we are trying to protect or the economic value to landowners who are having to make changes to accommodate new regulations or court-issued decrees. As we move forward and create more awareness and transfer more soil and water conservation technology, we do know that we are aiding in prevention of degrading water quality, which collectively is much less costly than having to make remediation and restoration efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity
204	Plant Product Quality and Utility (Preharvest)
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

Outcome #7

1. Outcome Measures

Number of program participants indicating new knowledge of water quality and conservation best management practices

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

2017 1062

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Conventionally and reduced tilled silt loam soils in Arkansas exhibit little soil structure. The lack of soil structure is often the underlying cause of many of our water and nutrient issues. Using cover crops to provide living material for soil microbes to feed on as many months of the year as possible contribute greatly to improving soil health. Soil microbes give off compounds that act as glue to help build soil structure. Microbes also provide a food source for yet larger organisms in the soil. Earthworms are perhaps the easiest to see and identify indicator of soil health. Establishing a robust population of soil microbes is the first step to building populations of earthworms.

What has been done

A modified cotton strip test using underwear as the cotton source is an effective demonstration to illustrate the greatly improved level of microbe activity in the soil where cover crops were grown compared to the producer standard. Microbes often degrade the cotton completely in a five week period where cover crop were used compared to little if any degradation in the producer standard.

Results

This demonstration has been used to educate over 1,025 producers, consultants, and other professionals about soil health and sustainability at 9 meetings. Producer groups including Cotton Incorporated, Cotton Board, and the National Cotton Council as well as NRCS and other organizations and individuals have posted, shared and tweeted this information.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
511	New and Improved Non-Food Products and Processes

Outcome #8

1. Outcome Measures

Number of producers who changed or adopted new production and/or conservation management practices or technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	269

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas farmers face serious natural resource issues including: 1) groundwater availability for irrigation, 2) Of-site water quality impacts via nutrient and sediment loss in agricultural runoff and 3) soil productivity concerns resulting from poor soil health. Arkansas farmers are looking for ways to increase farm profitability and sustainability by decreasing water use, improve nutrient use efficiency, reduce soil erosion and improving soil health. For example, farmers have commissioned a non-profit organization known as the Arkansas Soil Health Alliance to use their collective experience to promote soil health practices to other farmers. We serve on their advisory board and will be working on a grant together. We are providing information to help farmers reduce inputs by increasing both soil productivity and water use efficiency

What has been done

We continue to collect data from Arkansas Discovery Farms that document and quantify the benefit of conservation practices. We use the Discovery Farms as a centerpiece in education to conduct field days and tours where Discovery Farmers are given an opportuntiy to educate other farmers. We conduct educational meetings, workshops and conferences with our above-mentioned conservation partners for agricultural producers. We provide conservation training for County Agents, elected officials, Conservation District Directors and employees as well as conservation professionals.

Results

Arkansas Discovery Farms and our partnerships have increased knowledge of natural resource concerns and how land owners and managers can address these issues. Arkansas Discovery Farms and our partnerships have also led to increased adoption of water conservation practices and adoption of soil health practices such as no-till and cover crops.

4. Associated Knowledge Areas

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

136	Conservation of Biological Diversity
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Number of program participants indicating the adoption or implementation of new water quality and conservation best management practices.

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
2017	23

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Division Faculty research and monitoring team that is assessing the impacts of on-farm conservation through the Arkansas Discovery Farms Program and the operation of the C&H Farm at Mt. Judea, Newton County, on the quality of receiving waters.

What has been done
The work includes the following major tasks: a. Research implemented conservation practices that limit nutrient runoff from poultry production facilities, adoption of rotational grazing on soil health and water quality, and use of cover crops to minimize sediment and nutrient runoff from row crop settings.
b. Monitor the fate and transport of nutrients and bacteria from land-applied swine effluent to pastures of the C&H Farm, and c. Assess the impact of farming operations (effluent holding ponds and land-application of effluent) on the quality of critical water features on and surrounding the C&H Farm including springs, ephemeral streams, creeks and ground water.

Results

While preliminary, results suggest that elevated nutrient and sediment runoff from around poultry production areas are decreased three-fold by directing runoff into ponds or through grassed waterways. Further, the concentration of N and P in runoff from the poultry houses was greatly reduced when it enters a farm pond. This decrease can be attributed to P sorption by suspended and deposited sediment, dilution, as well as by algal and macrophyte uptake. Conservation practices (i.e., conservation tillage, cover crops, riparian buffers) decrease nutrient runoff; however, there is a large annual variability in reduction efficiencies related to year-to-year rainfall fluctuations. Irrigation water use efficiency was improved with the use of PHAUCET. Loss of nutrients, N and P, is less than losses predicted by nonpoint source models used to assign focus watersheds in the NRCS Mississippi River Basin Initiative (i.e., SPARROW model) and predicted by models used in in nutrient trading assessment (i.e., APEX and SWAT). Clearly less nutrients are running off the farms we are monitoring than prior predicted estimates, which will negatively impact farmer eligibility in conservation cost share and nutrient trading programs.

On C&H Farm, core samples collected by Harbor Environmental and Safety adjacent to the swine slurry Chemical analysis of water samples collected from the house well, trenches, and ephemeral gully provide three direct methods to determine if manure is leaking from the holding ponds. To date, these analyses do not provide a scientific, weight-of-evidence that there is any massive leakage of material from the manure holding ponds adjacent to the house barns. Concentrations of P, N, chloride (a conservative and effective tracer), and electrical conductivity do not show any elevated values compared with baseline or background values. In the Ozark Mountain karst region, nutrient concentrations in streams of the Buffalo, Upper Illinois, and Upper White River Watersheds increase as the percent of land in pasture and urban use increases. Averaged over the last three years, nutrient concentrations in Big Creek above and below the C&H Farm are similar to concentrations found in other watersheds where there is a similar amount of pasture and urban land use. Nitrogen, P, sediment, and bacteria concentration - flow regime relationships showed that between April 2014 and February 2017, the concentration of dissolved and total P, sediment and bacteria increased from base, to intermediate, to storm flows. In contrast nitrate-N and total N decreased from base, to intermediate, to storm flows. These patterns reflect the dominant flow pathways contributing to flow in Big Creek during storm flow is surface runoff and during base flow is groundwater flow and provide insight into identifying and targeting conservation practices designed to minimize any nutrient and bacteria transport in the Big Creek watershed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management

Outcome #10

1. Outcome Measures

Number of farm pond owners who indicate new knowledge of pond management

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
2017	31

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas has approximately 128,000 small impoundments. The Extension service is tasked with helping private land owners manage their impoundments to their highest potential, or at least to the satisfaction of the owner.

What has been done
UAPB employs an Extension specialists for small impoundments management. He trains county agents to handle general pond management issues and assists when they cannot handle on their own. The Farm Pond Management in-service is the primary method for directly training. Extension agents can also receive assistance over the phone, by email, or by visit on cases that cannot be easily solved. Private pond owners are also able to contact me directly for assistance.

Results
In 2017, UAPB specialists had 187 Extension agent contacts, mostly involving pond cases and the Farm Pond Management In-service. The 2017 Farm Pond Management In-service was held in Hensley, AR and 9 agents attended. Responses to the program survey indicated that all 9 agents agreed that they had learned something that they did not already know, and that the information they learned during the in-service would help them assist clients with pond-related issues in the future. The topics most frequently mentioned as most useful were fish stocking, troubleshooting, and weed identification and management. The topics most frequently mentioned as least-useful were weed identification and management, oddly, and pond water chemistry.

Twenty-one pond visits were conducted in 2017. The owners of ponds where I made visits

received summaries of the visit along with recommendations and additional reading material tailored specifically for their pond and their management goals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
134	Outdoor Recreation
601	Economics of Agricultural Production and Farm Management

Outcome #11

1. Outcome Measures

Number of fisheries biologists indicating new knowledge of populations of important Arkansas fisheries

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
During the last decade, invasive Asian carps (silver carp Hypophthalmichthys molitrix and bighead carp H. nobilis) have established in the lower Mississippi River and several tributary rivers. Project 1 will explore the effects of Asian carp invasions on native Arkansas fish assemblages.

What has been done
Two project have been undertaken to study impact of Asian carps on native fish communities in lakes on the White River floodplain. Multiple gears (gill net, fyke net, and electrofishing) were used to collect adults of all species. Juveniles of select feeding guilds were also collected. Three different methods (electrofishing catch per effort, visual counts, videography) were employed to quantify Asian carp densities. The correlation among methods of estimating Asian carp densities

is being examined. The relationship between fish community metrics and Asian carp density are being examined. The relationship between growth rates of individuals from different feeding guilds and Asian carp densities are also being examined.

Results
There appears to be a good agreement among methods of estimating Asian carp densities. However, at higher densities of Asian carps, visual counts and electofishing CPE consistently underestimate true Asian carp density. Other analyses are ongoing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
134	Outdoor Recreation
601	Economics of Agricultural Production and Farm Management

Outcome #12

1. Outcome Measures

Number of Nutrient Management Tools Developed

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The production of animal derived food and products generates manure byproducts. The management of these byproducts has potentially significant impacts on food production, societal economic wellbeing, human and animal health, as well as environmental quality. Concerns regarding these potential impacts on farmers, neighbors, and consumers has resulted in numerous regulations and policies for livestock producers and those that manage manure byproducts, including farm specific Nutrient Management Plans based on farm conditions, phosphorus and nitrogen runoff risk, and crop agronomic requirements.

What has been done

A Microsoft Excel workbook based nutrient management planning tool (ARNMP) has been developed and refined over a number years. In the past the tool has been provided to nutrient management planners to facilitate and expedite their plan writing process. Over time, both the Arkansas Department of Environmental Quality, the Arkansas Natural Resources Commission, and the Natural Resources Conservation Services have come to expect plans be written using ARNMP. In the past ARNMP was distributed via email. This year the latest version was posted to www.uaex.edu/manure.

Results

The results of this long term and continuing efforts is a nutrient management tool that is focused at Arkansas landowner and nutrient planner needs. The tool is provided at no charge to potential users. This provides Arkansas's limited number of certified planners a tool targeted at the writing of nutrient management plans that meet certification requirements. In addition the tool coupled with Extension's planner certification train helps to ensure that written plans are structurally uniform which facilitates agency review. Both of which helps to reduce the development/approval time of a plan as well as increase the number of plans that can be written/revised.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #13

1. Outcome Measures

Number of watershed management assessments

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

How does water quality change? It is improving, getting worse, or just staying the same? These are questions that often asked for many reasons, including the State's investment in water-quality monitoring, best management practices, and other voluntary actions. The Arkansas Water Resources Center continues to monitor water quality in streams in Northwest Arkansas to answer these questions.

What has been done

The Arkansas Water Resources Center, funded by the 319 Nonpoint Source Program of the Arkansas Natural Resources Commission, collects water samples from streams in the Upper Illinois River Watershed, Upper White River Basin and the Poteau River Watershed. These water samples were analyzed for chloride, nitrogen, phosphorus, sediment and sulfate at its water quality lab, which is certified by the Arkansas Department of Environmental Quality. The data was organized, and then water quality trends were evaluated using flow-adjusted concentrations and cool statistical techniques.

Results

The Arkansas Water Resources Center noticed four distinct findings that were important to the State. First, short-term changes in water quality (measured via flow adjusted concentrations) are influenced by variation in climate and hydrology. Second, the recent reductions in phosphorus from the City of Springdale's wastewater treatment plant has reduced phosphorus concentrations in Spring Creek; however, these improvements have not been observed further downstream in the Illinois River yet. Third, there is an increasing trend in chloride and sulfate concentrations in some streams; why is an important question, but it might be related to salt use during winter. Last, the site specific criteria form minerals in streams might need to be revised to consider underlying geology and biological response. These data are critical to our understanding of how we influence water quality with what we do in our watersheds.

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

Number of tillage, burning, and residue level management assessments

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Earthworms are important organisms driving soil quality. Earthworms increase litter decomposition and facilitate nutrient cycling, help build soil structure, and increase available N in soil. The importance of proper management for healthy soil ecology to promote soil fertility is crucial; the sustainability of agroecosystems requires greater productivity to feed a growing world population while maintaining ecosystem functioning under greater variability of weather patterns induced by climate change. However, earthworm density is often reduced in low organic matter soils that are intensively managed for row-crop production.

What has been done
A study was completed to relate earthworm density and community composition to residue management after seven years of consistent management practices in a wheat-soybean double-crop system in eastern Arkansas. Residue management practices included conventional tillage and no-tillage, N fertilization to produce different (high and low) wheat residue levels, and burning compared to unburned wheat residue remaining on the soil surface.

Results
This study was conducted because observationally there were no earthworms when the long-term study was initiated, and earthworm activity became noticeable during routine annual soil sampling four to five years after initial establishment. Sampling found that indeed earthworms were abundant in this row crop system on a silt-loam soil in eastern Arkansas. Both native and non-native earthworms were identified. Diversity was low as only two species were identified; however, the majority of adults (identifications were done on adults only) were native species. The actual densities were dependent on the interactions of the three residue management methods employed in the study (tillage by residue level by burning), and suggest that the native species may be better adapted to particular conditions than the non-native earthworms. Differences in earthworm populations and abundances may serve as a bioindicator of long-term sustainability of common residue management practices in the highly agriculturally productive delta region in the Lower Mississippi River Valley of eastern Arkansas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
136	Conservation of Biological Diversity

Outcome #15

1. Outcome Measures

Number of assessments of drug resistant bacteria in the environment

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The spread of antibiotic resistance is a concern that continues to increase for human health, agriculture, and ecology, but trying to untangle the interrelated properties and processes that may lead to an increase in antibiotic resistance in the environment is difficult. Antibiotic resistance genes are often found on genetic elements, including integrons and mobilizable and conjugative plasmids, which can move genes around, including from one organism to another.

What has been done
We have been investigating Escherichia coli collected from treated effluent and receiving stream water that was found to be resistant to a number of different antibiotics (from one to six different antibiotics). We have been testing for the presence of mobile genetic elements and for a number of different genes that lead to resistance to two of the different antibiotics (trimethoprim and sulfamethoxazole). We have investigated whether the presence of DNA for genetic elements that help transfer and integrate genes, or the genes that encode for resistance to the antibiotics trimethoprim or sulfamethoxazole, are in fact positively related to increased multiple drug resistance within our collection of Escherichia coli. Furthermore, we wanted to determine if the presence of these genes in fact resulted in greater transfer of antibiotic resistance to other bacteria in laboratory experiments

Results
Our results confirmed other findings of a relatively large percentage of co-occurrence of antibiotic resistance genes and presence of elements that facilitate the transfer and integration of resistance among organisms. Our results also indicate that increased density of genes for resistance against trimethoprim and sulfamethoxazole may serve as a biomarker for mobile multiple drug resistance in general. Furthermore, E. coli recovered from receiving stream water located (2 km) downstream of wastewater treatment plant effluent input, E. coli possessing resistance to three antibiotics, and E. coli possessing three compared to a single

sulfamethoxazole (sul) gene increased transfer to other bacteria. While these were controlled experiments on a limited number of bacterial isolates, the data do signal that (conjugative mediated) transfer of antibiotic resistance, in particular to sulfamethoxazole, may be an important problem among resistant bacteria in stream water and deserves continued investigation.

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

Number of assessments of fish survival rates

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this project was to determine how short-term mortality experienced in the weeks to months following stocking influenced stocked crappie contribution to year-classes.

What has been done
During this 2-year study, ~180,000 Black Crappies P. nigromaculatus and ~180,000 White Crappies P. annularis were chemically marked with OTC and/or calcein. Efficacy of OTC and calcein marking was 100% for both marks on sagittal otoliths, and for calcein marks on external surfaces. Eight Arkansas reservoirs were stocked at a density of 124 crappies/ha. Marking, hauling, and delayed handling mortality in this study were similar to, or lower than previous estimates for crappies

Results
Stocking contribution and catch-per-effort (CPE) varied among study reservoirs and between short-term sample periods in individual reservoirs. As little as 2 weeks after stocking, stocking contributions to the year-class were as low as, or lower than, the majority of previous contribution

estimates made 1 year after stocking. This study did not reveal any obvious procedural choices that would increase the mean or decrease the variability of percent contribution of stocked crappie to a year-class. This study illustrates the relation between stocking contribution and CPE of stocked fish shortly after stocking and the stocking contribution and CPE of stocked fish at age-1.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
134	Outdoor Recreation
136	Conservation of Biological Diversity

Outcome #17

1. Outcome Measures

Number of fish conservation assessments

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Strawberry Darter (Etheostoma fragi Distler 1967) was identified as a species of greatest conservation need in the Arkansas Wildlife Action Plan. The Strawberry Darter is endemic to the Strawberry River drainage and was recently elevated from the subspecies to the species level.

What has been done
Two summer field seasons were conducted during this project. Thirty-two unique sites were sampled each of the two field seasons. An equal number of main-stem and tributary sites were sampled during the project.

Results
A total of 236 individual Strawberry Darters were observed during the study, 105 were collected in 2015, with another 131 collected in 2016. Strawberry Darters were observed at 24 of the 64 sites, 12 sites in 2015 and another 12 sites in 2016.

Occupancy modeling was used to characterize the status and distribution of this species. The model incorporating site-type estimated an occupancy rate (mean ± SE) of 0.30 ± 0.09 and a probability of detection of 0.49 ± 0.10 at main-stem sites. Additional modeling at tributary sites estimated an occupancy rate of 0.48 ± 0.09 and a probability of detection of 0.63 ± 0.07. There were no significant differences in occupancy rate and probability of detection between main-stem and tributary sites. Across the whole drainage, occupancy rate was estimated at 0.41 ± 0.06 and the probability of detection was 0.56 ± 0.06 for Strawberry Darters.

There was a significant decline between the historical (0.79 ± 0.12) and current occupancy rates, though there was no significant difference between the historical (0.73 ± 0.08) and current probability of detection. These data provide a compelling argument for conservation measures both of the species and its habitat in the Strawberry River drainage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
136	Conservation of Biological Diversity

Outcome #18

1. Outcome Measures

Number of registered foresters who maintained their state certification as a result of programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	395

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The UA, Division of Agriculture, Arkansas Forest Resources Center (AFRC) is the lead partner in providing continuing forestry education credits (CFEs) for registered foresters in Arkansas. Registered foresters are required by State law to obtain 8 CFEs each year to maintain their registration.

What has been done

AFRC faculty and county Extension personnel, working with the Arkansas State Board of Registration for Foresters and the Society of American Foresters, annually host a series of meetings that provide CFEs for Registered Foresters, with attendance averaging about 200 per meeting. Center faculty serve as program coordinators, meeting planners, organizers, and speakers at all programs designed to meet the educational needs of registered foresters. Several Extension faculty members in collaboration with the AR Division of the Ouachita Society of American Foresters and the AR Board of Registration for Foresters planned and implemented 3 Registered Foresters Workshops.

Results

In FY17, 395 registered foresters attended and maintained their certification which represents 88% of the state's registered foresters and potentially impacted 6.7 million acres of forest land. An Extension led workshop on Herbicide Control in Hardwood management was and attended by 37 professional foresters. These participants reported a potential value/acre impacted was reported as $ 27.00/acre. The Herbicide Use in Forest Management in-service training was attended by 11 Extension agents, and 7 Arkansas Forestry Commission foresters and 1 NRCS forester. Seventy-six percent of the attendees indicated a significant change in knowledge regarding herbicide use in forest management and 100% indicated an improved ability to better serve clientele. Attendees also said that the knowledge they gained would have an average impact of $ 25.00 per acre to their respective clientele. This number represents impact on forest establishment costs associated with herbicide use site preparation, release operations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
134	Outdoor Recreation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
204	Plant Product Quality and Utility (Preharvest)
511	New and Improved Non-Food Products and Processes
605	Natural Resource and Environmental Economics

Outcome #19

1. Outcome Measures

Amount of GHG emissions reduced in cotton (metric tons)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Greenhouse gas (GHG) emissions contribute to climate change. The cotton industry from producer groups to brands and retailers has set goals for GHG reductions. Walmart's project Gigaton is a sustainability push to remove 1 billion metric tons of GHG from the supply chain by 2030. The U.S. cotton producer's sustainability goals for 2025 include a 39% reduction in GHG emissions.

What has been done
Through the adoption of no-till and the use of cover crops a reduction of GHG emissions of 11.1% in the field as measured by Field to Markets' Fieldprint Calculator has been documented compared to the producer standard practice in the Arkansas Discovery Farms.

Results
If applied to the 438,000 acres of cotton harvested in 2017, this would represent a reduction of 27.8 metric tons of GHG, the equivalent of removing 6 passenger vehicles from the road for one year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
511	New and Improved Non-Food Products and Processes

Outcome #20

1. Outcome Measures

Increase in Cotton water use efficiency (in million gallons)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	48

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Excessive runoff from fields in the Mississippi River Valley contributes to soil and nutrient loss which can contribute to hypoxia in the Gulf of Mexico. In an effort to preserve groundwater and reduce erosion, the U.S. cotton producer's sustainability goals for 2025 include an increase of irrigation water use efficiency by 18% and a 50% reduction in soil loss.

What has been done
Through the adoption of no-till and the use of cover crops an increase in irrigation water use efficiency of 23.5% and a reduction of soil loss by 67.5% as measured by Field to Markets' Fieldprint Calculator has been documented compared to the producer standard practice in the Arkansas Discovery Farms.

Results
If applied to the 438,000 acres of cotton harvested in 2017, this would represent a reduction of 47.6 million gallons or 1,752 acre inches of water pumped and a reduction of 700.8 tons or approximately 35 semi-truck loads of soil.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation

Outcome #21

1. Outcome Measures

Number of landowners trained in feral hog control

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	560

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Feral Hogs destroy crops, harm habitat and cause economic harm to Arkansas landowners.

What has been done
An ongoing educational effort to inform and demonstrate best management practices for controlling feral hogs has been made by Division of Agriculture Faculty. The purpose is to raise awareness of feral hog control among landowners and to reduce damage through localized trapping, and improve the conservation of natural resources. Since January 2015, UA has hosted 14 regional (multi-county) workshops attended by 560 landowners, educational displays staffed at 20+ events resulting in an estimated 6,316 viewers, published 4 fact sheets and printed 1,550+ feral hog publications distributed at workshops and exhibits, conducted 11 field demonstrations of trail camera surveillance techniques, and 13+ field demonstrations of corral trapping. The feral hog webpage (www.uaex.edu/feralhogs) received 8,179 page views since August 2015.

Results
A Division scientist currently is serving on the Arkansas Feral Hog Eradication Task Force, a legislatively mandated committee comprised of agencies and organizations with stakeholders in feral hog damage and control. A study of economics associated with feral hogs in the state is planned for 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
134	Outdoor Recreation
601	Economics of Agricultural Production and Farm Management

Outcome #22

1. Outcome Measures

Number of Biofuels management assessments

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Switchgrass is a perennial native grass species with great supply potential for cellulosic biomass conversion facilities interested in providing renewable energy without impacting food, feed and fiber supply. This is possible as switchgrass grows on marginal land.

What has been done
As a perennial crop, switchgrass, recycles nutrients from above ground biomass to its roots after senescence which usually occurs after first fall frost. As such, harvested biomass contains less N, P and K than material harvested earlier in the season. Delayed harvest thus leads to nutrient replacement cost savings. Moisture in the standing crop also declines and as such, single pass harvest with a forage chopper is possible and cheaper compared to conventional cutting, baling and grinding operations. The catch is lesser yield with delayed harvest. To analyze these harvest time tradeoffs, switchgrass field trials conducted at Oklahoma, Arkansas and Louisiana, were performed to provide profitable nutrient application recommendations for different harvest dates to answer whether waiting for low moisture and nutrient concentration with a single pass was more profitable than harvest at an earlier time using multiple passes.

Results
For most locations analyzed, results showed that harvest past the maximum yielding season typically observed in August and September and near or at the onset of senescence in late October or November, using multiple harvest passes, is more cost effective than waiting for the crop to dry down for a single harvest as early as December but usually in January or February.

Locations that had lower yield potential suffered lesser yield loss from waiting until January and offered the potential for a single cut system. Producers and biorefineries operating in situations where fields with different yield potential exist in the periphery of the plant are thus advised to harvest higher yielding fields relatively early whereas delayed harvest on lower yielding fields could be profitable. Nutrient replacement cost savings and enhanced capacity utilization of harvesting equipment were sufficient to offset yield losses. Not analyzed were cost implications for plant storage needs or cost savings associated with lesser nutrient concentration of biomass harvested late.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The world price for fossil fuels continues to discourage public funding for biofuels research and education. Arkansas currently does not have an agricultural biofuels industry, although there are some forestry based biofuels efforts in the state.
The public expectations for environmentally sustainable continues, yet the financial support for environmentally relevant research and educational programs is largely absent.
In Arkansas, where water is relatively abundant, there is little public financial support for improving water use efficiency in crop production. Yet, farmers continue to make on-farm adjustments including installation of tailwater recovery systems, multiple inlet irrigation techniques, and construction of surface water retention reservoirs. The Arkansas Water Plan has been updated and Division of Agriculture faculty and staff will coordinate research and educational efforts to implement the new plan.
Water quality is a top-of-mind topic in certain areas, particularly the Buffalo River Watershed and the Beaver Lake Watershed. Science-based recommendations and regulations have, on occasion, been severely criticized by some environmental groups in Arkansas and reported in the popular press. Some groups have attempted to paint the Division of Agriculture as biased in favor of agricultural production simply because of our history of working closely with farmers to improve production practices.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Surveys of participants and stakeholders are utilized to provide both direction to future programs and to evaluate current programs. Surveys are conducted during workshops to determine current knowledge levels and to determine any changes in knowledge as a result of the program. For example, more than 54 landowners representing 12,869 acres of forestland attended a workshop held at the SW Research and Extension Center in FY17. Over 50% of the attendees plan on changing the way they market timber, 38% stated that they will work towards certifying their forest, and 25% reported an increase in knowledge of estimating timber value and conducting timber sales. One of these landowners changed the manner in which they sold timber as a direct result of attending the educational workshop. A Herbicide Use in Forest Management in-service training was attended by 11 Extension agents, and 7 Arkansas Forestry Commission foresters and 1 NRCS forester. Seventy-six percent of the attendees indicated a significant change in knowledge regarding herbicide use in forest management and 100% indicated an improved ability to better serve clientele. Attendees also said that the knowledge they gained would have an average impact of $ 25.00 per acre to their respective clientele.

UA Extension utilizes input from a survey results of AR Tree Farmers regarding their preference in topics in program planning. Based on a survey of Tree Farmers the top four topics of interest were: 1) how to harvest timber (45%); selling and marketing timber (43%); 3) protecting woodlands from insects and disease (42%); and 4) managing wildlife habitat and wildlife problems (42%). Members of the Tree Farm System are often the most motivated of landowners. Working closely with the State Tree Farm board provides valuable program direction and ensures that our Extension efforts are based upon key stakeholder input. A series of workshops focused on marketing timber and certification options for private landowners was developed based on this input.

Key Items of Evaluation

The number of publications distributed and website hits on subjects that inform to Environment, Energy & Climate are good indicators of stakeholder interest.
Adoption of N-STaR can be predicted and quantified by the number of soil samples submitted for N-STaR analysis. The number of new N-STaR enrollees that more farmers are adopting the N-STaR recommendations, which frequently call for reduced rates of N on rice.
Patents awarded are a good evaluation of novel research discoveries, but the full impact of those discoveries is best measured by the number of successful commercial licenses and revenue from those licenses.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Access to Safe & Nutritious Food

☑ 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
501	New and Improved Food Processing Technologies	5%	0%	0%	15%
502	New and Improved Food Products	0%	0%	21%	15%
503	Quality Maintenance in Storing and Marketing Food Products	0%	0%	1%	15%
504	Home and Commercial Food Service	10%	0%	1%	0%
701	Nutrient Composition of Food	0%	0%	10%	0%
702	Requirements and Function of Nutrients and Other Food Components	10%	40%	20%	5%
703	Nutrition Education and Behavior	25%	10%	10%	25%
704	Nutrition and Hunger in the Population	15%	0%	0%	0%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%	0%	9%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%	50%	23%	25%
723	Hazards to Human Health and Safety	0%	0%	5%	0%
724	Healthy Lifestyle	15%	0%	0%	0%
806	Youth Development	10%	0%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	51.1	0.5	80.0	4.3
Actual Paid	71.1	0.0	43.2	5.0
Actual Volunteer	4.9	0.0	2.5	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**
624388	0	480333	296142
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
840301	0	4325067	314345
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
6537622	0	267016	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Preventing Childhood Obesity:
The University of Arkansas Division of Agriculture addresses childhood obesity through Extension & Research's Supplemental Nutrition Assistance Program - Education (SNAP-Ed), Expanded Food and Nutrition Education Program (EFNEP) and 4H and youth development programs. SNAP-Ed and 4-H programs are conducted in all 75 counties and EFNEP was conducted in 16 counties in FY17. The goal of the SNAP-Ed is to help individuals receiving SNAP benefits or eligible to receive SNAP benefits make healthy food choices on a limited budget and choose physically active lifestyles consistent with the Dietary Guidelines for Americans. SNAP-Ed works with community partners who target a similar audience. EFNEP is taught by peer educators to deliver up to 12 lessons to eligible youth. 4-H uses healthy living projects and other curricula (4-H Yoga for Kids, Healthy Lifestyle Choices, Choose Health: Food, Fun and Fitness) to reach Arkansas youth. Youth engagement approaches, such as Teens as Teachers, and a youth healthy living ambassador track are used to connect state and county level program efforts.

Nutrition:
Division of Agriculture and UAPB faculty develop, evaluate, and disseminate education programs and curricula, incorporating new research and emphasizing healthy lifestyles to prevent and/or reduce adult and childhood obesity and other diet related diseases. Programs include but are not limited to:

- Supplemental Nutrition Assistance Program Education (SNAP- Ed and FFNews) Adults and Youth
- Expanded Food and Nutrition Education Program (EFNEP) Adults and Youth
- Healthy weight programs
- Arkansas Farm to You
- USDA Eat Healthy, Be Active Workshops
- Living Well with Diabetes
- Cooking schools

Division of Agriculture and UAPB faculty conduct novel research to determine the impact of diet and food composition and functional food components on body weight and health.
Food Security:
Food security means that people have access, at all times, to enough food for an active, healthy life for all household members. At a minimum, this includes: 1) readily available, nutritionally adequate, and safe foods and 2) assured ability to acquire personally acceptable foods in a socially acceptable way. Arkansas has the 5th highest percentage (17.2%) of persons living in poverty and the 5th highest percentage of food insecure children under 18 years of age (26.3%) in the nation. During the 2016-207

school year, 287,142 students, or 61% of total enrollment in public schools, were approved for free and reduced-price lunches. In FY17, approximately 20% of the total population in Arkansas received SNAP benefits to help them stretch their family's resources. The Arkansas Department of Human Services Statistical Report for state fiscal year 2016 showed that 610,957 persons were participating in the program. Among Arkansans receiving SNAP benefits in 2016, 53% were children, age 0 - 18 and 3% were 65 years of age or older.
UACES has two large programs that help people with limited resources access safe and nutritious food and improve food security. The Expanded Food and Nutrition Education Program (EFNEP) uses a holistic nutrition education approach to help participants improve their ability to get food directly--and from food assistance programs where necessary--to ensure having enough healthy food to eat. The EFNEP program was in 16 counties in FY17. The SNAP-Ed program helps people receiving or eligible to receive SNAP benefits improve the likelihood of making healthy food choices within a limited budget and choosing active lifestyles consistent with the current Dietary Guidelines for Americans and the USDA Food Guidance System. The SNAP-Ed program is offered in all 75 Arkansas counties.
Food Processing and Safety:
The Division of Agriculture and UAPB faculty and staff develop, evaluate and disseminate education and curricula incorporating research and teaching for food safety and processing. Programs include:

- Quarterly HACCP Roundtable meeting
- HACCP workshops
- Food safety and preservation workshops for consumers
- ServSafe workshops
- Culinary arts training for food industry personnel
- Online distance education in food safety and manufacturing
- Assistance to small food companies and entrepreneurs in the form of services, workshops, and consulting.
- Provide science-based information on catfish production, processing and economics to USDA-FSIS to assist with development of the new food safety inspection.

Research activities in food safety include work to better understand the ecology of food pathogens, improve food processing systems to minimize food pathogens and to improve detection systems for Listeria, Salmonella, E. Coli and other major food pathogens.
Research activities in food chemistry and food processing include work to (1) improve the quality of rice and improve rice processes, (2) expand the utilization of soybeans and its co-products, (3) assess the health benefits associated with fish, vegetables and other processed foods, and (4) improve the sensory quality of processed foods.

2. Brief description of the target audience

4H Youth
SNAP-Ed Youth and Adults
EFNEP Youth
Teachers
School personnel
Parents
Adults
Child Care Providers
Researchers
Food Manufacturers
Farmer's Markets
Farmers
Limited resource farmers

Entrepreneurs and Restaurants
Food Service Employees and/or Food Handlers
Employers & Employees
Health Professionals
Consumers
State & federal agencies
College Students
Catfish farmers and processors

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	139314	602738	278649	16394

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

Patent Applications Submitted

Year:	2017
Actual:	3

Patents listed

US 9,752,099.Conjugated Linoleic Acid Rich Vegetable Oil Production using Heterogenous Catalysis. 9/5/17. Andrew Proctor.
Blueberry plant named 'Norman'. 10/10/17. JohnClark, et.al.
US 9,603,915. Compositions and Methods of Enhancing Immune Responses to Eimeria Limiting Eimeria Infection. 3/28/17. Billy Hargis, et.al.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	9	85	94

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of 4-H/Youth Food, Nutrition and Physical activity programs delivered related to eating healthy, being active, and safe food handling

Year	Actual
2017	14949

Output #2

Output Measure

- Number of youth contacts in youth Food, Nutrition, and Physical Activity programs related to eating healthy, being active, and safe food handling

Year	Actual
2017	287086

Output #3

Output Measure

- Number of adult contacts from educational events (educational classes, workshops, group discussions, one-on-one interventions, demonstrations and other educational activities) related to eating healthy, being active, and safe food handling

Year	Actual
2017	47634

Output #4

Output Measure

- Number of Online Master of Agriculture (Food Safety Emphasis) students enrolled in courses

Year	Actual
2017	36

Output #5

Output Measure

- Total competitive federal Grant $ for program area

Year	Actual
2017	3445610

Output #6

Output Measure

- Total non-federal competitive grant $ for program area

Year	Actual
2017	1756000

Output #7

Output Measure

- Number of participants in educational programs leading to graduation from the Better Process Control School
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of participants in educational programs leading to ServSafe certification for managers

Year	Actual
2017	268

Output #9

Output Measure

- Number of participants in quarterly HACCP roundtables

Year	Actual
2017	115

Output #10

Output Measure

- Number of culinary workshops for food technologists

Year	Actual
2017	6

Output #11

Output Measure

- Number of participants in culinary workshops for food technologists leading to certification as Certified Culinary Scientist

Year	Actual
2017	37

Output #12

Output Measure

- Number of culinary workshop participants completing 120 hours of required contact time for the Certified Culinary Scientist recognition

Year	Actual
2017	21

Output #13

Output Measure

- Number of food processing laboratory services provided

Year	Actual
2017	15

Output #14

Output Measure

- Number of nutritional labels developed

Year	Actual
2017	135

Output #15

Output Measure

- Number of food processing approvals developed (2541a)

Year	Actual
2017	15

Output #16

Output Measure

- Number of adult nutritional programs delivered related to eating healthy and being active

Year	Actual
2017	3523

Output #17

Output Measure

- Number of briefings to catfish farmers and catfish processors
  Not reporting on this Output for this Annual Report

Output #18

Output Measure

- Number of presentations to catfish farmers and processors
  Not reporting on this Output for this Annual Report

Output #19

Output Measure

- Number of emails, phone calls, and conference calls to catfish farmers and processors
  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 participants receiving certification in Better Process Control
2	Number of participants receiving certification in ServSafe
3	Number of participants in other workshops related to Food Safety including HACCP, food safety, food defense, food labeling, and food microbiology workshops receiving attendance certification
4	Number of growers and producers receiving GAP certification or equivalent (gaining access to new markets)
5	Number of youth demonstrating improved knowledge of food safety or hand washing
6	Number of Online Master in Food Safety graduates employed in the food industry
7	Number of viable technologies developed or modified for the detection and characterization of foodborne pathogens
8	Number of viable prevention, control and intervention strategies for foodborne threats in the food system
9	Number of culinary workshop participants passing the examination to become a Certified Culinary Scientist
10	Number of viable technologies developed or modified for improving food processing systems
11	Number of viable technologies developed or modified to improve the nutritive quality of foods
12	Number of small businesses started as a result of the food entrepreneur assistance program
13	Number of children that reported eating more of healthy foods.
14	Number of children who increase physical activity
15	Number of adults who improve food preparation skills
16	Number of adults who decrease sodium intake
17	Number of adult participants who increase consumption of foods recommended by the Dietary Guidelines for Americans

18	Number of adult participants who decrease consumption of foods recommended by the Dietary Guidelines for Americans
19	Number of public agencies personnel, aquaculture industry personnel, and general public individuals with increased understanding of food security and safety issues related to fish consumption in imported catfish and catfish-like products as compared to U.S. farm-raised catfish
20	Number of adults who report improved food security after participating in a nutrition education class

Outcome #1

1. Outcome Measures

Number of participants receiving certification in Better Process Control

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of participants receiving certification in ServSafe

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The CDC estimates that every year about 76 million people in the US become ill from pathogens in food. Every month, many new food service establishments open in Arkansas with personnel having little or no
training in safe food handling practices.

What has been done
During 2017, Extension conducted programs to improve food safety. Nineteen ServSafe Food Manager and tem food handler classes were conducted in cooperation with county health

departments to train food service workers.

Results
Food safety literacy was overall improved.
137 managers of food establishments were trained through 19 ServSafe classes. Of those 93 received certification.
131 food service workers participated in 10 food handler classes with 99 participants passing the assessment.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Number of participants in other workshops related to Food Safety including HACCP, food safety, food defense, food labeling, and food microbiology workshops receiving attendance certification

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	115

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The poultry industry is a mature industry that is both commodity market and value-added consumer products with higher profit margins. Food safety is an issue that will always be of concern as long as we continue to produce, distribute and consume foods of animal origin.

What has been done
To serve as an educational resource for the poultry industry, the Center of Excellence for Poultry Science and the U of A System Division of Agriculture offered both a Basic HACCP workshop that is required by USDA regulations as well as an Advanced HACCP workshop that is not required by regulation but is part of demonstration of process improvement required by the Global Food

Safety Initiative (GFSI) 3rd party auditing schemes.
2017 was the 20th anniversary of the U of A HACCP Roundtable. This quarterly meeting allows the industry to come to the university to discuss HACCP / regulatory issues and then have an open communication with officials from the USDA FSIS Springdale District Office.

Results

The impact of Food Safety educational efforts are usually difficult to measure by the absence of a problem and the education does not necessarily change the unsafe condition (meat and poultry that has pathogenic bacteria that are controlled by proper handling and cooking). Success is measured by the low incidence of foodborne illness, not the complete absence.
The HACCP Roundtable allows industry to get correlation on regulatory interpretation at the District level which includes the 15 circuits within the Springdale District in Arkansas, Kansas and Missouri, as well as have a conversational relationship with regulators in a non-crisis situation. This is verified by the Springdale District Director, Mr. Robert Bane in his words to CES Communications Dept. on the occasion of the 20th anniversary.
"I first became involved with the HACCP roundtable shortly after I became a Deputy District Manager for FSIS in 2009. I was asked to attend on behalf of the Springdale District Office with the understanding that industry would be posing questions for me to answer- questions about Agency policies, District expectations, and any other relevant concerns they may have. Admittedly, I was somewhat anxious as I felt my way through my first couple of sessions, but I quickly realized the value of the forum for all parties involved. For me, it provides an opportunity to share the District's perspective on new policies and emerging issues, and hopefully make regulatory compliance more easily attainable. But it has also proven to be a valuable opportunity for me to gain a better understanding of industry's perspective. Interacting with the participants in these sessions has helped me identify areas where correlation is needed to ensure we are clear and consistent in our regulatory approach. In some cases, it has shed light on policy concerns that were passed on to FSIS headquarters. Simply put, these conversations make our District and our Agency better, and I'm grateful to Dr. Marcy and the U of A for their support in strengthening the relationship between FSIS and industry as we work together to ensure food safety."

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of growers and producers receiving GAP certification or equivalent (gaining access to new markets)

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of youth demonstrating improved knowledge of food safety or hand washing

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4759

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle
806	Youth Development

Outcome #6

1. Outcome Measures

Number of Online Master in Food Safety graduates employed in the food industry

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food Safety remains an important national issue for the public and the food industry. With the advent of the Food Safety Modernization Act, there is increased depend for food safety professional to receive food safety education and gain credentials in food safety while employed in the food industry.

What has been done
Faculty in the Division of Agriculture developed a distance education based graduate degree in food safety. The program is one of an handful in the nation to be delivered via distance. Since its inception, the program has served over 150 food safety professionals and the demand for the program continues to grow.

Results
There are currently 36 students enrolled in the program and we had 6 students graduating from the program in 2017. We are investigating additional staffing of the program to double our maximum enrolment to 80 students.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Number of viable technologies developed or modified for the detection and characterization of foodborne pathogens

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Could it be that the Gold Standard, plate counting, for enumerating pathogenic bacteria from food could be under reporting viable pathogens?
Listeria monocytogenes (LM) is a foodborne pathogen which is found in rural environments and frequently in raw products used in food production. The compromised immune systems of infants, the elderly and pregnant women make them especially vulnerable to infection by LM. In the food production environment, LM is frequently isolated from niches such as floor drains, cart wheels, shoes, and many other areas. Other locations may not support the growth of the pathogen but might still protect viable LM cells. If these cells survive under these low nutrient or starvation conditions, they may later be dislodged and contaminate food products or be deposited where nutrients are more plentiful. When many species of bacteria that are normally easily grown are starved for long periods of time, the culturable cell count declines while the total cell count as measured by microscopy or turbidity may remain constant, leading to a large number of non-culturable cells. Culture based methods presume that these cells are dead. However, some researchers have advanced a theory which hypothesizes that the non-culturable cells are in a "viable but non-culturable" (VBNC) state in which they remain viable and can grow-out when conditions improve but currently cannot be cultured.

What has been done
LM strains EGD-e, Scott A, F2365, and HCC23 were starved individually in sterile water. Colony counts declined over 4 weeks, with Scott A declining the most rapidly. Starving cells were subjected to the metabolic inhibitors fluoride, arsenite, 2,4-dinitrophenol (DNP), iodoacetate, and cyanide individually.

Results
Transmission electron microscopy images show degradation of starving cell membranes and altered cytosols.Iodoacetate, which inhibits glyceraldehyde-3-phosphate dehydrogenase, completely reduced cultivable counts below the level of detection as compared to the control starving cells; DNP, which dissipates proton motive force, almost completely reduced cultivable counts. These results suggest that LM strains EGD-e, Scott A, F2365, and HCC23 are actively using part of glycolysis pathway while starving. These results suggest that starving LM retain aspects of active metabolism and therefore deserve additional research to further characterize their risk to human health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #8

1. Outcome Measures

Number of viable prevention, control and intervention strategies for foodborne threats in the food system

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

On-farm, in-bin drying and storage of grains using natural air, if not properly managed, is a process that is prone to grain mold contamination and associated mycotoxin contamination problems (e.g., aflatoxin), posing significant public health risks, and reducing overall grain quality. In collaboration with Arkansas grain producers and processors, our research continues to produce science-based knowledge to inform improved regional and national food security, chiefly in the rice, soybean, corn, and grain-sorghum industries, on issues of determining best drying and storage practices that maintain quality and mitigate contamination with toxigenic fungi and their associated mycotoxins, many of which are carcinogenic to humans.

What has been done

Recently-introduced technology for use in on-farm drying systems offers a means to utilize the advantages of low-temperature, in-bin drying systems, yet prevent the disadvantages that are sometimes incurred with natural air drying. The new technology controls drying fan operation by the principle of Equilibrium Moisture Content (EMC), which is the moisture content that a specific grain will attain if exposed to air with a given relative humidity and temperature for a long enough duration. Thus, drying fans are operated only under set conditions to avoid over-drying of grain.

The new in-bin technology comprises sensors to measure ambient air conditions, as well as cables to monitor grain moisture content and temperature throughout the grain bin mass, and the data can also be accessed anytime via the internet, which has revolutionized monitoring capabilities. From an electronic monitor and fan control standpoint, this new technology appears very promising. However, the ultimate success hinges on (1) accurate EMC data to determine fan run time, (2) knowledge of the rate of mycotoxin development and quality reduction for rice in the upper bin layers, and (3) availability of auxiliary systems to support rapid drying in event of bad weather, and for pest and mycotoxin control. Specific research issues addressed include:

· Studying kinetics of grain quality degradation, mold growth, and mycotoxin development during on-farm, in-bin drying and storage;

· Determination of accurate EMC models for use in the new on-farm, in-bin drying and storage systems;

· Mathematical modeling to optimize performance of the on-farm, in-bin grain drying and storage systems;

· Development of novel techniques to enhance drying rates and for detection, decontamination, and detoxification of harmful-grain molds and mycotoxins.

It is expected that the research will answer the following questions that are critical for successful implementation of the new technology for on-farm, in-bin drying and storage in major U.S. grain growing areas:

· what is the rate of grain "quality" reduction and mycotoxin development under typically encountered drying and storage scenarios;

· with respect to stored product "quality," what is the upper moisture content limit for grain placed into the drying and storage bin systems at various geographic locations; and

· energy savings using the new technology for in-bin grain drying and storage.

· Could use of in-bin grain chilling technology improve quality of grain in storage?

Results

A computer simulation platform capable of predicting natural air in-bin drying of rice, corn and soybean has been built; models used in the simulations have been validated using field experiments. The developed platform, with a user-friendly interface, is helpful to determine natural air in-bin drying strategies such as airflow rate, harvest-start date, and fan control option for successfully drying and storage of grain harvested at varied moisture contents and geographic locations. The simulation platform incorporates 20-year hourly weather data of temperature and relative humidity across major grain growing regions in Arkansas for the simulations. Overall, the study continues to document kinetics of grain quality deterioration and mycotoxin formation; these are to be modeled to provide further constraints to defining guidelines for optimal in-bin drying and storage strategy. Also, with the same research scope we continue to develop novel techniques to enhance grain quality, drying rates and for detection, decontamination, and detoxification of harmful-grain molds and mycotoxins.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #9

1. Outcome Measures

Number of culinary workshop participants passing the examination to become a Certified Culinary Scientist

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	21

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #10

1. Outcome Measures

Number of viable technologies developed or modified for improving food processing systems

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to Scientific Report of the 2015 U.S. Dietary Guidelines Advisory Committee, the U.S. population ages two years and older consume inadequate amounts of vitamins A, C, D, and E, folate, calcium, magnesium, iron and potassium. Because of a strong association of micronutrient deficiency and chronic diseases, it is important to increase the U.S. population intake of these micronutrients. Fortification offers the most effective way in terms of both cost and success to improve intakes of micronutrients. Rice micronutrient fortification has remained a technological challenge because rice is conventionally consumed as whole kernel instead of as flour in which micronutrients can be fortified easily and effectively. Recently, parboiling has been employed as a strategy to fortify rice with micronutrients. Although rough rice (paddy) is often used as a feedstock for parboiling, removing the hull would enhance the penetration of the fortificants into the endosperm. Therefore, it is important to compare the effectiveness of fortification-parboiling process using rough rice and brown rice as feedstocks.

What has been done
Food science researchers at the University of Arkansas parboiled two rice cultivars (one pureline and one hybrid) using both rough rice and brown rice as feedstocks. Rice was soaked in fortificants of three concentrations (0, 100, and 200 mg∙L-1 for both Fe and Zn) at 70°C for 3 hr and then steamed at 115°C and 69 kPa (10 psi) for 10 min. The results show that cultivar had little impact on the retention of Fe and Zn; steaming combined with soaking significantly increased the migration of Fe and Zn into the endosperm compared with soaking only. Fortificant-mineral retention in head rice was 13-24% with rough rice as a feedstock, and 59-64% with brown rice as a feedstock. Retention increased up to 5.2 fold for Fe and 2.6 fold for Zn. Simulated washing retained up to 95% of Fe and 84% of Zn. The results indicate that parboiling is effective in fortifying rice with minerals and brown rice is a better feedstock than rough rice for mineral fortification via parboiling.

Results
In order to produce parboiled rice with therapeutic levels of micronutrients, it is important to understand the impacts of feedstock, parboiling conditions, and fortificant concentration on micronutrient retention. This study provides benchmark information on the key factors affecting rice fortification efficiency via parboiling. The information is important to rice processors in selecting conditions to produce high-quality fortified parboiled rice.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Number of viable technologies developed or modified to improve the nutritive quality of foods

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Blackberries are a popular fruit with high concentrations of antioxidants, particularly anthocyanins and ellagitannins that possess positive health effects. Fresh berries have limited shelf-life and thus need to be processed into jams, juice, or frozen to limit postharvest losses. Anthocyanin content decreases over processing and storage at ambient temperature, which most likely has an adverse effect on health benefits. Various additives have been added to berry juices to stabilize anthocyanins, including β- cyclodextrin, pectins and other polysaccharides, and copigments such as phenolic acids. These treatments are designed to restrict the hydration reaction responsible for anthocyanin bleaching or decolorization as a result of water nucleophilic attack at the 2 position of the anthocyanin nucleus. Often very high additive concentrations are needed to limit anthocyanin degradation, therefore a recycling mechanism of multiple additives could be effective at lower concentrations. The objective of this study was to evaluate the effect of stabilizing agents with different mechanistic tactics on blackberry juice color and an antioxidant recycling mechanism on anthocyanin, flavonol, and ellagitannin content in blackberry juice over accelerated storage.

What has been done

The anthocyanin stabilizing agents; glutathione, galacturonic acid, diethylenetriaminepentaacetic acid and tannic acid were added to blackberry juice at concentration of 500 mg/L. Juices were evaluated over five weeks of accelerated storage at 30oC for anthocyanin, flavonol, and ellagitannin contents by HPLC and percent polymeric color. Glutathione had the greatest protective effect with 11% greater retention of total anthocyanins and polymeric color was reduced to 26% from 33% in the control juice receiving no additive following five weeks of storage. Therefore, a second study was performed with glutathione in combination with lipoic and ascorbic acids in an effort to use antioxidant recycling to achieve a synergistic effect. However, the antioxidant recycling system had no protective effect relative to glutathione alone. There were no notable changes in ellagitannin or flavonol content among additives or over storage. Two flavonols, quercetin-3-glucuronide and quercetin-3-pentosyl-glucuronide, were identified and quantified in blackberries for the first time.

Results

The addition of glutathione to blackberry juice resulted in greater retention of anthocyanins over accelerated storage compared to other stabilizing agents. Color was not visibly different over the course of storage, but lightness values increased presumably in response to anthocyanin degradation. Glutathione in combination with lipoic acid and ascorbic acid was tested to determine if an antioxidant recycling mechanism would reduce the concentration of stabilizing agents needed and stabilize anthocyanins more successfully; however, the combination was not more effective than glutathione alone. Glutathione did not bind to the anthocyanins, so further research is needed to determine the mechanism of stabilization. Glutathione appears to be a promising blackberry juice additive to protect against anthocyanin degradation during storage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components

Outcome #12

1. Outcome Measures

Number of small businesses started as a result of the food entrepreneur assistance program

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
2017	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The vast majority of jobs in the United States and in Arkansas are created by small, privately held companies. It is therefore vital to create an environment and conditions to assist small businesses to develop and hire people. Assisting small food companies and entrepreneurs in technical and business issues of the food processing industry can result in job creation and provide additional tax revenue for Arkansas.

What has been done
The Institute of Food Science & Engineering (IFSE) of the University of Arkansas System Division of Agriculture assists small food processing companies and entrepreneurs by providing technical assistance and making its FDA registered processing plant accessible for product manufacturing. The use of the Arkansas Food Innovation Center (AFIC) has provided the platform which to help entrepreneurs in the state of Arkansas. This past year the center has continued its outreach in the state through entrepreneurship workshops.

Results
AFIC currently has approximately twenty five active entrepreneurs using the facility routinely. A total of 74 different products were manufactured in the plant for a total of 450 production runs. We estimate that this past year AFIC was chiefly responsible for the creation of 5 fulltime processing jobs and 15-20 fulltime jobs within the startup companies associated with AFIC.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
504	Home and Commercial Food Service

Outcome #13

1. Outcome Measures

Number of children that reported eating more of healthy foods.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	10846

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over 38% of school-aged children in Arkansas are overweight or obese. Arkansas children and teens are falling short of nutrition and physical activity recommendations. Approximately sixty-one percent (287,142) of Arkansas students receive free and reduced price lunches.

What has been done
SNAP-Ed partners with schools in which 50% or more of students receive free and reduced price lunch. Nutrition education is delivered in classrooms, school gardens, cafeterias, after school programs, and summer programs. Lessons emphasize MyPlate guidelines, Arkansas grown foods, physical activity, and food preparation. Information and recipes are sent home to parents to reinforce what the children are learning. In FY17, SNAP-Ed nutrition educators worked with 239 schools to deliver 9,614 lessons.

Results
As a result of participating in nutrition education programs:

89% of youth reported they intend to follow MyPlate guidelines.

40% of youth reported increased knowledge about Arkansas foods.

80% of youth reported increased knowledge of MyPlate.

91% of youth reported improved food preparation skills.

55% of youth reported eating closer to the recommended amount of fruit.

50% of youth reported eating closer to the recommended amount of vegetables.

51% of youth reported eating closer to the recommended amount of whole grains.

50% of youth reported eating closer to the recommended amount of low-fat or fat-free dairy.

45% of youth reported decreased consumption of sugar-sweetened beverages.

50% of youth reported increasing physical activity or reducing sedentary behavior.

41% of youth reported understanding the importance of balancing food intake and physical activity.

What participants are saying...

"I make the whole grain snack mix with my mom at home. We snack on it instead of chips now." ~4th grade SNAP-Ed participant

"Arkansas grows a lot of healthy food. We should eat more of it to grow up healthy and strong." ~5th grade SNAP-Ed participant

"I took the recipes home and my mama bought the stuff for us to make them. It was so good! My mama asked if you could send some more healthy recipes." ~5th grade SNAP-Ed participant

"My child is more willing to try new foods and vegetables. He chooses higher protein snacks instead of sugary ones on his own." ~ Clay Co. parent

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

Number of children who increase physical activity

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	7332

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #15

1. Outcome Measures

Number of adults who improve food preparation skills

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	843

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

704 Nutrition and Hunger in the Population

Outcome #16

1. Outcome Measures

Number of adults who decrease sodium intake

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1151

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #17

1. Outcome Measures

Number of adult participants who increase consumption of foods recommended by the Dietary Guidelines for Americans

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5271

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In Arkansas, 68.2% of adults are overweight or obese, 13.5% have diabetes, 41% have high blood cholesterol and 39% have high blood pressure. Research shows that even small changes in diet and small decreases in weight can lower the risks for diabetes, heart disease and hypertension.

What has been done
Multiple educational approaches were used to respond to issues related to chronic illness and obesity. Healthy weight classes were evaluated in 4 counties. Participants learned to plan healthy meals, balance calorie intake with calorie expenditure, read food labels, reduce portion sizes and decrease fat and sodium intake. Cooking classes offered in 15 counties helped people learn skills that enable them to plan and prepare healthier meals at home. Participants learned to cook using healthier techniques, eat more locally grown foods and save money by eating at home more often. Nine counties offered programs to help people with diabetes better manage their disease. Programs focusing on healthy weight, diabetes self-management and choosing and preparing healthy foods resulted in 23,008 contacts through 2,441 direct education methods. Programs provided to adults through the Expanded Food and Nutrition Education Program resulted in 44,451 direct education contacts through 10,884 educational sessions and SNAP-Ed had 22,263 contacts via 878 programs.

Results
Of adult participants in nutrition programs who were asked:

81% reported improvements in one or more nutrition practice
79% reported increased fruit and/or vegetable intake
73% reported increased lowfat or fat-free dairy intake
59% reported increased whole grain intake

Of participants in healthy weight programs who were asked:

54% reported decreasing weight
67% reported decreased blood pressure
67% reported decreased blood glucose
22% reported lower blood cholesterol

What participants are saying:

"[The] doctor took me off 2 of medicines because of the healthy lifestyle I am living since participating in Living Well with Diabetes" Miller Co. Participant

"Until this class, I did not know how fun cooking could be! Now I am not afraid to try new foods and new recipes." Pike Co. Cook Smart Eat Smart Participant

"I lost a total of 25 pounds, a total of 10 inches and my cholesterol dropped 26 points." Ashley Co. ReNew You Participant

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

Number of adult participants who decrease consumption of foods recommended by the Dietary Guidelines for Americans

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3698

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #19

1. Outcome Measures

Number of public agencies personnel, aquaculture industry personnel, and general public individuals with increased understanding of food security and safety issues related to fish consumption in imported catfish and catfish-like products as compared to U.S. farm-raised catfish

Not Reporting on this Outcome Measure

Outcome #20

1. Outcome Measures

Number of adults who report improved food security after participating in a nutrition education class

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1242

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas has a high rate of food insecurity with 17.5% of households and 26.3% of children lacking access to enough food for an active, healthy life.

What has been done

The Expanded Food and Nutrition Education Program (EFNEP) addressed food insecurity by teach low-income households with children how to better manage their food resources, handle their food safely, make healthier food choices and be more physically active. In FY17, trained program assistants in 16 counties taught more than 11,007 lessons to 2,492 adults. We also reached more than 12,147 unduplicated adults through SNAP-Ed 2,638 lessons.

Results

As a result of participating in UA nutrition education programs:

80% of adult EFNEP program graduates adopted one or more food resource management practice

66% of adult SNAP-Ed program participants adopted one or more food resource management practice

37% of adult EFNEP program graduates ran out of food less often

72% of adult SNAP-Ed program participants ran out of food less often

37% of adult EFNEP program graduates increased food security

78% of SNAP-Ed participants reported saving money on groceries

206 EFNEP participants enrolled in public programs to assist them in feeding their families better

What participants are saying:

-The residents have been able to utilize their commodities and food pantry items so much better since they started going to SNAP-Ed classes. ~Senior Living Center Manager.

-I never knew how to put together a meal from leftover pantry items. I have cooked my own dinner every night this week! Thank you for teaching us how to use what we have. ~ SNAP-Ed Participant

-It's not as difficult as I thought to make healthy and affordable meals. ~EFNEP Participant

These classes changed my entire household's lifestyle. My husband has lost 14 pounds, I have lost 10 and my son has lost 6 pounds. We are saving money now because we don't eat out like we use too. We drink more water. We measure our foods, make shopping lists and walk our dog 2 miles as often as possible. THANK YOU! ~ EFNEP Participant

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

A retirement prevented the Division of Agriculture from delivering the Better Process Control School for stakeholders.
State budgets have been flat for 10 years and with $3 million dollars of "one-time" funding the last two years have created a climate that makes funding, hiring, and keeping employees difficult. Cost savings and attrition has kept key research and extension programs continuing but at the cost of meeting other needs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Childhood Obesity:
For youth, EFNEP uses age appropriate evaluation tools with K-2nd using the same tool, 3rd-5th using a different tool, 6-8th using a different tool, and finally 9th-12th is using a different tool. Every state uses the same evaluation tool as required by our Federal partners. Food resource management and food security are only assessed in the 6-8th grades and 9-12th grades, respectively.
For EFNEP youth outcomes:
81% (3774 of 4685) Children and youth improve their abilities to choose foods according to the Federal Dietary Recommendations or gain knowledge
38% (1771 of 4667) Children and youth improve their physical activity practices or gain knowledge
For SNAP-Ed, process evaluation is critical because it allows ongoing monitoring of the program and enables timely refinements which help achieve success. Process evaluation activities include tracking the number of SNAP-eligible and potential eligibles reached, the number of materials distributed at educational displays and the number of events and methods used to reach the target audience. SNAP-Ed reports planned events in the UACES Arkansas Information Management System (AIMS) online electronic reporting system.
Formative evaluation assures the best possible program by identifying appropriate target audiences and ensuring program messages and activities are relevant and meaningful to them. Methods used to evaluate the program include observing participant behavior, informal talks with the participant about the educational activity, giving short surveys, holding group discussions with participants to gain feedback to assess a project as it progresses or to determine improvements and adjustments needed to attain the program objectives.
Outcome/impact evaluation is conducted with direct contact programs. Pre-and post-tests or post-then pre-tests are used to assess knowledge, attitude, and behavior change among

youth and adults. A series of evaluation questions are in place for county agents to use to develop appropriate questionnaires that fit their programs and are aligned with UACES outcome/impact indicators.

For SNAP-Ed. Youth, evaluations collect information on knowledge gain and diet and physical activity practices.

Youth outcome evaluation measures changes as a result of participating in a SNAP-Ed program. The number of youth surveyed is not necessarily the same for every outcome indicator. Of youth surveyed:

89% reported they intend to follow MyPlate guidelines

52% reported eating closer to the recommended number of cup equivalents from the fruit group most days

50% reported eating closer to the recommended number of cup equivalents from the vegetable group most days

51% reported eating closer to the recommended number of ounce equivalents of whole grains most days

50% reported eating closer to the recommended number of cup equivalents of low fat or fat free foods from the dairy group most days

50% reported increasing physical activity or reducing sedentary time

41% reported understanding the importance of balancing food intake and physical activity

45% reported decreasing consumption of sugar sweetened beverages

40% reported increased knowledge about Arkansas foods

91% reported improved food preparation skills

4-H Healthy Living

Overall in FY17, 54,871 contacts were reported to youth Healthy Living programs, representing 18% of total youth development contacts reported in AIMS. Extension faculty and staff devoted 28,247 hours to programs in this area; 19,758 hours were dedicated to healthy living programs by volunteers ($476,958 value @ $24.14/hour).

Healthy Living Common Measures

- Survey of 3,573 participants showed that, as a result of the program:

- 90% (n=3,211) reported little to no difficulty in making healthy food choices.
- 85% (n=3,031) increased knowledge of healthy food choices.

- 83% (n=2,955) improved eating habits.
- 81% (n=2,884) indicated healthy physical activity habits.
- 89% (n=3,167) had positive attitudes toward physical activity.

Yoga for Kids Participant Survey Data

- Survey of 1,389 students showed that:

- 32% (n=445) reported doing yoga at home
- 42% (n=577) said they showed yoga poses to family or friends
- 10% (n=142) do yoga with family
- 59% (n=813) think yoga helps them relax

- 79% (n=1102) think it is fun to exercise

Nutrition:

UA Extension Nutrition programs use pre- and post- program surveys or retrospective pre-

post surveys with similar evaluation questions to assess impact of multi-session educational programs. Data are compiled across programs and totals are reported below. Not all participants complete evaluation surveys.
39% (1,151/2915) participants decreased consumption of salt/sodium as a result of completing a program
62% (3996/6407) participants increased average daily consumption of fruits and/or vegetables as a result of completing a program
57% (2704/4731) participants decreased consumption of fat, saturated fat and/or trans fats as a result of completing a program
Additionally, in the SNAP-Ed program we survey parents of children we reach to see if they are learning and changing behavior based on what their children talk about leaning and take home materials. Sixteen county agents surveyed 2,517 parents of children in the school-based program and the results are as follows:

- 81% said children talked about healthy food
- 79% said children talked about physical activity
- 73% said children asked for more or different fruit, vegetables, milk or yogurt
- 68% said children are more willing to try new foods

- 56% of parents made changes in family meals and snacks based on children's requests
- 60% said family has been more active
- 55% said they serve more fruit

Food Security:
UA Extension Nutrition programs use pre- and post- program surveys or retrospective pre-post surveys with similar evaluation questions to assess impact of multi-session educational programs. Data for the food security outcome indicators are compiled across SNAP-Ed and EFNEP programs and totals are reported below. Not all participants complete evaluation surveys.

Key Items of Evaluation

Childhood Obesity:
Adopt one or more healthy food/nutrition practice recommended by MyPlate
Eat nearer to the recommended number of cup equivalents from the Fruit Group
Eat nearer to the recommended number of cup equivalents from the Vegetable Group
Eat nearer to the recommended number of cup equivalents from the Dairy Group
Eat nearer to the recommended number of cup equivalents of whole grains from the Grains Group
Engage more often in regular physical activity
Increase ability to balance calories from food and beverages with calories expended
Reduce sugar sweetened beverages
increase knowledge about Arkansas foods
Improve food preparation skills Improve knowledge of Arkansas-grown foods
Food Security:
48% (1242/2588) unduplicated adults who reported less often running out of food before the end of the month after participating in an Extension program
54% (1432/2676) of unduplicated adults who reported saving money on groceries after participation in an Extension program

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Increasing Opportunities for Families & Youth

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
607	Consumer Economics	10%	0%	23%	0%
724	Healthy Lifestyle	20%	0%	0%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
802	Human Development and Family Well-Being	18%	45%	12%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	2%	0%	2%	0%
806	Youth Development	40%	55%	1%	0%
902	Administration of Projects and Programs	0%	0%	6%	0%
903	Communication, Education, and Information Delivery	0%	0%	56%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	132.2	3.3	1.8	0.0
Actual Paid	146.7	5.0	14.8	0.0
Actual Volunteer	367.9	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**
1518266	384169	54865	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2043284	550724	1185118	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
15896935	0	846015	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In the area of **Health and Aging**, the University of Arkansas System Division of Agriculture:

- Provided programs that improve functional fitness.
- Provided educational resources that enable older persons to live long, healthy and independent lives.

In the area of **Strengthening Families**, the University of Arkansas System Division of Agriculture provided:

- Practical science-based knowledge to help people form and sustain healthy relationships, manage stress, and increase their well--being.
- Equipped adults with practical science--based practices to raise resilient and caring children.
- Taught early childhood professionals practical science--based knowledge to help them provide care and education for children.

In the area of **Family Resource Management**, the University of Arkansas System Division of Agriculture provided:

- Practical, research-based information to Arkansans to increase financial well-being.
- Equipped adults and youth with the skills needed to build financial stability.
- Explored strategies that can be used to help Arkansans improve personal finance and consumer practices.

In the area of **Empowering Youth**, the University of Arkansas System Division of Agriculture and the University of Arkansas at Pine Bluff provided:

- Expanded access to quality 4--H programming in Arkansas.
- Taught life skills to prepare youth for adulthood.
- Helped youth explore career and entrepreneurship possibilities.
- Provided programs that involve youth in science, technology, engineering and math.
- Provided programs that encourage healthy living for Arkansas youth.
- Provided programs that engage youth in citizenship and leadership development.

Raised awareness of the connections between food, agriculture and the natural world.

2. Brief description of the target audience

Employers and Employees
Consumers
Health Professionals
School personnel
Child Care Providers
Adults
Youth
Jr Master Gardeners, Extension Homemakers (Councils)
Homeowners
State and Federal Agency Personnel
General Public
Project and program funding organizations
Public Health Officials
Policy Decision-makers
Civic leaders and organizations
Married couples or those considering marriage
Business leaders
Parents, Grandparents, caregivers, volunteers, 4-H members
Limited Resource youth
Minority youth and families
Wellness Ambassadors

3. How was eXtension used?

eXtension was used by UAPB (1890) in Empowering Youth to research programs, collaboration and grants. It was used by Division of Ag (1862) universities for professional development, website information, and as a information resource.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	771914	1986818	433484	493779

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

Patent Applications Submitted

Year: 2017
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	18	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of organized 4-H clubs and other youth groups supported by Division of Agriculture Research and Extension and 1890 Extension resources.

Year	Actual
2017	816

Output #2

Output Measure

- Number of volunteers working with organized 4-H and other youth groups

Year	Actual
2017	113347

Output #3

Output Measure

- Number of organized adult clubs and other groups supported by Division of Agriculture Research and Extension and 1890 Extension resources.

Year	Actual
2017	329

Output #4

Output Measure

- Number of volunteers working with organized adult and other groups

Year	Actual
2017	3900

Output #5

Output Measure

- Number of grant dollars generated by grant and contract development efforts

Year	Actual
2017	4750412

Output #6

Output Measure

- Number of unique visitors to Health and Living webpage

Year	Actual
2017	380020

Output #7

Output Measure

- Number of unique visitors to 4-H Youth Development webpage

Year	Actual
2017	252414

Output #8

Output Measure

- Number of Health & Aging programs delivered

Year	Actual
2017	3571

Output #9

Output Measure

- Number of participants in Health & Aging programs

Year	Actual
2017	59206

Output #10

Output Measure

- Number of youth participating in 4-H Healthy Living learning opportunities

Year	Actual
2017	15565

Output #11

Output Measure

- Number of youth participating in science, engineering and technology program and activities

Year	Actual
2017	27520

Output #12

Output Measure

- Number of youth participating in Citizenship/Leadership programs

Year	Actual
2017	4027

Output #13

Output Measure

- Number of youth participating in UAPB 1890 educational programs (4-H Science, Arkansas Ag Awareness Adventures Program and Aquaculture programs)

Year	Actual
2017	15

Output #14

Output Measure

- Number of youth participating in 4-H mentoring programs

Year	Actual
2017	120

Output #15

Output Measure

- Number of volunteers participating in 4-H mentoring programs

Year	Actual
2017	40

Output #16

Output Measure

- Number of high schools with UAPB 1890 fishing teams
  Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Number of students participating in Arkansas Collegiate Series fishing tournaments

Year	Actual

2017	85

Output #18

Output Measure

- Number of Extension Wellness Ambassadors graduates

Year	Actual
2017	137

Output #19

Output Measure

- Number of participants in an Extension Wellness Ambassador programs and projects

Year	Actual
2017	6484

Output #20

Output Measure

- Number of participants trained in family life programs (personal well-being, couples relationship and parenting)

Year	Actual
2017	3705

Output #21

Output Measure

- Number of child care providers trained

Year	Actual
2017	5083

Output #22

Output Measure

- Number of participants in a Family Resource Management program

Year	Actual
2017	7598

Output #23

Output Measure

- Number of Individual and Family Resource Management programs delivered.

Year	Actual
2017	7588

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Estimated dollar value of program support volunteers provide to the organization and communities (includes: EHC; 4-H, Jr. Master Gardeners).
2	Number of mentoring program participants who increase their knowledge about agriscience and STEM related topics (1890)
3	Number of youth engaged in Citizenship/Leadership opportunities
4	Number of youth adopting behaviors to prevent injury prevention behaviors such as: seatbelt use, helmet use, distraction-free driving, ATV use, bicycle, shooting sports safety, etc.
5	Number of youth indicating healthy physical activity habits
6	Number of youth that practiced positive communication skills
7	Number of youth that increased their understanding of the consequences of risk behaviors
8	Number of youth that express interest and engage in sciences related activities, 4-H Science, Arkansas Ag Awareness program and Aquaculture programs
9	Number of Extension Wellness participants who report conducting programs or accepting new leadership roles as a result of the program
10	Number of participants who changed at least one personal well-being, couple or parenting practice as a result of participating in family life programs
11	Number of child care provider training program participants who changed at least one behavior/practice (Best Care,4-H Afterschool).
12	Number of participants who intended to change at least one well-being, couple or parenting practice as a result of participating in family life programs.
13	Number of child care professionals who increased their knowledge as a result of child care professional programs (Best Care, Best Care Connected, Guiding Children Successfully,4-H After-School)
14	Number of participants improving functional fitness after participating in Extension Exercise program
15	Number of participants reporting an increase in physical activity after completing an Extension Exercise and/or health education program
16	Number of youth adopting behaviors to reduce sedentary activity
17	Number of mentoring program participants who increase their social competencies through leadership, community service or group projects.

18	Number of participants who report increased knowledge as a result of participating in Individual and Family Resource Management programs.
19	Number of participants who report intended behavior change as a result of participating in Cooperative Extension Service Individual and Family Resource Management programs.
20	Number of participants who improve skills in How To Talk to Your Doctor(NIFA Funded)

Outcome #1

1. Outcome Measures

Estimated dollar value of program support volunteers provide to the organization and communities (includes: EHC; 4-H, Jr. Master Gardeners).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	17534861

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of mentoring program participants who increase their knowledge about agriscience and STEM related topics (1890)

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to be more involved in community development and leadership. Leadership is one of the pillars of the Education Initiative of the Go Forward Pine Bluff plan. The education Pillar participants, which include the mayor and many UAPB faculty including our current and a former chancellor, care about the educational attainment of our youth as well as the ability to be future leaders.

What has been done
4-H Citizenship and Leadership activities have been implemented in all of our clubs no matter what their primary focus. The Quest Middle School Club participated in the Mindful Listening activities, creation of vision boards, entrepreneurship lessons, and community development plans. A select group of 6 were chosen to attend Citizenship Washington Focus. They attended with in July with their teacher/4-H sponsor and participated in the week of activities there and brought back an action plan for their school and community.

Results
Unfortunately some of the students who attended did not return to Quest in the fall. There was also an administration change and our teacher sponsor accepted a position at another school, so the action plan did not get implement. The trip was not for naught. Below is an impact statement regarding one of the attendees. "The trip to Washington DC was an exciting experience for me. It was everything and more than I ever expected. The Memorials landmarks and the different workshops kept my interest the entire trip. I will always remember the wonderful experience"

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Number of youth engaged in Citizenship/Leadership opportunities

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3682

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Since its inception 4-H has placed emphasis on the importance of young people being engaged, well-informed citizens. By connecting to their communities and leaders, youth understand their role in civic affairs and are able to expand their role in decision-making processes. It's clear that civic engagement provides the foundation that helps youth understand the big picture of life and learn the skill sets that will allow them to become wise leaders for the 21st century.

What has been done
Citizenship training is a part of every club meeting and with the use of special events. Over 400 youth from across Arkansas traveled to the state Capitol for 4-H Day. There, participants had the opportunity to hear the Governor, lieutenant governor, a senator, the attorney general, the speaker of the house and the land commissioner. Youth visited with their local elected officials and toured the Capitol and Supreme Court building. This experience empowered the young people in knowing they can take an active role in their local and state government if they know the right protocol and people to contact.

Results
In the leadership/citizenship initiative area, 951 participants were surveyed using 4-H Common Measures that indicated:
79% indicated that they were more aware of their community
77% indicated they were more likely to volunteer in a community service project, and
92% indicated they increased their skills and leadership abilities through 4-H programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Number of youth adopting behaviors to prevent injury prevention behaviors such as: seatbelt use, helmet use, distraction-free driving, ATV use, bicycle, shooting sports safety, etc.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2833

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The U.S. Consumer Product Safety Commission reports Arkansas ranks 15th in the nation for deaths associated with All Terrain Vehicles (ATVs). In 2014, there were an estimated 93,700 ATV-related emergency department treated injuries in the United States. An estimated 26% involved children younger than 16 yars of age. According to the Health Research Funding organization, there were over 107,500 emergency room visits by people who were involved with a four wheeler accident in 2011. Of the 2,865 ATV-related fatalities of children younger than 16 years of age, 43% were younger than 12 years old. The Arkansas Children's Hospital reports nearly 90% of ATV crashes in Arkansas occur with drivers under age 16 driving adult-sized ATV. Research shows that children under age 16 suffer a disproportionate share of the injuries, do not wear helmets, and fail to receive formal ATV training. Helmets have been shown to reduce the risk of fatalities in ATV accidents by 42% and reduce the risk of non-fatal head injury by 64%

What has been done
The Division of Agriculture has the capacity to reach youth and adults in every Arkansas County with the ATV safety education. The ATV Safety Institute's (ASI) RiderCourse program to help youth and adults learn to safely and properly ride ATV's. Thirty faculty and staff are trained to teach the four-hour course.

Results
4-H ATV Safety education has reached over 40,000 individuals in the last five years. This has resulted in over 1,800 completing the ASI RiderCourse which certifies riders through a four hour hands-on training. 117 youth reported increased knowledge of personal safety. Partnerships have evolved with ATV dealerships, Arkansas Game & Fish Commission, Arkansas Farm Bureau, Arkansas 4-H Foundation and other businesses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Number of youth indicating healthy physical activity habits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3573

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas is the least physically active state in the US and has among the highest rates of adult obesity. Twenty percent of youth ages 10 to 17 are obese, the 6th highest rate for this age group in the nation. High school students int he state have the 4th highest obesity rate; 18 percent are obese. As rates of adult and childhood overweight and obesity continue to rise, risk for potentially threatening chronic diseases like diabetes, heart disease and hypertension increase as well, leading to higher healthcare costs and increased burden on the health care delivery system.

What has been done
Clubs were given activities to complete in order to be designated a Healthy Living 4-H club. Youth participated in the seminar at the National 4-H Center to become leaders in a healthy living movement. Healthy habits are encouraged at all 4-H events. Thirty-nine camps were held with healthy living components.

Results
83% indicated improved eating habits
81% indicated healthy physical activity habits
90% indicated little or no difficulty making healthy food choices

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

806 Youth Development

Outcome #6

1. Outcome Measures

Number of youth that practiced positive communication skills

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1125

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Number of youth that increased their understanding of the consequences of risk behaviors

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Decreasing recidivism in the juvenile justice system. The social as well as financial impact on society of youth incarceration is staggering. Arkansas Advocates for Children and Families reports that "Most youthful offenders do not pose a serious threat to public sfety and do not need to be confined. Using secure confinement to lock up youth who do not pose a serious threat is a waste of taxpayers' money and diminishes the likelihood of rehabilitation and a brighter future for young offenders. The state spends $29.5 million annually for confining youth committed to the custody of the Department of Human Services Division of Youth Services. The recidivism rate for kids in Arkansas's secure juvenile facilities is 46.5% Creating a PYD environment with 4-H programs creates optimism in incarcerated youth that aids n their decision making skills regarding their behavior and what they put in their body.

What has been done

The Health Rocks curriculum, 4-H Yoga, mindful Listening and the creation of vision boards have been done with the youth incarcerated in the Jack Jones Juvenile Justice Center on a weekly basis. The center teachers have the UAPB contact (1890) and youth leaving the facility are encouraged to contact our 4-H program to continue.

Results

Students display a more calm demeanor and are learning to listen to those that see them as having a positive future "in the free" rather than returning to the juvenile enter various times. We were able to participate in and witness the first group of students whom we worked with participate in a graduation ceremony for those that had completed their GED at the Center. Two of those students had already been released are are pursuing associate-degrees, and, returned for the ceremony to be honored and to encourage others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

Number of youth that express interest and engage in sciences related activities, 4-H Science, Arkansas Ag Awareness program and Aquaculture programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	9335

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
ACT statistics indicate 63% of American high school graduates are not prpared for college-level math and science courses. Nearly two-thirds of American teens have never considered a career in engineering. Increased youth engaged in 4-H STEM activities, hopefully will lead to a career in STEM areas and increasing the aptitude for science.

What has been done
The 4-H STEM program in Arkansas has used workshops in robotics (suchjunk drawer & sea perch) to energize youth about STEM. Through the Vet Science program tours and other projects these STEM related skills are enhanced.

Results
The 4-H Sea Perch program is growing rapidly. Through this training youth are energized over STEM related activities. Increased participation by girls is evident. By 2019 we expect the program to double in participation. 4-H common measures indicated 93% interest, engagement and positive attitudes toward science. 80% indicated they were able to apply science skills and abilities to everyday tasks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #9

1. Outcome Measures

Number of Extension Wellness participants who report conducting programs or accepting new leadership roles as a result of the program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lifestyle factors, such as diet and exercise, lay at the core of Arkansas's heavy chronic disease burden. Such issues are complex and require more than educational messages to make a difference. Arkansans have fewer opportunities to engage in health-promoting services and programs. Limited access to fitness facilities and programs means rural citizens, who tend to be less healthy than their urban counterparts, are geographically isolated from resources that could help them live healthier lives. A look at Arkansas' health statistics paints a grim picture, but Arkansas has many willing volunteers. More than 21% of Arkansans actively volunteered in 2012.

What has been done
Extension's approach to improving Arkansas health engages residents to use their knowledge in service to others in their local communities. The Extension Wellness Ambassador Program trains Arkansans to help their friends, neighbors and communities live healthier lives. This lay health leadership development program provides training and an organizational structure to guide collective efforts to improve health in Arkansas.

The program's 137 graduates from 18 counties demonstrated increased knowledge of personal and community health, nutrition, and exercise by passing a final exam following the 40-hour basic training program. The Wellness Ambassador Program includes planning and implementation of projects by program graduates.

Results
Extension Wellness Ambassador program graduates are filling programming gaps and expanding Extension's capacity to improve health in communities. Ambassadors planned and are implementing prjects to help others live healthier lives; including youth healthy living programs delivered in school and out-of-school settings; fitness classes in rural areas; intergenerational

community gardens; development of a community health resource guide; one-on-one health mentoring; and initiation of caregiver support of groups. More than 363 educational classes and sessions in 2017 reached a reported 6,484 Arkansans. Approximately 2,843 volunteer hours valued at $68,630 were contributed by Wellness Ambassadors. Dozens of state and local partnerships have been formed to support healthy communities, with a common goal of increasing the number of Arkansans who are healthy at every stage of life. Arkansas' approach to master health volunteers had been adopted as a model program for the Robert Wood Johnson Foundation - Cooperative Extension System Culture of Health Initiative and will be disseminated to at least five additional states in the next 18 months.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #10

1. Outcome Measures

Number of participants who changed at least one personal well-being, couple or parenting practice as a result of participating in family life programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	139

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas has the highest teen birth rate in the US, the highest rate of divorce, and one of the lowest rates of overall health. The importance of free, accessible, trustworthy resources to improve knowledge of relationships and health cannot be overstated. Our programs offer invaluable resources to parents, couples, and individuals who seek to improve their psychological and relationship health.

What has been done
Programs such as Managing Stress, Your Blueprint for Happiness, and the Marriage Garden engage individuals and couples in self-reflection and teach healthy relationship practices and coping strategies that can improve well-being. Many of these courses are available online through our Guiding Children Successfully as well as handed out at health fairs and other meetings. Parenting and child guidance programs such as See the World through My Eyes,

Family Time Tips, and Ages and Stages teach positivie parenting strategies and offer tools for teachers, medical professionals, and early childcare providers to engage parents. New programs Parents Forever and How Much Is Too Much will extend our reach into multi-session parenting programming and fill a gap for divorce and co-parenting education in Arkansas.

Results
In FY17, 90% of reported participants in our personal well-being programs increased knowledge, and 83% stated they would change at least one behavior. Over 500 Arkansans participated in the marriage Garden program, and over 1000 See the World publications were distributed statewide.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Number of child care provider training program participants who changed at least one behavior/practice (Best Care,4-H Afterschool).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3947

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Early childhood professionals in Arkansas are required to earn at least 15 hours of continuing education professional development training each year. With our three, grant-funded childcare training programs, participants have the option of earning all 15 plus hours with us. Our programs offer updated, researched-based, unbiased curricula using three different delivery methods.

What has been done
The Best Care offers 10 hours of face-to-face, TAPP verified training for childcare professionals across the state in 26, multi-county clusters. Best Care Connected is an online program that offers five hours of professional development for Arkansas childcare professionals. Guiding Children Successfully is an online or correspondence program offering up to 38 hours of continuing education for parents, foster parents, and childcare providers.

Results

These programs are funded through the Arkansas Division of Childcare and Early Childhood Education. Best Care reached 2413 participants in FY17. Of those participants, 90% reported knowledge gained, and 80% stated that they will change at least one behavior or practice. In 2017, 50+ trainings were offered statewide. Best Care Connected awarded 6702 training hours in FY 17. Of those completing the program, 98% reported knowledge gain, and 96% stated that they will change at least one behavior or practice. Guiding Children Successfully reached 1130 participants in FY17 and awarded over 9000 training hours. 4-H Afterschool trained 99 afterschool providers and trainers.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Number of participants who intended to change at least one well-being, couple or parenting practice as a result of participating in family life programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	120

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

Number of child care professionals who increased their knowledge as a result of child care professional programs (Best Care, Best Care Connected, Guiding Children Successfully,4-H After-School)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3947

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Child Care providers in Arkansas are required to have educational training to obtain and maintain employment. Licensed facilities adn providers must insure that all workers obtain the required number of hours each year to retain their license.

What has been done
The Division of Agriculture offers 10 hours of Best Care face-to-fact training, 5 hours online training through Best Care Connected, and up to 38hours of online or correspondence training through Guiding Children Successfully, and 5 hours of face-to-face training for aftershcool providers through the 4-H Afterschool program.

Results
These programs are funded through the Arkansas Division of Childcare and Early Childhood Education. Best care reached 2413 participants in FY17. Of those participants, 90% reported knowledge gained, and 80% stated that they will change at least one behavior or practice. In 2017, 50+ trainings were offered statewide. Best Care Connected awarded 6702 training hours. Of those completing the program, 98% reported knowledge gain, and 96% stated that they will change at least one behavior or practice. Guiding Children Successfully reached 1130 participants in FY17 and awarded over 9000 training hours. 4-H Afterschool trained 99 afterschool providers and trainers.

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

Number of participants improving functional fitness after participating in Extension Exercise program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	48439

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas is the least physically active state in the US and has among the highest rates of adult obesity. As rates of adult and childhood overweight and obesity continue to rise, risk for potentially life-threatening chronic diseases like diabetes, heart disease and hypertension increase as well, leading to higher healthcare costs and increased burden on the healthcare delivery system.

What has been done
Limited access to fitness facilities and programs means rural citizens, who tend to be less healthy than those in urban areas, are geographically isolated from resources that could help them live healthier lives. The Extension Get Fit program is increasing access to physical activity and improving health for adults. The Extension Get Fit Program uses a volunteer delivery model to expand access to group exercise classes for Arkansans across the state. In 2017 this progra reached 48,439.

Results
Evaluation results demonstrated that participants improved upper body strength (63%), lower body strength (64%), aerobic endurance (53%), upper body flexibility (60%), lower body flexibility (68%), and agility and balance (57%). Participants also increased overall physical activity levels (92%), increased energy (82%), and decreased joint pain (83%). Based on fitness test results, we can estimate tht the program resulted in $2.45 million in hospitalization costs savings from reduced fall risk.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #15

1. Outcome Measures

Number of participants reporting an increase in physical activity after completing an Extension Exercise and/or health education program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	102439

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas is one of the most sedentary states in the US and has among the highest rates of adult obesity. More than one-third of youth ages 10 to 17 are overweight or obese, the 9th highest rate for this age group in the nation. High school students in the state have the 4th highest obesity rate; 18% are obese. As rates of adult and childhood overweight and obesity continue to rise, risk for potentially life-threatening chronic diseases like diabetes, heart disease and hypertension increase as well, leading to higher healthcare costs and increased burden on the healthcare delivery system.

What has been done
Limited access to fitness facilities and programs means rural citizens, who tend to be less healthy than those in urban areas, are geographically isolated from resources that could help them live healthier lives. The Extension Get Fit and 4-H Yoga for Kids programs are increasing access to physical activity and improving health for youth and adults. The Extension Get Fit Program uses a volunteer delivery model to expand access to group exercise classes for ARkansans across the state. In 2017, this program reached 48,439 participants with twice weekly sessions.

Results
Evaluation results demonstrated that participants improved upper body strength (63%), lower body strength (64%), aerobic endurance (53%), upper body flexibility (60%), lower body flexibility (68%), and agility and balance (57%). Participants also increased overall physical activity levels (92%), increased energy (82%), and decreased joint pain (83%). Based on fitness test results, we can estimate that the program resulted in $2.45 million in hospitalization cost savings from reduced fall risk.

Youth healthy living programs, including Yoga for Kids, reached more than 54,000 ARkansas students in 2017. Educators representing sixteen states received training as Yoga for Kids

Instructors. in three years, 481 instructors have been trained (179 in Arkansas) and are increasing access to physical activity during the school day and afterschool hours. youth healthy living participants reported healthy physical activity habits (81%) and positive attitudes toward physical activity (89%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #16

1. Outcome Measures

Number of youth adopting behaviors to reduce sedentary activity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2884

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #17

1. Outcome Measures

Number of mentoring program participants who increase their social competencies through leadership, community service or group projects.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	160

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Arkansas 4-H Mentoring program is supported by the U.S. Office of Juvenile Justice - Delinquency prevention/National Mentoring Program. The objective is to provide direct one-on-one, group, or peer mentoring services to underserved youth populations. The program provides mentoring opportunities using the 4-H program structure.

What has been done
The 4-H Mentoring program has impacted 407 young people and the adults that mentored them in the last five years. In the 2016-17 program year, the following counties were involved: Clay, Hot Spring, Poinsett & Perry. These four counties reached 120 mentees and 40 adult mentors.

Results
Using the 4-H Common Measures instrument, evaluation data was collected from the youth involved in the program. The information indicated: 96% had a positive experience with the mentoring program,94% increased their decision-making, goal setting, and confidence levels; 88% responded positively about stress management and standing up for themselves; and 98% had a positive expereience with the adults involved in the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #18

1. Outcome Measures

Number of participants who report increased knowledge as a result of participating in Individual and Family Resource Management programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6860

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansans have poor financial behaviors in fact we rate 49th in financial literacy. The poverty rate is 18.7%, 7th highest in the country. There are pockets of extreme poverty with 25% or greater.

What has been done
We have available workshops that teach managing credit, how to get out of debt and basic financial principles.

Results
Participants report increasing knowledge (90.4%) and intention to make at least one positive financial change (71.8%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #19

1. Outcome Measures

Number of participants who report intended behavior change as a result of participating in Cooperative Extension Service Individual and Family Resource Management programs.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5450

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research shows that ARkansans have the 48th worst financial behaior and the 49th worst financial literacy among all states (Employee Benefit Research Institute). Much of Arkansas' population is economically vulnerable. Arkansas has the 7th highest poverty rate (18.7 percent) in the country. Pockets of extreme poverty remain throughout the state, and 16 counties in the state had a poverty rate 25 percent or greater.

What has been done
Seminars and workshops are presented in numerous consumer topics that include estate planning, debtor education, managing credit, fraud and financial security.

Results
7,588 individuals participated in face-to-face Extension consumer economics educational programs. Participants reported increasing knowledge (90.4%) and intention to make at least one, positive money management behavior change (71.8%). Program participants said "Now I understand the importance of debt load and emergency savings." and "I realize how much I need these financial skills."

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #20

1. Outcome Measures

Number of participants who improve skills in How To Talk to Your Doctor(NIFA Funded)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	665

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The How to Talk to Your Doctor program aims to improve individual and family health literacy around the domain of communication with healthcare providers. This is a NIFA-funded Rural Health and Safety Education grant.

What has been done
County Extension AGents and volunteers in 37 counties have conducted How to Talk to Your Doctor (HYTTD) sessions. Approximately 3,300 sets of program materials have been distributed, with documented reach of 665 based on return of informed consent and evaluation documents. Over 500 people have completed the first two phases (pre-and post-testing) of the HTTYD health literacy program.

Results
Analysis of pre-test/post-test and 3-month follow-up data from 166 participants indicates a statistically significant change in confidence from pre to post , with positive change sustained at the 3-month point.

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
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (NASS data availability)

Brief Explanation

- Staff turnover

State budgets have been flat for 10 years and with $3 million dollars of "one-time" funding the last two years have created a climate that makes funding, hiring, and keeping employees difficult. Cost savings and attrition has kept key research and extension programs continuing but at the cost of meeting other needs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Several strategies will be initiated and used for collecting program assessment information to determine program results, outcomes and impacts. Extension educators will use a variety of recommended methods to gather needed information. Collection methodology and assessment tools will be program and audience centered. Programs focusing on physical activity will use skill-based assessments, before-after program assessments, behavioral changes, observation, and questionaires. Health and Aging related activities will use anecdotal information, pre-test assessments and self-report of practice change. Unobtrusive means (request for additional information, purchase of videos and materials, increased participation and observation) will also be used to capture information. Each of the Strengthening Families core programs area has a brief evaluation instrument. These instruments are administered to the program participants immediately at the end of a given program. The instruments allow county agents to gather data about the number of program participants, whether their knowledge increased, whether they intend to make a change as result of their program participation, and if so, what they plan or hope to do. Participant contact information is also collected. The contact information allows county agents to contact program particpiants one month following program completion to see what changes have actually made. The Youth Development program uses the national 4-H Outcome, the 4-H Common Measure evaluation to report the change in social competencies of youth participants. Comprehensive program and departmental evaluation reviews for Reserch, Extension and Teaching programs are conducted on a five to seven year cycle by various researched based evaluation.

Key Items of Evaluation

Extension Get Fit volunteer leaders contributed 21,876 hours valued at $526,086 instructing 3,233 exercise classes. Aims data indicate Extension Exercise programs had 48,439 duplicated participants in FY17. Agents reported 1,205 unduplicated "enrolled" participants. of the 475 participants with pre-post data from the Senior Fitness Test: 64% increased lower body strength, 63% increased upper body strength, 53 % increased aerobic endurance; 68% increased lower body flexibility; 60% increased upper body flexibility; and 57% increased agility and dynamic balance.
Extension Wellness Ambassador Program has graduated 137 trained health-focused volunteer leaders representing 18 counties since the program started;13 graduated in 2017. In FY 17, approximately 2,843 volunteer hours valued at $68,630 were contributed by Wellness Ambassadors, 363 educational sessions were reported reaching 6,484 Arkansans.
Participants receiving training in any of the **Extension Early Care Education (Best Care, Best Care Connected, and Guiding Children Successfully)** were evaluated based on: Ninety percent of participants indicated their knowledge of child care issues has increased, 80% participants will change at least one child care behavior or practice, and as a result of the training, 85% of participants indicated their knowledge of effective child care practices increased and did something new to be a better child care professional.
Family & Consumer Economics 7,588 individuals participated in face-to-face Extension consumer economics educational programs. Participants reported increasing knowledge (90.4%) and intention to make at least one, positive money management behavior change (71.8%).
4-H Youth Development used the 4-H Common Measures which are used in each of 4-H's mission mandated areas: Citizenship, Science and Healthy Living. A Universal Common Measure tool was created last year that has been used as well. The universal instrument can be used in any subject matter area. These evaluations are available to agents via hard copy or via Qualtrics survey. In **Citizenship:** 79% indicated they were more aware of community needs, 77% indicated that they were more likely to volunteer with a community service project, and 92% indicated they increased their skills and leadership abilities thru 4-H programs. In **Healthy Living:** 83% indicated improved eating habits, 81% indicated healthy physical activity habits, and 90% indicated little or no difficulty making healthy food choices. In **Science 93%** indicated interest, engagement and positive attitudes toward science, and 80% indicated they were able to apply science skills and activities.
UAPB (1890) in 4-H used observation by staff. Also, youth new to the 4-h program give impact statements regarding their involvement in various activities and projects.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Economic & Community 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
601	Economics of Agricultural Production and Farm Management	0%	0%	18%	0%
602	Business Management, Finance, and Taxation	37%	0%	0%	0%
603	Market Economics	0%	0%	27%	0%
605	Natural Resource and Environmental Economics	15%	0%	0%	0%
606	International Trade and Development Economics	0%	0%	21%	0%
607	Consumer Economics	0%	0%	20%	0%
608	Community Resource Planning and Development	21%	0%	0%	0%
610	Domestic Policy Analysis	8%	0%	10%	0%
702	Requirements and Function of Nutrients and Other Food Components	0%	0%	3%	0%
703	Nutrition Education and Behavior	0%	0%	1%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	13%	0%	0%	0%
805	Community Institutions, Health, and Social Services	5%	0%	0%	0%
806	Youth Development	1%	0%	0%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	16.5	0.0	2.0	0.0
Actual Paid	18.8	0.0	13.9	0.0
Actual Volunteer	11.5	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
283563	0	252309	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
381620	0	1545228	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2969035	0	134826	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Economic Viability and Sustainability

- Enabled communities and regions to identify and implement innovative economic development strategies.
- Provided businesses with innovative risk management strategies.
- Helped businesses identify marketing opportunities and develop strategies for selling to the public and private sectors.
- Assisted community leaders in efforts to create a trained and motivated workforce for an evolving economy.

Entrepreneurship in Evolving Economies

- Provided education and technical assistance to help entrepreneurs compete in an evolving economy.
- Engaged local leaders to create entrepreneurial communities.
- Produced research-based information and assistance to facilitate growth in value-added and local food systems.
- Assisted in transforming scientific discoveries into new businesses, products, and services.

Leadership & Civic Engagement

- Engaged and educated current and future leaders.
- Encouraged diverse and under-served populations in civic engagement.
- Taught tools and skills for civic engagement to communities.
- Provided research-based education on public issues affecting the citizens of Arkansas.

Quality of Life and Place

- Equipped community leaders to understand and leverage their quality of place assets.
- Empowered communities to identify, develop, and market services and amenities.
- Researched critical and emerging issues for local communities.

2. Brief description of the target audience

Audiences vary by categories of activity (see above). For each activity we try to involve all stakeholders relevant to the topic at hand; not all of the audiences listed below may be engaged during every activity.

- Attorneys

- Businesses/Industry - small, large, rural, urban, consultants, tax preparers and other
- Farmers/Producers - small, large, limited resource, retirement, and other
- Non-farm private landowners
- Lenders
- Potential business owners (youth and adult)
- Elected officials - city, county, state, and federal
- Unelected community and business leaders
- Emerging and existing leaders
- Industry, trade and commodity organizations
- Civic, nonprofit, environmental, conservation, health and community organizations
- Organizational boards
- Federal, state and local policy makers (including administrators and other personnel) from agricultural and non-agricultural public agencies
- Contracting offices
- Voters
- Research, extension and teaching professionals
- Educators and academics
- General public
- Youth
- Community and economic development professionals
- Watershed groups and 319(h) grant recipients

3. How was eXtension used?

Staff attended eXtension webinars and interacted with Communities of Practice (Community, Local and Regional Food Systems; Enhancing Rural Community Capacity; Agricultural and Food Law).

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	67396	515215	3650	10966

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	95	0	95

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of clientele contacts resulting from education classes, workshops, group discussions, one-on-one interventions, demonstrations, and other educational methods

Year	Actual
2017	41752

Output #2

Output Measure

- Number of educational materials, curricula, newsletters, web-based modules and fact sheets developed

Year	Actual
2017	3314

Output #3

Output Measure

- Number of dollars received to support programs (grants and other)

Year	Actual
2017	1412340

Output #4

Output Measure

- Number of Tax Preparers certified through Tax Schools

Year	Actual
2017	370

Output #5

Output Measure

- Number of web visitors on program-related web pages

Year	Actual
2017	632017

Output #6

Output Measure

- Downloads from website

Year	Actual
2017	43619

Output #7

Output Measure

- Number of educational materials, curricula, newsletters, web-based modules and fact sheets distributed

Year	Actual
2017	107747

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants (youth and adult) who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of economic & community development programs
2	Estimated dollar value of program support volunteers (includes: EH; 4-H; Master Gardeners; conferences; etc.)
3	Dollar value of government contracts received by APAC business clients
4	Number of jobs created/retained as a result of economic & community development programs
5	Number of businesses created, retained, or expanded
6	Number of participants implementing new strategies, tools or technology as a result of economic & community development programs
7	Number of participants who indicate new knowledge gained as a result of economic & community development programs
8	Dollar value of grants generated by organizations, communities or regions as a result of economic and community development programs
9	Number of plans (new or revised) adopted and begun to be implemented (community, agency, local government, business or disaster) as a result of economic and community development programs
10	Number of new alliances or networks formed through some type of formal agreement or MOU
11	Dollar value of other in-kind resources contributed to organizations, communities or regions as a result of economic and community development programs

Outcome #1

1. Outcome Measures

Number of participants (youth and adult) who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of economic & community development programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	388

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Effective and inclusive leaders working with engaged citizens is vital to sustainable and economically viable communities. Diversity of populations and ideas is increasingly important to community planning, public support and effective implementation of plans. Engaging the public, expanding access to research-based information on public issues, and creating a local environment that encourages collaboration and innovation are critical for communities and their leaders to be successful.

What has been done
LeadAR is an intensive program that increases participants' knowledge of economic and social changes facing Arkansas through seminars and travel. Participants enhance their leadership skills during these seminars and through the responsibility for proposing and executing individual community projects.

Results
LeadAR graduated its 17th class with 22 graduates from 15 counties. Thirteen graduates have completed their leadership service projects. Projects include: an area wide youth gun safety program; replacement of a marquee at the historic Ken Theatre; installation of playground equipment at a local school; Safety Baby Showers for at-risk pregnant women and mothers; creation of a community goat festival; creation of a career training center; a youth and adult reading program; fundraising to start a scholarship endowment for science and engineering; growth of a non-profit center for adults with mental disabilities; election to a county conservation board; creation of the Vision 2025 Leadership Institute for female youth in high school; a Crime Stoppers program; and creation of a study abroad program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #2

1. Outcome Measures

Estimated dollar value of program support volunteers (includes: EH; 4-H; Master Gardeners; conferences; etc.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	21698191

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Volunteers are a valuable part of the Ashley County Extension program. They offer vital help to worthwhile causes in the community. Participating in community service helps volunteers to acquire skills and knowledge, as well as provide a service to those who need it most. Volunteers active in their community, have a lasting impact on society.

What has been done
Volunteers were recruited, and trained to assist with projects at Crossett Rehabilitation and Health Center, Stonegate Villa Health & Rehabilitation, Department of Human Services, Ashley County Extension Family & Consumer Sciences program, Ashley County 4-H program, Crossett Centennial Park, Mia Rose Garden, Ashley County Medical Center, Ashley County Fair Association, Salvation Army, Hamburg Chamber of Commerce and local faith based groups.

Results
Four hundred three volunteers donated over 22,625 hours of service valued at $539,335 to Ashley County. These volunteers were a great asset to Ashley County. Not only giving their time,

but the knowledge and skills they imparted to Ashley County residents are invaluable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #3

1. Outcome Measures

Dollar value of government contracts received by APAC business clients

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	92901187

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Identifying new market opportunities is an important task for most businesses. One extremely large potential market is government. Local, state, and federal governments spend hundreds of billions of dollars each year. Many of the products and services government buys are produced within Arkansas, creating market potential. However, navigating the world of government contracting can by difficult and overwhelming for businesses with limited experience doing so.

What has been done
The Arkansas Procurement Assistance Center, which serves as a Procurement Technical Assistance Center (PTAC), is funded in part through a cooperative agreement from the Department of Defense (DOD) through a program that is administered by the Defense Logistics Agency (DLA). We offer free training and technical assistance to Arkansas businesses interested

in selling goods or services to public agencies. We do this through one-on-one counseling, seminars, bid-matching services, a monthly newsletter and other methods.

Results
In FY2017, APAC offered (or partnered with other organizations to offer) 48 training events attended by almost 900 participants. We also held 469 counseling sessions with Arkansas businesses. Collectively, APAC clients reported receiving 1,161 contract awards valued at $92.9 million.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of jobs created/retained as a result of economic & community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2177

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
At a May 15, 2017 meeting the Woodruff County Quorum Court voted to place 0.375% Sales and Use Tax for Jail and Law Enforcement Purposes, Jail and Law Enforcement Facilities Bonds and 0.5% Sales and Use Tax, and 0.125% Sales and Use Tax for Economic Development Purposes, on the ballot. A sales tax and related bond issue must be approved by voters.

What has been done
The Woodruff County Extension Service and Extension's Public Policy Center staff put together a fact sheet to inform voters about the election and issues. The goal was not to influence voters to vote one way or other. Rather, we wanted voters to feel confident in the choices they made. Local citizens, subject experts, and others were engaged to ensure the guide provided factual, neutral and unbiased information.

Results
All measures passed by a wide margin. Woodruff County will have a new 11,886 sq. foot, 40 bed, detention center. The building will house the sheriff's office, emergency dispatch center and an arraignment room. Woodruff County will also receive an estimated $95,000 per year revenue from the permanent 1/8 percent sales tax for economic development. This will be used to help address the county's economy by hopefully increasing jobs and retaining population.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #5

1. Outcome Measures

Number of businesses created, retained, or expanded

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	82

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cleveland County is struggling to overcome 20 years of limited economic development, change, and improvements. Still faced with vacant store fronts, declining population, and a stagnant economy, community leaders are continuing to work on ways to improve communities in Cleveland County and make it the talk of south-central Arkansas.

What has been done

Extension continues to partner with local leaders as part of Kickstart Cleveland County. 2017 efforts include: expansion of county-wide community development initiatives; applying principles learned through Extension's Breakthrough Solutions program; collaborating with grassroots working/action groups and youth in the Environmental and Spatial Technology (EAST) Lab program; promoting county trends, assets, and key drivers; following a mutually agreed upon Vision; facilitating community events and meetings and sharing and promoting successes with other counties and groups.

Results

As a result of these efforts:
*Two new businesses have been announced for Kingsland and $10,000 in Johnny Cash displays donated for the city's new Johnny Cash museum.
*The Community Theater presented 2 productions (5 performances) reaching over 500 attendees.
* The Pioneer Village Commission restored 2 buildings, are currently working on a third, and has raised over $20,000.00 this past year.
* Over $45,000 has been raised through grants, fund-raisers, and donations.
* 8 Events have been conducted reaching over 5000 people.
* Over 9,865 volunteer hours have been logged in community projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #6

1. Outcome Measures

Number of participants implementing new strategies, tools or technology as a result of economic & community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5975

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rural isolation and lack of industrial growth has prompted Scott County to embrace methods of regional sustainability in West-Central Arkansas over the past few years. However, the sudden announcement of the local Walmart store closing developed an immediate crisis to the economic well being of Waldron and Scott County.

What has been done
County and State Extension personnel along with the City of Waldron, Arkansas Regional Coalition for the Ouachitas (ARCO), and Chamber of Commerce planned a community meeting to present the current situation and announce plans for activities to help displaced workers. This meeting was followed by a Job Fair held at City Hall, committee meetings with downtown business leaders, and another community meeting. The first community meeting was developed to help people find ways to meet their immediate needs. The second meeting centered on activities to stimulate local economic growth.

Results
Two community meetings were conducted to inform citizens of efforts to minimize impact of Walmart closing. While it's too early to measure the long-term impacts of these efforts, citizens and community leaders are active and engaged. Over 50 citizens participated in the Job Fair at Waldron. A Shop Local Campaign was established and a new downtown revitalization committee has been formed to strengthen the downtown area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #7

1. Outcome Measures

Number of participants who indicate new knowledge gained as a result of economic & community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	13656

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research shows that high profile candidate races often overshadow state ballot issues on Election Day (Magleby, 1984). Some voters may not develop firm opinions on ballot issues until the final days of a campaign, if they develop an opinion at all. Arkansas is no exception. Arkansas voters routinely undervote, or do not respond, to state ballot questions (Arkansas Secretary of State, n.d.).

What has been done
The 2016 Arkansas Ballot Issue Education Program was conducted across fiscal years, from June 2016 to November 8, 2016. The program consisted of a voter guide with fact sheets describing each ballot measure, a short video and website summarizing each issue, county-based educational presentations, press releases, a monthly email newsletter, and tabletop display boards for events.

Results
Extension printed 23,000 voter guides that were distributed across the state. The voter guide was downloaded 11,717 times between when it was uploaded Sept. 15, 2016 and Nov. 14, 2016. More than 300,000 people visited Extension's ballot newsletter websites ahead of the election in November, and our educational videos were viewed 48,732 times. A small evaluation conducted online before the election showed more than half indicated knowledge gain from the fact sheets. Surveys conducted after the election showed users felt they had the information they needed to make an educated decision on the ballot measures.

4. Associated Knowledge Areas

KA Code	Knowledge Area

602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #8

1. Outcome Measures

Dollar value of grants generated by organizations, communities or regions as a result of economic and community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	160000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The saying "it takes a village" to raise a child is never more true than in today's times. Research shows school and community collaborations can lead to increased test scores, increased student attendance, and lower dropout rates. When families, schools, and community organizations work together toward a common goal everyone benefits.

What has been done
The Grant County Extension Office recently acted as a facilitator to plan, construct, and utilize the Sheridan Intermediate School Garden and Outdoor Classroom. Organizations and their roles included:
-Grant County Extension Office - Planning, Construction
-Grant County Master Gardeners - Planning, Construction
-Grant County Conservation District - Funding for the project
-Sheridan Intermediate School - Location, Funding, Construction
-Chartwell's Food Service - Prepares school lunches

Results

The constructed Sheridan School Garden and Outdoor classroom consists of 10 raised beds, 8 used for vegetable production and 2 used for butterfly gardens. Students and teachers manage and work in the garden with direction from Extension Staff through periodic educational programs. All produce from the garden is utilized in the school cafeteria. Project Results include:
-1300 lbs of sweet potatoes harvested
-2400 servings of salad mix produced
-$1100 in produce harvested
-392 students educated
-$4000 in grants and in-kind donations

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #9

1. Outcome Measures

Number of plans (new or revised) adopted and begun to be implemented (community, agency, local government, business or disaster) as a result of economic and community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Comprehensive strategic planning is vitally important to ensure the sustainability of many small towns in Arkansas. Planning that includes broad-based community involvement helps community leaders identify the most important issues and opportunities facing a town, and provides the greatest probability of long-term success.

What has been done

County agents and state specialists began working with leadership in Manila, AR in late 2016. An assessment of the community's assets was initiated in January 2017 and in March, seven representatives of Manila flew to Little Rock to meet with "Breakthrough Solutions" partners and begin the initial process of developing a strategic plan. Five residents participated in Breakthrough Solutions Conference and updated leaders about possible activities/programs suited for Manila.

Results

Two community surveys were completed by 315 Manila residents. Survey results indicated that over 75% of citizens were interested in increased community activities and unique dining options on Main Street. Two town meetings were attended by 112 residents and help further define the objectives most appropriate to Manila. Based on survey results and town meeting discussion, residents organized a mission statement, formed action teams, adopted a logo and selected an official group name (Moving Manila Forward). Two "Farmers Markets", a Shrimp Fly-in and 4 main-street music events have attracted over 1,000 people to the downtown area. One new business has been approved for location to Main Street.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #10

1. Outcome Measures

Number of new alliances or networks formed through some type of formal agreement or MOU

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	42

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Hempstead County has been shifting in leadership for the past year. A new mayor of Hope took office in January with plans to initiate strategic planning. The Chamber of Commerce Director for over 25 years stepped down in January and a new Director took office in August.

What has been done
The County Extension office offered training and workshops to local leaders. A new organization was created, the Hope Downtown Network. Two state faculty members and staff chair facilitated a visioning session and information to increase awareness of businesses in Hope. Leadership positions were filled. The group identified needs for Hope Downtown Network and goals were established. The community of Fulton also organized a strategic planning group to set goals and work on issues in their area.

Results
The Hope Downtown Network has applied for 501(c)(3) status. The organizations current goals include beautification, increased events with the Chamber of Commerce, and Scheduled Trade Days to increase shopping downtown.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #11

1. Outcome Measures

Dollar value of other in-kind resources contributed to organizations, communities or regions as a result of economic and community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	242512

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It has been several years since the Lend-A-Hand food pantry has been able to provide fresh eggs to the needy residents of Lincoln County. Many of these seniors, low income or anyone in desperate need cannot afford to purchase eggs at the store. A group of high school poultry science students saw this need and came up with a solution.

What has been done
The Poultry Science class at Star City High School utilized the expertise of Extension Poultry Specialists to design and build a small scale layer facility on the high school campus. The cost for the project was $2500. Over $1800 was raised in donations from community businesses and individuals. The students have also solicited on-going sponsorship for monthly expenses. The project not only fills a need for the community but provides a teaching/learning environment to prepare students for life after graduation.

Results
The layers officially went into production on November 29, 2016. Students have worked out a schedule to make sure eggs are collected and the chickens are fed a watered even on holidays and weekends. As of September of 2017, they have donated -12,000 eggs to the food pantry. The food pantry serves from 130 to over 200 families per month. The fresh eggs provided by "Eggs to Others" are a great source of necessary protein. Through the planning and support of local businesses this project will be sustainable for many years to come.

4. Associated Knowledge Areas

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

605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Despite increasing demand for community and economic development programs, particularly in rural counties, funding constraints due to external factors listed above have limited our ability to grow or even replace staff members who left the organization for retirement or other reasons. This has negatively impacted our ability to fully address needs across the state. Despite these limitations, we continue to successfully leverage resources that are available to achieve positive impacts.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A variety of methods were used to evaluate programs including the use of advisory groups, participant questionnaires, pre-and post-tests, interviews with program participants, required reporting mechanisms and informal feedback. Periodically, we do a comprehensive evaluation of long-standing programs. In 2016-2018, we conducted a comprehensive program of Lead Arkansas (LeadAR), an intensive two-year program designed to educate emerging leaders from across the state on public issues and develop their expertise to address critical problems facing Arkansas. The comprehensive LeadAR evaluation included a needs assessment that reviewed known adult leadership programs in Arkansas and a survey of agricultural and business leaders. A process evaluation was also conducted that included a review of historical program records, a survey of current class members (Class 17), a survey of former LeadAR program directors, and a focus group with the LeadAR advisory council. Finally, an outcome/impact evaluation was conducted, which included an alumni survey and focus group with representative of the Association of Arkansas LeadAR Alumni (AALA).
Program impacts identified by this study included:
Graduates improved public speaking skills and were more vocal about agricultural and rural issues.

Graduates have more self-confidence, as well as a wider network of individuals with common interests with whom they continued to interact with after completion of the program.
Supervisors indicated that graduates of the program were overall more well-rounded individuals than prior to participating in the program.
99% of LeadAR alumni agreed to strongly-agreed that their participation in LeadAR was time well spent.
68% of LeadAR alumni reported that they have increased their leadership roles as a result of their participation in LeadAR.
Members of AALA, all of whom were LeadAR grads, reported they had experienced personal growth, gained a wider network of collaborators, a greater understanding of the political process and an expanded knowledge of Arkansas resources and issues as a result of their participation in the program.

Key Items of Evaluation

Over 13,000 program participants reported an increase in knowledge gained, nearly 6,000 reported implementing new strategies, tools or technology, and nearly 400 reported conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of community and economic development programs. The value of volunteer hours associated with Extension programs exceeded $21.6 million. The Arkansas Procurement Assistance Center (APAC) program has helped Arkansas businesses generate nearly $93 million in government contracts. Through our programs communities and regions have increased capacity and leveraged their assets to create positive change in small and large ways, such as the 82 businesses created, retained, or expanded.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
10846	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
3	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
195549	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)	
1	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
1	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.