2019 Annual Report of Accomplishments and Results

Arkansas
University of Arkansas System Division of Agriculture
University of Arkansas Pine Bluff School of Agriculture, Fisheries and Human Sciences- Research & Extension

I. Report Overview

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

1. Executive Summary (Optional)

University of 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 (SAFHS) 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 the three departments, while Extension personnel are under the direct supervision of Assistant Dean of Extension. The department of Agriculture and the Regulatory Science Center of Excellence are administered by a department head/center director, and the Department of Aquaculture/Fisheries and the Aquaculture/Fisheries Center of Excellence are administered by a department head/center director. Both department heads/center directors are supervised by the SAFHS dean/director; it is under this structure that 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. Division of Agriculture and UAPB Extension educators and

researchers deliver research-based education. Division of Agriculture and UAPB Extension educators employ diverse educational methods statewide including: educational classes, landowner visits, individual consultations, demonstrations, and field days/tours/camps. County agents and specialists strive to provide the best science-based recommendations available. Although information is readily available in the Digital Age, the Division of Agriculture and UAPB remain providers of data that are independent of financial or philosophical interests.

During 2019, the Division delivered timely and responsive distance education webinars through the National Center for Agricultural Law on emerging Issues including: the Endangered Species Act, property rights, water quality impacts, organic aquaculture, and industrial hemp regulation under the 2018 Farm Bill. 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 5,220 participants in FY2019 through 61 course offerings.

The focus of work conducted by the Division of Agriculture 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 2017-2023 Strategic Plan. Based on broad stakeholder feedback, the Division identified five emphasis areas to focus our efforts:

- 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.

2019 Arkansas Extension and Research Planned Program Impact Highlights

Agricultural Production & Processing

The University of Arkansas System Division of Agriculture and the University of Arkansas Pine Bluff conducted research and educational programs to promote sustainable and efficient agricultural production and processing.

In the area of row crops, the Division of Agriculture continued their Soybean Research Verification Program for the thirty-fifth growing season and conducted on-farm demonstrations of research-based recommendations on over twenty commercial fields in nineteen Arkansas counties. Extension efforts also included soil health in 2019; conventionally and reduced tilled silt loam soils in Arkansas exhibit little soil structure, greatly reducing water infiltration rates. The Division of Agriculture also continued the development and breeding of two new soybean cultivars, MG4 and MG5, to assist in meeting market needs for earlier planting dates and shorter maturity times (see Impact #2). The Division of Agriculture's scientists have continued efforts to develop improved small grain varieties in a multistate effort in the SunGrains breeding cooperative. The efforts have produced new varieties of wheat, oat, and triticale, with two new wheat varieties developed for Arkansas producers in 2019 (see Impact #3). The Division of Agriculture began a new partnership with FieldWatch in 2018 in response to the needs of specialty crop producers, beekeepers, and applicators. The continued efforts in FY2019 have reached over 160,000 acres and associated producers and applicators (see Impact #8).

Water resources are becoming a larger Issue with each passing year and Arkansas is no exception. Extension educational efforts on Irrigation Water Management (IWM) practices continued in FY2019 and included collaborative efforts with other county, state, and national agencies. Demonstrations of various irrigation technology and tools, development of irrigation field designs, and many field visits/consultations were employed to improve the sustainability and efficiency of producers' irrigation efforts. UAPB's conservation programs targeted socially disadvantage producers (SDPs). Through a partnership with the Natural Resources Conservation Services (NRCS), they have been able to increase adoption of conservation practices and assist SDPs in securing over $900,000 in EQUIP funding (see Impact #1). A new technology that has spurred the need for expanded research and extensive Extension programming are dicamba tolerant row crop varieties, namely cotton and soybeans. Through Extension education efforts, the Division of Agriculture reached over 1,600 applicators through in-person and online applicator trainings, as well as a number of demonstrations and testing (see Impact #9). Recently, non-GMO varieties have created Issues with pests that Extension had not faced in years. The Southwestern Corn Borer is a devastating pest to non-Bt corn and the Division of Agriculture has implemented a multi-faceted approach to their control. Monitoring programs have allowed Extension to assist producers in making more accurate application decisions, which has saved producers approximately $1,900,000 statewide (see Impact #10). The Division of Agriculture has continued efforts to help producers make other decisions in pesticide and herbicide application (see Impact #11) and crop variety selection (see Impact #12) with continued success.

Horticulture efforts in Arkansas focused on assisting producers in expanding production seasons. The Division of Agriculture has developed five commercially available primocane-fruiting blackberry cultivars that provide producers more choices that are better suited for Arkansas

conditions and have the potential to expand the growing season from mid-May until mid-November. To support blackberry producers across the state, the Division of Agriculture faculty secured funding and began the process of creating the Arkansas Blackberry Growers Association. UAPB has continued research and Extension programming on sweet potato varieties for edible leaf vegetable production and the use of rotation and cover crops in sweet potato production. UAPB initiated and continued the Sweetpotato Foundation Seed Program, which produces plants that are indexed and free of target viruses; this program serves the sweet potato farmers in Arkansas.

The AQFI Center of Excellence at the University of Arkansas at Pine Bluff (UAPB) has continued their efforts to support Arkansas' $61 million aquaculture industry. The Center's research and Extension efforts also support the recreational fishing industry that has an economic impact of over $740 million per year in Arkansas. The Center's main activities focus on continued routine health inspections, issuing health certificates, analyzing water quality and identifying aquatic weeds (see Impact #5). In 2019, The Center's scientists examined reducing losses in catfish due to toxic algal blooms (see Impact #7), assisted producers with exploring aquaculture alternatives (see Impact #6), and contributed to Extension publications for producers and pond owners (see Impact #4).

Livestock and products account for sixty percent of Arkansas' agricultural cash receipts. Activities to advance the livestock industry in Arkansas includes research, on-farm demonstrations, producer meetings, and educational material development. Focus areas include grazing efficiency and forage management, health and disease, alternative finishing systems, and management effects on carcass quality. UAPB research faculty are conducting research to identify "natural" methods to control parasites in sheep and goat production.

The poultry industry is very strong in Arkansas, ranking third nationally in broiler production. With the continued outbreaks of Low Pathogenic AI and Highly Pathogenic AI, the Division of Agriculture has continued efforts to educate producers and small flock owners on proper biosecurity steps to ensure these outbreaks do not occur in Arkansas. Extension efforts in 2019 targeted many audiences, from commercial producers, hobby owners, 4-H and FFA members, and the general public. Extension fact sheets were developed and distributed in Arkansas and Mississippi; Extension continued education efforts through the use of the free online course, "Backyard Poultry."

The Issue of decreasing numbers of new farmers/producers was addressed through Division of Agriculture Extension efforts in 2019 through three programs: Young Cattlemen's Series, Annie's Project, and Farm Stress. The Young Cattlemen's and Annie's Project programs addressed basic foundational knowledge and risk management, which are both areas producers need. Both programs lead to the adoption of best management practices and the Young Cattlemen's Series showed a total estimated production savings of $47,000 through adoption. Farm Stress is a program conducted through the Family & Consumer Science department. Other emerging Issues such as suicide and heightened stress among farmers and agriculture workers added to the need for the Farm Stress program. During 2019, over five-hundred Arkansans were reached through the program.

Environment, Energy & Climate

The University of Arkansas System Division of Agriculture and the University of Arkansas Pine Bluff conducted research and educational programs on the environment to ensure sustainable use of soil, water and air. Research and educational efforts were targeted at all citizens of Arkansas, but emphasis was placed on agricultural producers, private landowners, youth, homeowners, and land management professionals. Research was conducted on Experiment stations as well as on private farms through programs such as the Division of Agriculture's Discovery Farms (see Impact #17) and Research Verification Trials. Critical Issues that were addressed included: 1) Meeting competing water needs, 2) Protecting and improving water quality, 3) Protecting and improving soil health, 4) Protecting air quality, 5) Enhancing the ecological services provided by forested lands, riparian zones and wildlife, 6) Protecting the health of aquaculture and aquatic wildlife, and 7) Environmental Sustainability.

In the area of water needs and quality, the Division of Agriculture research focused on evaluating conservation practices in row crop production that increased crop water use efficiency. Meanwhile, education initiatives focused on disseminating proven water savings techniques such as computerized hole selection for designing furrow irrigation that increases uniformity and reduces tail water losses as well as multiple inlet design for flooding rice, using soil moisture sensors and apps for scheduling irrigation, and using cover crops to improve soil infiltration. Extension efforts included working with row crop producers, livestock producers and homeowners through a myriad of delivery methods, including field days, field visits, meetings, and an online course related to nutrient management.

In FY2019, the Division of Agriculture Extension and researchers worked to support the newly formed Arkansas Soil Health Alliance (ASHA), who works to educate farmers on practices to improve soil health. Demonstrations were conducted on best practices for preventing erosion and tools available to assist in improving plant nutrient use. Efforts have resulted in a decrease of approximately $60/acre in production costs (see Impact #14). Other efforts in the area of soil health and nutrient management being conducted are in the areas of synthetic-P fertilizer use for soybean and corn production. Division of Agriculture scientists have conducted field studies in eastern Arkansas to evaluate plant response to electrochemically precipitated struvite with positive initial Results (see Impact #16).

Burning rice stubble to remove crop residue, greenhouse emissions from flooded rice production and ammonia-laden emissions from poultry house ventilation fans are all air quality concerns for the citizens of Arkansas. Research is being conducted to find alternatives to burning rice stubble and other surface residues that make agronomic sense and are not cost-prohibitive. Researchers are also investigating the reduction of methane and nitrous oxide production through alternative wetting and drying instead of continuous flooding of rice while others are investigating growing rice with furrow irrigation (row Rice) rather than flooding. Air improvement practices are being studied to determine how to best reduce emissions from poultry house ventilation using small-scale industrial scrubbing techniques. 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 Forest Management Program for Extension Forestry encompasses multiple education efforts aimed to further advance the overall health and productivity of forest and timber

lands in the State and region. UAPB's "Keeping it in the Family" Sustainable Forestry African-American Land Retention Program provides landowners with educational resources and technical assistance to build family legacies, healthy forestland and generational wealth through land retention in the African-American community. The KIITF program reached over 900 landowners and, to date, has impacted 8,618 forestry acres (see Impact #13). The Division of Agriculture has continued their research and Extension work in this area through the Arkansas Forestry Resource Center (AFRC). AFRC enhances and ensures the sustainability of forest-based natural resources through the interdisciplinary partnership of the Division of Agriculture and UA-Monticello. Research programs in forestry encompassed work in cellulosic nano-technology development, determining the invasion potential of emerald ash borer, enhancing the resiliency of forests to climate change, enhancing bottomland hardwood restoration for carbon sequestration and wildlife conservation, increasing problem-solving efficiency though better communication among natural resource professionals, estimating the economic contributions of forest management to the state's economy, and revealing how wildlife management affects forest health and productivity.

The Division of Agriculture Extension wildlife education program areas are: (1) addressing nuisance wildlife problems, including Feral Hog Education Program and pesky wildlife around the yard and garden, (2) wildlife habitat management, (3) wildlife enterprises including habitat management for leasing lands for hunting and wildlife viewing, and (4) youth education through the 4-H Wildlife Program. The Division of Agriculture is conducting a survey of ticks and tickborne disease across the state of Arkansas in response to the first confirmed case of Lyme Disease in Arkansas in 2017. By the end of the 2019 program year, over 9,000 ticks have been submitted for testing (see Impact #15).

The University of Arkansas Pine Bluff has many efforts that work towards protecting the health of aquaculture and aquatic wildlife. UAPB houses the Aquaculture/Fisheries Center for Excellence, which is recognized as a leader in aquaculture/fisheries teaching, research and extension programs. Some of the research UAPB conducted included assisting the AGFC in developing a non-lethal, quick method of assessing hatchery contribution to a year class in the field and delineating areas used for spawning. UAPB's research also worked towards validating measurement techniques used to collect data. UAPB has continued to monitor the ecological effect of the invasive Northern Snakehead, which at this point is only found in six states in the United States. UAPB provides support and training for county Extension personnel and private landowners on the subject of private impoundment management.

The focus area of sustainability is conceptually and practically interwoven with production, economy, environment, energy and climate activities and concerns. As such, the Division of Agriculture has research and Extension faculty making contributions to the Environment, Energy & Climate planned program in the focus area of Environmental Sustainability. Specific efforts (not reported to other focus areas) related to environmental sustainability are being made in alternative residue and water management practice effects of soil properties and crop production, trace gas emissions to the atmosphere from rice production, improving waste water quality through struvite creation to remove excess phosphorous and nitrogen, and quantification and modification of waste water treatment systems appropriate for small dairy milk centers. 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 an investigation and quantification of the sustainability of cotton production. There continues to be an extension effort to provide a nutrient management planner, nutrient applicator, and mortality management education. A particular area of growth 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.

Access to Safe & Nutritious Foods

The University of Arkansas System Division of Agriculture and University of Arkansas Pine Bluff faculty and staff developed, evaluated, and disseminated 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. Division of Agriculture and UAPB faculty conducted novel research to determine the impact of diet and food composition and functional food components on body weight and health. Key programs included Supplemental Nutrition Assistance Program Education (SNAP- Ed and FFNews) and Expanded Food and Nutrition Education Program (EFNEP) (see Impacts #18 and #19). In response to the high incidence of diabetes and prediabetes in Arkansas, the Division of Agriculture has began and continued the Diabetes Prevention Program that has had initial positive impacts to the first two cohorts of participants (see Impact #20).

UA Division of Agriculture researchers continue to work with UA Fayetteville, the University of Arkansas for Medical Sciences (UAMS), and the Arkansas Children's Research Institute examining the link between childhood obesity outcomes and features of the food, social, and built environment. The Arkansas Children's Research Institute and the UAMS Arkansas Center for Health Improvement (ACHI) provides access to a unique individual-level dataset on obesity outcomes. Access to this data allows research to be conducted at a level of detail and accuracy that is not possible with national-level datasets.

The Division of Agriculture and UAPB faculty and staff developed, evaluated, and disseminated education and curricula incorporating research and teaching for food safety and processing. Extension programs included HACCP workshops and meetings, food safety and preservation workshops, Better Process Control School, and ServSafe workshops. Other programs conducted included culinary arts training for food industry personnel, online distance education in food safety and manufacturing, and assistance to small food companies and entrepreneurs in the form of services, workshops, and consulting. UAPB provided 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 included 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 included work to (1) improve environmental monitoring processes (see Impact #21), (2) assess impact of high protein diets on obesity and diabetes (see Impact #22), (3) assess the health benefits associated with fish, vegetables and other processed foods, and (4) improve the sensory quality of processed foods.

Increasing Opportunities for Families & Youth

The University of Arkansas System Division of Agriculture and University of Arkansas Pine Bluff faculty and staff developed, evaluated, and disseminated education related to increasing opportunities for families and youth through the Family & Consumer Science and 4-H Youth Development areas.
In the area of Health and Aging, the University of Arkansas System Division of Agriculture and the University of Arkansas at Pine Bluff provided programs to improve health at every stage of life by educating and engaging Arkansans to address locally relevant health Issues. Programs like Extension Get Fit and Walk Across Arkansas helped young and mature Arkansans increase physical activity, improve health, and improve quality of life (see Impact #27). The Extension Wellness Ambassador Program trained and engaged community volunteers to address local health Issues by implementing projects and conducting health improvement activities. Extension Health and Aging programs worked to help Arkansans of all ages achieve optimal physical, mental, and social health, which can result in significant savings in healthcare and treatment dollars each year. As the Issue of mental health becomes a greater focus nationally, the Division of Agriculture Extension has implemented new programs to address these health Issues. Farm Stress and Mental Health First Aid programs have reached over 500 people and will only continue to grow in the coming years (see Impact #25).
In the area of Strengthening Families, the University of Arkansas System Division of Agriculture and the University of Arkansas at Pine Bluff offered invaluable resources to parents, couples, and individuals who seek to improve their psychological and relationship health and their overall quality of life. We also offered free, researched-based professional development training to childcare providers and afterschool care workers to help them meet their annual state required training hours, improve their job performance, and improve quality of care given to our youngest citizens (see Impact #26). The Division of Agriculture and UAPB parenting programs offer parents tools to improve relationships with their children and partners.
In the area of Family Resource Management, the University of Arkansas System Division of Agriculture provided practical, researched-based information to Arkansans to increase financial well-being, equipped adults and youth with the skills needed for financial stability, and explored strategies that can be used to help Arkansans improve personal finance and consumer practices (see Impact #28).

In the area of Empowering Youth, the University of Arkansas System Division of Agriculture and the University of Arkansas at Pine Bluff have worked to expand access to quality 4-H programming in Arkansas. The 4-H program has moved youth towards the future by teaching life skills to prepare youth for adulthood and helping youth explore career and entrepreneurship possibilities. 4-H programs align with the National 4-H Mission Mandates in providing programs that involve youth in science, technology, engineering and math, encourage healthy living for Arkansas youth, and engage youth in citizenship and leadership development. In the 4-H Mission Mandate area of healthy living, the UAPB 4-H Healthy Habits Program has reached over 1,500 youth through nutrition and cooking lessons (see Impact #24). In the 4H Mission Mandate area of Science, The Division of Agriculture and UAPB have conducted various youth programs geared towards teaching youth life skills related to science and encouraging interest in science careers. The Aquaculture Program at UAPB also contributes to positive youth development through the Youth Fishing and Aquaculture Education program, which reached over 200 youth in 2019 (see Impact #23). The Division of Agriculture's 4-H Program has conducted science programs related to engineering through the SeaPerch program and the newly released 4-H Drone program (see Impact #30). In response to Arkansas reporting one of the highest incidence of injuries due to ATVs and UTVs, the Arkansas 4-H program has continued their ATV safety program, reaching over 2,000 Arkansans in 2019 (see Impact #31).

Volunteer groups are essential parts to Extension families and youth programs. The Arkansas Extension Homemakers Council has continued to extend the reach of Extension programs through their 3,650 members in 307 clubs statewide. These active volunteer leaders serve their clubs and communities in a number of ways and served over 344,000 hours in 2019 (see Impact #29).

Economic & Community Development

The University of Arkansas System Division of Agriculture faculty and staff developed, evaluated, and disseminated education in economic and community development (ECD). ECD efforts concentrated in the areas of leadership, community development, business, and public policy. Division of Agriculture faculty and county agents have conducted many leadership programs in 2019. In addition to developing, conducting, and evaluating local leadership programs, Extension has continued LeadAR (Lead Arkansas), a two-year statewide adult leadership development program to teach participants about Issues impacting Arkansas and develop leadership skills.

In community development, the Division of Agriculture has provided stakeholders in-depth analysis of regional socio-economic conditions, opportunities, and strategies for development. Some topics include: development capacity, changing economic base, cluster industries, economic and fiscal impact, enhancing retail trade, and retiree in-migration. Assistance in using a 15-year database of county government revenues and expenses has also been provided in 2019, along with demographic and economic changes, to develop strategies for the provision of county services and infrastructure.

Breakthrough Solutions is a visionary, strategic planning and implementation process for communities or regions that is asset based, community

driven, technology enabled and Results oriented. In addition to technical assistance, the program features an annual Breakthrough Solutions Conference and an electronic newsletter (Breakthrough News) to support vibrant, sustainable communities in the 21st century economy. Breakthrough Solutions has had success in the Baxter County community (see Impact #32) and the City of Corning (see Impact #34) in the 2019 program year.

Programs conducted by the Division of Agriculture to support businesses include the Arkansas Procurement Technical Assistance Center (Arkansas PTAC), Create Bridges, and the Income Tax Schools. Customized technical assistance was also provided in developing and implementing economic development strategies, including entrepreneurial support and business development.

The Division of Agriculture's Public Policy Center (PPC) provided education on local and state ballot Issues, worked with state agencies to encourage public involvement on water and other public Issues, and helped Arkansans understand and interpret new laws and regulations. In order to reach clientele regardless of location, "Introduction to County Government in Arkansas" was offered online for citizens. During the November 2018 general elections, PPC researched and created state level and local level voter guides and fact sheets to provide citizens non-biased information on Issues they would see on their ballots (see Impact #33).

Also housed within the University of Arkansas System Division of Agriculture, the National Agricultural Law Center (NALC) serves as the nation's leading source of non-partisan agricultural and food law research and information, in partnership with the USDA Agricultural Research Service and National Agricultural Library. NALC leads the Agricultural & Food Law Consortium, a first-of-its-kind 4-university partnership designed to expand and enhance the delivery of objective and relevant agricultural and food law research and information to the nation's agricultural community. NALC maintains a formal partnership with the National Association of State Departments of Agriculture (NASDA), and works closely with other state, regional, and national organizations.

II. Merit and Scientific Peer Review Processes

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

Process	Updates
1. The <u>Merit Review Process</u>	Updates to the content of the Merit Review Process section of the FY2017-2021 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Plan of Work include the following:

	• The University of Arkansas System Division of Agriculture uses an external, comprehensive departmental review process. Reviews are scheduled on a 9-10 year cycle and conducted concurrently for research, Extension and instruction 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. In addition, mid-term internal reviews for departments have been added to the process, which tracks the progress of the department toward meeting the review team's recommendations and the department's plan for implementing changes. • The University of Arkansas Pine Bluff has continued the process outlined in the 2017 Plan of Work.
2. The <u>Scientific Peer Review Process</u>	• The University of Arkansas System Division of Agriculture has continued the process outlined in the 2017 Plan of Work. • The University of Arkansas Pine Bluff has continued the process outlined in the 2017 Plan of Work.

III. Stakeholder Input

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

Stakeholder Input Aspects	Updates
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	Updates to the content of the actions taken section of the FY2017-2021 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Plan of Work include the following: • The University of Arkansas System Division of Agriculture has continued the process outlined in the 2017 Plan of Work. • The University of Arkansas Pine Bluff has continued the process outlined in the 2017 Plan of Work.
2. Methods to identify individuals and groups and brief explanation.	Updates to the content of the methods to identify section of the FY2017-2021 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Plan of Work include the following: • The University of Arkansas System Division of Agriculture has continued to tailor the process for identifying stakeholder groups to the specific county, department, and research project. Extension County programs continue to have advisory committees in which the members are selected to be representative of their respective counties. In 2017, the University of Arkansas System 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 the University of Arkansas Pine Bluff 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. Over the past few years the program has been revamped, and the program is committed to reconstituting our advisory Board in the near future. 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.
3. Methods for collecting stakeholder input and brief explanation.	Updates to the content of the methods for collecting section of the FY2017-2021 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Plan of Work include the following: • The University of Arkansas System Division of Agriculture has continued the efforts outlined in the Plan of Work. • The University of Arkansas Pine Bluff has continued the efforts outlined in the Plan of Work.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	Updates to the content of this section of the FY2017-2021 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Plan of Work include the following: • The University of Arkansas System Division of Agriculture has since updated and expanded the 2017-2021 Strategic Plan to now encompass 2017-2023. The program areas have been updated to reflect stakeholder needs and input. The overall focus of work for the University of Arkansas System Division of Agriculture has not changed, but the Issues facing Arkansans created a need to realign where Extension and Research efforts are placed.

	• The University of Arkansas Pine Bluff has continued how stakeholder input is considered and used as outlined in the Plan of Work.

IV. Planned Program Table of Contents

V. Planned Program Activities and Accomplishments

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

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	**Conservation on Small Farms (University of Arkansas Pine Bluff)**	**Issue** Arkansas has approximately 7 million acres of cropland and 900,000 acres of pastureland. However, much of the land can be improved by the addition of different conservation practices. Adding conservation practices such as land leveling, filter strips, prescribed grazing, and watering facilities can improve the productive capacity of the land while also enhancing the environmental aspects of the land. Producers have always used the USDA Conservation programs to receive technical and financial assistance to install these programs. Socially disadvantaged producers (SDPs) have been slow to use the USDA Programs that provide technical and financial assistance for installing conservation practices. Their mistrust of the government, lack of information about USDA Programs, failure to attend outreach meetings, and their lack of knowledge about the different conservation practices, made it difficult for them to participate in the programs. **Target audience** Target audience was socially disadvantaged producers (SDPs). Most of these producers have not used conservation practices to improve the productive capacity of their land. If the conservation practices are installed yields will increase which will also improve the profit potential and profit margins of their operations. In addition, environment will be enhanced by cleaner streams through less runoff, less fertilizer leaching, and more wildlife habitat.	Agricultural Production & Processing

		What was Done To assist SDPs in using USDA Conservation Programs to improve their land the University of Arkansas at Pine Bluff (UAPB) partnered with the Natural Resources Conservation Service (NRCS) to provide one-on-one counseling and educational workshops on the Environmental Quality Incentive Program (EQIP). To help SDPs understand the program, UAPB made conservation practices forms for pasture land, cropland, and forestland. These forms identified the different conservation practices for each type of land. SDPs were assisted in selecting conservation practices for their land, shown pictures of the practices with the Arkansas Conservation Practice Catalog, and when needed, assistance in completing the EQIP Application. **Results** SDPs obtained $900,000 in EQIP Funding to install land improving and environmental enhancing conservation practices on their farms and ranches. Approximately 1000 acres of land and 20 SDPs will be affected. This funding will include 10 high tunnels, precision land leveling, underground pipelines, irrigation wells for vegetables, micro-irrigation, prescribed grazing, crop rotations, and cover crops. Once these practices are installed, the productive capacity of the land will be increased resulting in an increase in profit potential and profit margins for these underserved producers. We received a significant amount of rain in the spring (flooding in some areas). This may delay the installation of some practices. Information on this project may be found on the School of Agriculture, Fisheries, and Human Science Facebook page: www.uapb.edu/safhs **Impact Contact**: Dr. Henry English; englishh@uapb.edu	
2.	**Breeding MG4 and MG5 soybean cultivars to meet market needs**	**Issue** Arkansas' soybean farming has changed over the last few decades, moving into earlier planting dates and shorter maturity groups. To answer these	Agricultural Production and Processing

	(University of Arkansas System Division of Agriculture)	challenges, the University of Arkansas System Division of Agriculture has been able to incorporate genetic diversity in improved varieties, and to release products with unique traits of interest, including off-patent glyphosate tolerance, modified oil and protein composition, and conventional cultivars that could be grown under non-GMO contracts. But these products have historically been of determinate growth habit and of late maturity (MG5). **Target Audience** Arkansas soybean growers, seed dealers, grain markets **What has been Done** In 2017 we defined a 5-year breeding goal of advancing from 20% to 75% indeterminate MG4 lines in our commodity breeding program in order to meet market needs. Program redesign was initiated in 2018, and steps towards its implementation continued in 2019. The breeding strategy was modified to increase the proportion of indeterminate MG4 and MG5 materials in the program. We placed stricter advancement decisions on determinate materials, selected lines to be advanced based on project goal targets and increased the overall number of entries in first year of yield trials. These steps allowed testing of 1,230 entries with indeterminate growth habit versus 562 determinate entries in 2019. In addition, we changed our field design and packaging protocols to allow planting of indeterminate materials in April. In 2019 we also utilized winter nurseries in Costa Rica for the advancement of generations and in Chile for the visual selection of progeny rows. Finally, packaging of entries for yield trials was conducted utilizing pure seed sources, as opposed to plot seed, with the intent to enhance the genetic purity and to speed up the cleaning, packaging, and harvesting of yield trials plots.	

		In 2019 we also initiated significant laboratory operations for DNA extraction and marker assisted selection in our program. For the first time we screened lines in the pre-commercial stage with chloride tolerance markers, and we are in the process of characterizing all entries in testing with 6K SNP chips for future genomic selection efforts. Concomitantly, we are conducting a genotyping-by-sequence trial run with the University of Minnesota that would allow us to reduce the genotyping costs by half. **Results** The changes implemented in the Soybean Breeding Program have resulted in short-term gains, including the conditional release of three new conventional MG4 indeterminate lines and one glyphosate-tolerant indeterminate MG5 line that will become available for commercialization in 2020. Similarly, the implemented changes are working to deliver long-term benefits for the program, including a more balanced and sustainable mix of traits and maturities, an improved return on investment by supplementing field testing with genomic selection, and a steady flow of lines to be released as commercial varieties or germplasm lines. All these cultivar releases will benefit the local and regional soybean seed and farming industry. **Impact Contact**: Dr. Leandro Mozzoni; lmozzon@uark.edu	
3.	**Wheat Breeding for Improved Crops, Better Profits for Arkansas Farmers (University of Arkansas System Division of Agriculture)**	**Issue** Soft red winter wheat is an important rotational crop in Arkansas, with historical acreage ranging from 100,000 to 1 million acres cultivated per year, dependent on crop price. In Arkansas, wheat yields have increased at a rate of 0.5 bu per acre per 1 year since 1924. This continuous increase in yield is due to the combined impact of both improved cultural practices	Agricultural Production and Processing

		and genetic improvement through variety development by breeders. The presence of aggressive breeding programs is necessary for continued improvement in yield and development of improved resistant varieties that can replace the current cultivars as they become susceptible to disease. **Target Audience** Wheat growers, seed distributors **What has been Done** The goal of the Arkansas small grains breeding program is to develop wheat varieties adapted to the state and region. This goal is accomplished through adapted crosses to maximize efficiency while continuing to broaden the genetic base of the program to guard against genetic vulnerability and limited genetic improvement. Arkansas is part of a small grains breeding cooperative known as SunGrains, which also includes public breeding programs in Louisiana, North Carolina, Georgia, Florida and Texas. This breeding cooperative allows for leveraging of resources from all programs toward the goal of variety development. **Results** The breeding program, in combination with an extensive variety testing program, continues to provide Arkansas Producers with new adapted cultivars and information to make educated choices in variety selection. The breeding program has released 14 wheat varieties and, in combination with SunGrains, has co-developed an additional 13 oat varieties, 6 triticale varieties and 18 wheat varieties since joining in 2010. In 2016, AGS 2055 wheat was released by our program and was commercially available to growers. In 2019, both AR01040-4-1 and AR06146E-1-4 were approved for release.	

		Higher grain yield and test weight in new varieties and lower input costs from improved disease and pest resistance result in higher profits to Arkansas wheat producers. **Other Information** SunGrains breeding cooperative: http://www.agronomy.lsu.edu/sungrains/sungrains.html **Impact Contact**: Esten Mason, esten@uark.edu	
4.	**Aquatic Vegetation Control (University of Arkansas Pine Bluff)**	**Issue** Aquatic vegetation control continues to be a problem for aquaculture producers, recreational pond owners, and row crop producers. New products are developed but the information provided to the stakeholders is limited. **What has been Done** An annual update of the Aquatic Herbicide section of the Cooperative Extension publication; Recommended Chemicals for Weed and Brush Control, MP44. This helps to keep Arkansas farmers and pond owners aware of the current legal herbicides and some information on their use. Information on Harmful Algal Blooms was published on water resource newsletters, extension publications, and a radio interview. Further assistance was also given to many pond owners, often through county agents, on-farm pond and aquatic weed Issues. Presentations to extension agents, private pond owners, water resource managers, producer organizations, and aquatic plant management professional organizations were given. Over 395 requests for information and recommendations were received by phone calls, phone texts, and/or emails from county agents and stakeholders. **Impact**	Agricultural Production & Processing

		The impact for this program is difficult to monetarize. For producers, seining ponds, and loss of fish are reduced. For recreational pond owners, ponds are more aesthetically pleasing, and easier to fish. County Agents and Recreational Pond Management companies have the latest information on approved chemicals for aquatic use. **Impact Contact**: Dr. Rebecca Lochmann, lochmannr@uapb.edu	
5.	**UAPB Fish Health Inspection Lab (University of Arkansas Pine Bluff)**	**Issue** 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 7 APHIS approved laboratories in the US for aquatic organisms. The UAPB Fish Health Inspection lab in Lake Village conducts necropsies on fish as problems arise. All treatment recommendations follow the letter of the law. Additionally, specialist works closely with local D.V.M. in obtaining Veterinary feed directive therapeutics for fish producers. **Impact:** In 2019, personnel at the Lonoke lab conducted 209 disease diagnostic cases, 127 water quality/aquatic weed cases and 106 health certifications for interstate or international transport of live fish. Technical	Agricultural Production & Processing

		assistance was provided to clientele through more than 207 farm visits and 654 phone consultations. The Arkansas Baitfish Certification Program provides APHIS certifications for fish to be exported interstate and to other countries. In 2019, 20,042 fish were sampled and certified for the baitfish certification program, allowing Arkansas producers to safely ship millions of dollars' worth of fish. These farms are required to have biosecurity practices in place that prevent the spread of disease. In 2019, personnel at the Lake Village lab had 82 disease diagnostic cases submitted. Properly treating the fish saved the fish producer over $250,000. **Impact Contact**: Dr. Rebecca Lochmann, lochmannr@uapb.edu	
6.	**Arkansas Aquaculture Alternatives (University of Arkansas Pine Bluff)**	ISSUE: Acreage devoted to catfish production in Arkansas has seen a significant reduction during the past years. With acreage decreases there is a need for improving production efficiency. Two production systems that can improve production efficiency are the split pond system and the intensive aeration system. These systems allow for the production of 15,000 pounds per acre and move compared to the 4,000-5,000 pounds per acre using the traditional pond method to grow catfish. With fish growth concentrated in a smaller area of the pond, feeding, harvesting, and aeration are improved. Also, disease treatments are less costly since smaller volumes of water are being treated Another program under this initiative is the water testing program. In addition to service for catfish producers, this program has expanded into testing water for row crop producers, agriculture consultants, and well drilling operations. Not all groundwater is adequate for raising crops and some groundwater in areas contains excessive quantities of salt which are dangerous to crops and over time can be detrimental to the land itself. Some 80 irrigations water samples were submitted for analysis last year.	Agricultural Production & Processing

		OUTCOME: Currently 25 split ponds and 16 intensive aeration systems are in place currently. An additional split pond was constructed, and a larger unit was split into two separate units. IMPACTS: Producers are continuing to operate the split pond and intensive aeration systems. Anticipated production utilizing these systems should exceed 4 million pounds of fish. Extension monitors water quality in these ponds. The value of that service is $60/acre or a total of $12,600. For the water testing service, the service is valued at $7,500 or about $125 per sample. There is also an additional value to the well driller, once a "test hole" is drilled, water is tested, if the water is not of good irrigation quality, the "test hole" is sealed. That way a well is not drilled, wasting a producer and drilling company $100,000 for a useless well. **Impact Contact**: Dr. Rebecca Lochmann, lochmannr@uapb.edu	
7.	**Algal Toxicosis and related problems (University of Arkansas Pine Bluff)**	**Issue** Catfish losses attributed to toxic algal blooms have plagued the Arkansas catfish industry for a least two decades, with losses in the millions of dollars during some years. **What has been Done** A proactive approach to preventing fish losses due to algal problems was initiated during the early 2000's and continued to this date. Two farms are enrolled in the program consisting of 66 production ponds, both food, and fingerling catfish. Ponds enrolled in the program are visited weekly during the production season and algal samples are screened for the presence of the genus *Aphanocapsa*. When this genus is present in increasing numbers, the producer is advised to treat the pond with the appropriately registered algicide to control the population numbers. **Impact**	Agricultural Production & Processing

		The impact for this program is difficult to monetarize. During 2019, there were 0 economic losses attributed to algal toxicosis, losses to the industry had been more than two million dollars a few years earlier. **Impact Contact**: Dr. Rebecca Lochmann, lochmannr@uapb.edu	
8.	**Developing and Implementing CropCheck to Prevent Off-Site Herbicide Impacts (University of Arkansas System Division of Agriculture)**	**The Issue** Off-site movement of herbicide is a problem when diverse crops are in close proximity to some crop herbicide technologies. Flag-the-Technology was successfully implemented for several years by flagging fields with colored flags to represent herbicide technology in crops. With advent of cockpit GIS/GPS systems, a newer and easier system can be implemented that applicators can see where the field to be treated is in relation to more sensitive crops. It is impossible for an applicator to know what technologies are in a field without being previously informed. Labels warn about keeping certain distances from sensitive crops, but it is difficult to know where these crops reside. Beehives and specialty crops have faced this situation for many years and a company was formed from a project at Purdue University to meet this need. FieldWatch was formed 10 years ago to meet the needs of applicators, beekeepers, and specialty crop farmers. Three modules were created: BeeCheck (bees), DriftWatch (specialty crops), and FieldCheck (applicators). With the advent of dicamba and 2,4-D technology in soybeans and cotton, the University of Arkansas System Division of Agriculture partnered with FieldWatch in 2018 to develop CropCheck. CropCheck is a module to report the location of crops so that pesticide applicators can determine where sensitive crops occur. All the FieldWatch modules use a Google Earth type interface and allow the user to identify their fields.	Agricultural Production & Processing

		Target audience In 2018 and 2019, the first audience was the County Extension Agents which presented the information at the county crop production meetings. This led to reaching out to producers, consultants, and applicators. The Arkansas Department of Agriculture and other organizations have helped get the information in the hands of the targeted audiences. **What has been Done** The last two years, the Division has reached out to all audiences to register fields. Feedback to FieldWatch on difficulties has led to easier input of fields and better integration to modern GIS technology. Consultants now can upload fields in bulk from other GIS packages. Applicators have become the persuasive voice to convince producers to register their fields. **Results** In 2019, there were 145 applicators, 278 producers, 2316 fields, 160,927 acres, 39 apiaries, and 166 hives registered in Arkansas through FieldWatch. Although this was a low percentage of row crops, it was a successful start. Consultants have been advocates of the program and sign up their clients' properties. Specialty crops and non-GMO producers are becoming the biggest advocates of the program. The impact of the program is also evident in that 4 other states have signed on to CropCheck. **Impact Contact**: Dr. Vic Ford, vford@uaex.edu	
9.	**Teaching Arkansas Farmers How to Use Xtend Technology (University of Arkansas System Division of Agriculture)**	**Issue** New herbicide technology containing Xtend (dicamba tolerant) cotton and soybean was made available to producers in 2017. Off target movement of these herbicides to sensitive crops in 2017 proved to be devastating with	Agricultural Production & Processing

		over 1,000 formal complaints filed with the Arkansas State Plant Board. The new technology requires specific application techniques including nozzle selection, boom height, equipment speeds, and a focus on the applications environment. Efforts that focus on application technology and these specific requirements are essential to the successful adoption of this technology. **Response** Action was taken in educational efforts targeting four key areas: (1) certification and recertification of applicators through in-person and online trainings; (2) six in-person hands-on non-certifying applicator trainings were organized across the Arkansas Delta (27 to date); (3) equipment diagnostics were performed to prepare sprayers for 2019 applications; and (4) application information and innovations were shared through over 119 in-person presentations, in-person demonstrations, and producer site visits. In addition, much of the response was shared in parallel through social media contacts. **Results** (1) In partnership with the Pesticide Assessment program, nearly 20 in-person certification/recertification events were held, 3 online courses were developed resulting in 1,383 applicators being certified this year alone. These trainings increased applicators competency in understanding label requirements, equipment set-up, and environmental concerns, verified with a written test in the case of many of the in-person and all of the online certifications. The scope of these events covered applicators in agriculture, right-of-way, turf, and ornamental industries. (2) There were over 250 growers, consultants and applicators in attendance at the six in-person applicator trainings held. At the trainings, applicators received information not only through presentations but also through demonstrations with full size equipment. The scope of these events were exclusively agriculture producers and applicators.	

		(3) In collaboration with county faculty, the program has performed testing on equipment that applied pesticides to more than 500,000 acres with a conservative total estimated savings to applicators of over $1,000,000 statewide. This was done through calibration diagnostic equipment assembled and dispersed from this program to all counties in the state. In addition, a non-provisional utility patent was filed in 2018 that allows two EPA approved drift reduction technologies (DRT) to be compatible. The Fixed Angle Nozzle to Nozzle Body Adaptor adjusts low-drift nozzle patterns to a fixed angle so that they can be used with broadcast hoods without pattern deflection. Provision patent still pending and awaiting on utility patent approval. Equipment testing was conducted on almost exclusively self-propelled row crop sprayers. (4) Advanced application equipment was used as training tools and demonstrated at more than 50 events across the state. Fifty-five application related presentations have been given to over 6,300 direct contacts. Sprayer innovations, new regulations, and new application data were also shared with over 47,000 documented social media contacts in 2019. **Impact Contact**: Jason Davis, jdavis@uaex.edu, Ples Spradley, pspradley@uaex.edu	
10.	**Managing Southwestern Corn Borer Increases Grower Profitability (University of Arkansas System Division of Agriculture)**	**Issue** Acreage of non-GMO field corn nearly doubled in 2019 (70,000 acres) in Arkansas. The driving force behind this increase is a poultry facility paying growers a premium for non-GMO field corn. Southwestern corn borer can be a devastating pest to non-Bt corn. Because of the hidden nature of this pest, damage may not be realized until late in the season, when corn plants begin to lodge which can be up to 100% of an infested area. Monitoring for this pest is key to proper management and can be accomplished utilizing pheromone traps. Southwestern corn borer moths respond well to the universal IPM pheromone traps. These traps are	Agricultural Production & Processing

		relatively inexpensive and only require being checked once a week to monitor for populations. In the absence of a monitoring program, growers are often forced to make automatic applications of an insecticide to prevent infestations. **What has been Done** A southwestern corn borer monitoring program was initiated through the county IPM mini-grants program in 2016. Row crop agents participating in the program were required to include pheromone trapping for this pest in their program in order to receive funding. County agents were provided traps, pheromone and funds to cover travel to check the traps weekly. Traps and pheromone were also provided to counties that did not participate in the mini-grants program, but who requested traps to run in their county. Approximately 23-25 counties participated in the program from 2016-2019. Agents submitted trap catches each week that were posted to the Arkansas Row Crops Blog. Agents also utilized the catch numbers in weekly newsletters sent to clientele. **Impact** Although non-GMO corn acreage has increased each year, there has not been a corresponding increase in southwestern corn borer across all non-GMO acreage. In fact, populations decreased in 2019. In the past, the majority of growers made a prophylactic insecticide treatment based on corn growth stage and/or calendar date to manage southwestern corn borer. Our trapping program has indicated that economic infestations of southwestern corn borer was limited to 2 counties in the east central portion of the state. This area represents about 3,000 acres of the 70,000 across the state. The majority of growers in the remaining area representing approximately 67,000 acres did not make a prophylactic insecticide treatment. A savings of $29/acre. This translates into a total savings of over $1,900,000 statewide in 2019 and over $5,000,000 since the program began in 2016. Insecticides commonly used are applied at a rate range of 0.067 to 0.098 lbs of active ingredient per acre. This	

		translates into a reduction of up to 6,566 lbs of insecticide active ingredient applied to the environment by utilizing sound IPM practices in 2019 and over 16,000 lbs of active ingredient since 2016. Active monitoring of southwestern corn borer in non-GMO corn using pheromone traps saves growers money and reduces the pesticide load on the environment. **Cooperators** UA Entomology, UA Cooperative Extension Ag Agents **Funding** NIFA/USDA **Impact Contact**: Glenn Studebaker, gstudebaker@uaex.edu; Gus Lorenz, glorenz@uaex.edu	
11.	**Use of a Biopesticide in Soybean Increases Grower Profitability (University of Arkansas System Division of Agriculture)**	**Issue** Corn earworm, Helicoverpa zea (Boddie), is the most economically important insect pest of soybean, Glycine max (Merrill). The corn earworm damages soybeans by both defoliation and bloom and pod feeding. Helicoverpa zea has become resistant to several classes of insecticides and is becoming increasingly harder to manage. Corn earworm in Arkansas usually has 5 generations per year and with increasing resistance/tolerance to Bt in corn we are beginning to experience larger numbers of larvae coming out of corn into soybean. Control Issues have been developing with many currently used insecticides and Issues with insecticides that have little or no residual control. Growers are forced to use insecticides such as the anthranilic diamides (chlorantraniliprole) which costs as much as $18 to $22 per acre. The cost of control can exceed $40 per acre for corn earworm control which can severely impact the profitability of the crop for our producers. Helicoverpa armigera Nucleopolyhedrovirus (HearNPV) is a naturally occurring baculovirus that	Agricultural Production & Processing

		has the potential to control H. zea by initial ingestion and subsequently by creating epizootics through horizontal transmission. HearNPV, a highly host-specific viral biopesticide, is used to control H. zea populations with no off-target effects. **What has been Done** In 2014, Initial trials were very positive, and we noticed the natural spread of the virus outside our plots. A few routes of horizontal transmission had been previously observed. Abiotic factors can contribute to the horizontal transmission of HearNPV when ideal precipitation, wind, crop height, and soil conditions are present. Another route of transmission is from infected to uninfected larva. This route of infection has been shown to occur in a multitude of ways including, contact or ingestion of frass from infected larvae. Predators of H. zea and scavengers are also capable of spreading HearNPV without being susceptible to the virus. **Impact** In 2018, the corn earworm flight hit Arkansas about 2 weeks earlier than normal and larvae began to appear in late-June in soybean fields. About 200,000 acres received an application of the NPV in the state as a result. Because the NPV works slower than a synthetic insecticide there was some concern, but by the end of the year the NPV provided excellent control and the consensus was that the NPV did in fact provide very good control. At a cost of $5 per acre compared to $18-22 per acre the savings for growers was $2.6-3.2 million with no impact on off-target organisms in 2018. Interest in the use of these biopesticides increased in Arkansas and we conducted an in-service training for county agents and provided virus for demonstration purposes. Applications were made on grower fields and several field days were held to observe the virus in action. As a result, in 2019 over 750,000 acres were treated with the virus. The use of the virus in 2019 on 750,000 acres instead of a synthetic pesticide saved growers $9.75-$13.5 million.	

		Cooperators UA Entomology, Ag-Bi-Tech **Funding** Soybean Promotion Board Funds **Impact Contact**: Gus Lorenz, glorenz@uaex.edu; Ben Thrash, bthrash@uaex.edu	
12.	**Growing High Yielding and Profitable Corn in Arkansas (University of Arkansas System Division of Agriculture)**	**The Issue** Corn has become a crop of choice for many Arkansas growers as they see the benefits it provides their farming operations including; more and better weed control options to control glyphosate resistant weeds, profit potential, rotational benefits for following crops, water conservation, and overall crop diversity and risk reduction. In past years, Arkansas corn yields have been greater than many in more traditional corn growing regions due in part to improved management practices and irrigation capability. As commodity prices have declined during the last few years and overall farm profitability has declined, Arkansas producers need to have ways to continue to raise high yielding and economical corn. **Target Audience** Corn producers, ag consultants, ag suppliers. **What has been Done** Educational efforts were made throughout the year to educate corn producers, county extension agents, crop consultants, and industry representatives on management strategies to grow quality high yielding and economical corn. Various methods were used to disseminate information on corn production and included; newsletters, blog postings, county production meetings, field tours, IPM meetings, field visits,	Agricultural Production & Processing

		verification program fields, phone calls, and social media. Educational efforts focused on proper production methods to grow economical corn and included; impact of inputs on yield and profitability, hybrid selection, planting dates and rates, fertility, weed control, insect management, irrigation, harvest, and storage. **Results** Despite 2019 being one of the most challenging growing seasons in recent years with widespread replanting due to record rainfall and flooding during March-May, Arkansas corn producers still were able to achieve a state average yield of 175 bu/acre. This is remarkable considering that 33% of the state's corn was planted after May 1 (yields generally decline when planted after May 1), and acreage was at the second highest level in recent years at 750,000 acres. The eight highest state average corn yields have all occurred during the last eight years indicating that Arkansas corn producers have learned how to grow high yielding corn through successful extension educational programs. Corn is and will continue to be an economically important crop for Arkansas producers. In 2019, Arkansas produced approximately 130 million bushels of corn worth an estimated $518 million. With educational programs that were delivered on management considerations for replanting and late planting, Arkansas producers were able to grow high yielding and profitable corn in 2019. **Funding** Arkansas Corn and Grain Sorghum Promotion Board and the University of Arkansas System Division of Agriculture. **Impact Contact**: Dr. Jason Kelley; jkelley@uaex.edu	
13.	**"Keeping it in the Family"**	The project goals are to provide educational resources and technical assistance to build family legacies, healthy forestland, and generational wealth through land retention in the African-American community. This	Environment, Energy & Climate

	Sustainable Forestry African-American Land Retention Program (University of Arkansas Pine Bluff)	project thrives by building sustainable partnerships among landowners, educational institutions, government agencies, forestry businesses, and community based organizations. **The Issue** In 1920 African-Americans owned 15.6 million acres of farmland across the U. S., but that acreage has drastically declined over the last century to only 2 million acres for reasons including voluntary sales, emigration from the South, lack of access to credit and capital, and foreclosures. Current landowners face challenges when their land becomes heir property and is inherited by a group of individuals. This type of property leaves families without clear titles that prevents active management of the land, thereby limiting any economic returns. Target audience: This project initially served African-American woodland owners in seven (7) Southwest Arkansas counties, but grew to encompass a total of 18 counties across the central and southern parts of the state. **What has been Done** The University of Arkansas at Pine Bluff (UAPB) Small Farm Program started the "Keeping it in the Family" (KIITF) Sustainable Forestry African-American Land Retention (SFLR) Program in 2016 to educate African-American forest landowners in Arkansas about forestland management and applying conservation practices to improve the land's sustainability and value. Services included 12 outreach activities, one-on-one site-visits, forestry management assistance, and cost-share assistance to implement conservation practices. Legal services were also provided to help landowners obtain clear titles and address other land tenure concerns. **Results** To date, this program has impacted 11,325.10 total acres and 8,618.47 forest acres. During fiscal year 2019, the "Keeping it in the Family" Forestry Program provided forest management and heir property education to over	

		900 landowners. The KIITF team conducted 156 direct contacts (one-on-one site-visits/calls), and helped 61 landowners identify forestry management practices. The county foresters developed 16 forestry management plans. Fifteen landowners were assisted with applying for the Environmental Quality Incentive Program (EQIP). Twelve landowners received estate planning tools. Seven (7) landowners attended national conferences and gained awareness about forestry management, legislation to promote stewardship, and land tenure and property rights. Two (2) of the Arkansas landowners attended the American Forest Foundation Fly-In Event, which was held in Washington, DC, May 2019. From the Fly-In Event, not only did they learn about forestry legislation policies and the 2018 Farm Bill, they were able to speak to their local Congressman and discuss Issues that were related to their forestland and communities. The event had such an impact on one landowner that he invited his U. S. Senators and U. S. Representative to his property. Senator Boozman accepted the invitation and toured the landowner's property in August 2019. Five (5) Arkansas landowners attended the Minority Landowner Conference in South Padre Island, TX. One of the landowners set on a panel to discuss his experience with the SFLR project. The SFLR regional sites were also able to meet the participants from the other states and discuss common Issues. **External Factors** Extreme weather conditions stalled implementation of practices that were scheduled by landowners and forestry vendors. **Other information** Publications- Farm Sense – UAPB Small Farm Program	

		UAPB Magazine – Spring/Summer 2019 – Keeping it in the Family https://www.pbcommercial.com/news/20191229/forestry-award-honors-program-connected-to-uapb **Impact Contact**: Dr. Henry English, englishh@uapb.edu	
14.	**Soil Health Impact on Cotton Production (University of Arkansas System Division of Agriculture)**	**Issue** Conventionally and reduced tilled silt loam soils in Arkansas exhibit little soil structure. The lack of soil structure greatly reduces water infiltration rates. A reduction of the effective rooting depth of cotton occurs as a result of decreased infiltration. This is often the underlying cause of many of our water and nutrient Issues. While producers budget resources toward addressing symptoms associated with water and nutrient Issues, little attention is directed to improving soil health which plays a direct role in the cause of these Issues. **What has been Done** The Arkansas Soil Health Partnership is an informal workgroup of organizations that work together to increase the adoption of soil health practices. Partners include: the University of Arkansas System Division of Agriculture Cooperative Extension Service (UA-DOA-CES), researchers at the University of Arkansas and Arkansas State University, the Arkansas Soil Health Alliance (ASHA), Natural Resource Conservation Service (NRCS), Soil Health Institute, and Arkansas Association of Conservation Districts (AACD). The ASHA serves as the advisory committee to the Arkansas Soil Health Partnership on educational and research efforts. The partnership has been established to develop and disseminate information regarding strategies to improve soil health that are profitable and practical for Arkansas producers. Field days, county and multi-county meetings, on-farm demonstrations, news articles, publications, personal contacts and information gained from applied research projects were used to promote adoption.	Environment, Energy & Climate

		Impact The Division of Agriculture educational efforts in cotton to promote practices to improve soil health in conjunction with the Arkansas Discovery Farms resulted in a yield increase of 9% over a three year evaluation. We also noted an 11% reduction in cost per unit of production which translates to approximately $60/acre. Reductions in metrics used by the supply chain to document sustainability in our three –year study closely match the 10-year goals set by the U.S. Cotton Industry. **Funding** Cotton Incorporated, USDA-NRCS **Impact Contact**: Dr. Bill Robertson, brobertson@uaex.edu	
15.	**Survey of ticks and tickborne diseases in Arkansas (University of Arkansas System Division of Agriculture)**	**The Issue** Arkansas ranks at or near the top annually for number of reported cases of three tickborne diseases: Ehrlichiosis, Spotted Fever and Tularemia. Additionally, there has been an increase in the number people with Lyme-like symptoms, and the first confirmed cases of Lyme were reported to the Arkansas Department of Health in early 2017. Ticks are extremely abundant in Arkansas and part of everyday life for anyone working or playing outdoors. Yet, awareness of tickborne diseases is low among the public and even off the radar for many physicians, resulting in many misdiagnosed cases each year. **Target Audience** All Arkansas residents	Environment, Energy & Climate

		What has been Done We have been sampling ticks across the state and using molecular methods to screen each tick for a complement of disease-causing pathogens. In order to sample across the state, we have utilized citizen scientists by distributing tick collecting kits through each county extension office in the state. County agents were given training regarding the tick kits and advised to distribute to locals likely to encounter ticks and anyone that asked for a kit. Thousands of kits have been distributed and more than 9,000 ticks have been returned to the lab. DNA is extracted from each tick and molecular diagnostics are run to test for the presence of bacteria known to cause tickborne illness in humans. More than 7,500 ticks have been processed and screened for Rickettsia, the causative agent of Spotted Fever and more than 6,000 screened for Ehrlichia, the causative agent of Ehrlichiosis. These are the two most common human tickborne diseases in the state. **Results** This study is helping to determine the prevalence of tickborne diseases in ticks around the state. The data will also be used to identify disease "hotspots" around the state, which will help raise awareness of tickborne diseases in the public and medical professionals in these areas. Spotted fever-causing bacteria are proving to be fairly common in Arkansas ticks, with a prevalence of 39%. **Other Information** More information about the project and Results, including the tick locator map, can be found at https://adowling.hosted.uark.edu/ARTicks/index.html.	

		Impact Contact: Dr. Kelly Loftin, kloftin@uaex.edu	
16.	**Synthetic-P fertilizer shows positive response in soybean and corn (University of Arkansas System Division of Agriculture)**	**The Issue** As a primarily mined material, the global reserve of phosphorus (P) is finite and running out. Chemical engineering techniques have been developed and are being actively researched to recover P from wastewater sources. Many wastewaters contain elements, such as P and nitrogen (N), in various forms that could be recovered and beneficially recycled as fertilizer nutrients. Recovering nutrients, such as P, from wastewaters and/or treating wastewaters to the point they could be safely recycled back into the environment could have a tremendously positive impact on the environment, both terrestrial and aquatic, and any agricultural activity. Arkansas has a documented significant geographic nutrient imbalance, where the row-crop-dominated region of eastern Arkansas has a severe nutrient deficiency, particularly for P, which requires commercial P applications to supply crop-P needs for optimum production. The goal of this project was to generate preliminary data on the potential effectiveness of electrochemically precipitated struvite that was innovatively recovered from simulated wastewater as a P-fertilizer material for soybean and corn relative to other commonly available fertilizer-P sources. **Target Audience** Soil fertility researchers, agricultural producers, fertilizer producers, other stakeholders. **What has been Done**	Environment, Energy & Climate

		Field studies were conducted in 2019 in soybean and corn in eastern Arkansas to evaluate the plant response to electrochemically precipitated struvite (ECST) (a new fertilizer-P source created by removing P and N from synthetic waste water) with other common, commercially available fertilizer-P sources [monoammonium phosphate (MAP), diammonium phosphate (DAP), triple superphosphate (TSP), and rock phosphate (RP)] as well as a chemically precipitated struvite product, Crystal Green (CG) made from actual wastewater. Field plots with relatively low initial soil-test-P levels were amended with P from the various P sources at a target rate of 44.1 kg P/ha for soybean and 29.4 kg P/ha for corn at the Lon Mann Cotton Research Station. Crops were grown to harvest maturity and harvested with a plot combine for yield determinations. **Results** Based on one year of field data, when applied at the same total fertilizer-P rate and uniform N additions, both soybean and corn yields were significantly greater from ECST than from the other fertilizer-P sources. These Results demonstrate that ECST may have promise as an alternative fertilizer-P source for upland row crops in eastern Arkansas. A fertilizer-P source that is environmentally friendly, as the product of recycled wastewater treatment, and potentially economically cost-effective would represent a significant advancement in technology that could provide an alternative to mining P from the Earth, which at the present time has a finite life span. **Impact Contact**: Dr. Kristofor Brye, kbrye@uark.edu	

17.	**Water Resource Education (University of Arkansas System Division of Agriculture)**	**Issue** During the past decade, water resource quality concerns (both quality and quantity) from agricultural nonpoint source pollution continue to prompt a combination of 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 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. In many sectors of the farming community, this may create severe constraints to remaining economically viable and competitive in today's global marketplace. **What has been Done** In response, the Division of Agriculture Cooperative Extension Service has delivered educational programs such as the Arkansas Discovery Farm program, nutrient management training, soil and water conservation, watershed stewardship and urban stormwater management. The Arkansas Discovery Farm Program utilizes edge-of-field monitoring of both the quantity and quality of inflow (precipitation and irrigation) and outflow (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 presentations of agricultural practices at the state, regional and national levels. **Results**	Environment, Energy & Climate

		After four to five years of monitoring several row-crop fields across the State, 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 • Conservation practices such as irrigation water management and cover crops coupled with adaptive management can show a trend of continuous improvement with differences in effectiveness among years as hydrology can and does vary from year to year. • Computerized-hole selection and other irrigation water management strategies such as the use of surge valves can increase 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 • Nutrient losses tend to be higher after rainfall events as compared to furrow irrigation events. • Rice acts as a constructed wetland and reduces nutrient losses • Cover crops are effective means of reducing sediment losses. **Funding** $3 million from 16 different sources including competitive grants and gifts **Impact Contact**: Dr. Mike Daniels, mdaniels@uaex.edu	
18.	**Arkansas Expanded Food and Nutrition Education Program (EFNEP) (University of Arkansas System Division of Agriculture &**	**The Issue** The Expanded Food and Nutrition Program (EFNEP) teaches families with children in the home skills to overcome food insecurity challenges while promoting a healthful lifestyle, using evidence based, interactive lessons from the Eating Smart, Being Active and Kids in the Kitchen curriculums.	Access to Safe & Nutritious Foods

	University of Arkansas Pine Bluff)	EFNEP is conducted in Arkansas by both the Division of Agriculture and UAPB. **What has been Done** In program year 2019, as a result of the EFNEP efforts by the Division of Agriculture and UAPB, the following was accomplished:- A total of 14,430 adults, youth, and families were reached. 90% of adults and 86% of youth reported adopting healthier nutrition practices. 75% of adults and 59% of youth noted improvement in physical activity practices. Food cost savings as a result of participating in the classes was $36,482.70 or $26.90 per family. **Impact** Participants responded; "I learned that buying frozen vegetables when I can is cheaper than buying fresh when out of season. I learned about reading food labels, comparing unit prices, looking for reduced or low sodium choices to help decrease my blood pressure. "I have started bringing my own snacks to school!" -EFNEP youth participant **Impact Contact- University of Arkansas System Division of Agriculture**: Dr. Debie Head, dhead@uaex.edu **Impact Contact- University of Arkansas Pine Bluff**: Easter Tucker, tuckere@uapb.edu	
19.	**Arkansas Supplemental Food Assistance Program Education (SNAP-Ed) (University of Arkansas System Division of Agriculture)**	**What has been Done** 15,356 SNAP-Ed lessons were taught throughout Arkansas. SNAP-Ed partnered with 235 schools, reaching 43,649 students. **Results** Parent surveys completed at the conclusion of the SNAP-Ed series revealed that 55% of families ate healthier and increased physical activity. Additionally, 72% of parents stated that their children were more willing to try new foods after SNAP-Ed classes. "He used to hate veggies, but this	Access to Safe & Nutritious Foods

		year he has asked for more veggies!" -parent of student receiving SNAP-Ed lessons "(We) are turning off the TV and trying to meal prep and trying veggies we have never tried!" -parent of student receiving SNAP-Ed lessons "I'm making an effort to move more often! I'm walking instead of riding the sofa after a long day at school!" -teacher comment **Impact Contact**: Dr. Debie Head, dhead@uaex.edu	
20.	**Diabetes Prevention Program (University of Arkansas System Division of Agriculture)**	**Issue** Diabetes Prevention Program Arkansas adults have a high incidence of diabetes (14.8%) and prediabetes (36.4%), with associated costs $3.1 billion annually. Studies prove that modest weight loss (5% of body weight) and regular physical activity (150 minutes per week, minimum) can prevent or delay diabetes in over 50% of adults. **What has been Done** The Cooperative Extension Service Diabetes Prevention Program (DPP) received preliminary CDC recognition status after eighteen months of data submission. Two cohorts have completed the program and the third cohort will complete the program in April 2020. **Results** Participants have collectively lost 113 pounds and averaged greater than 150 minutes per week of physical activity. "Just a brief note to let you know I established a new personal best for swimming distance Monday; 3500 yards in 115 minutes. I wouldn't have been able to get to this position without the Friday class (Diabetes Prevention Class)." -DPP participant, cohort #2 "I can achieve changes that improve my quality of life. A "bad" day or week is not the end of the world and I can correct my habits to offset them." -DPP participant, cohort #2	Access to Safe & Nutritious Foods

		Impact Contact: Dr. Debie Head, dhead@uaex.edu	
21.	**Recovery of Microorganisms on Surfaces is Dependent on the Microorganism and Swab Type (University of Arkansas System Division of Agriculture)**	**The Issue** The U.S. FDA Food Safety Modernization Act Preventive Controls for Human Food Rule emphasizes the importance of an effective environmental monitoring (EM) program. Specifically, EM is used to determine harborage sites of microorganisms, assess the effectiveness of surface sanitation programs, and prevent transmission of microorganisms. In general, there is a lack of standardization of EM programs across the food industry. While there are regulatory guidelines to help food manufacturers align their EM programs with best practices, the actual collection devices used in these programs vary in size, shape, and material. Surprisingly, most EM tools are not well characterized in their ability to recover and release microorganisms for downstream detection. **Target Audience** Food processing industries, food safety agencies **What has been Done** The overall aim of this project is to determine the key characteristics of commercially available EM tools that allow for both the efficient recovery of microorganisms from surfaces and subsequent release of microorganisms for downstream detection. We hypothesize that the actual release of microorganisms from the EM tool is dependent on the microbial type (i.e., virus or bacteria), microbial concentration, and the composition of the EM tool material. For this project, we are utilizing two bacterium (*Salmonella* Typhimurium and *Listeria monocytogenes*) and two viruses (human norovirus [hNoV] and Tulane virus — a surrogate for hNoV) for initial characterization of polyurethane foam and cellulose-based EM tools. Data revealed significantly ($p<0.05$) greater release of bacteria compared to Tulane virus with a nearly 20% greater mean release. The average release of	Access to Safe & Nutritious Foods

		microorganisms from swabs decreased as the amounts of microorganisms on the swab decreased. We are continuing to explore the effects of various environmental variables on the recovery of microorganisms relevant to the food industry and human health. **Results** While there is limited and variable information available about the efficiency of EM tools and the recovery of microorganisms, especially viruses, there are many types of EM tools currently being used to verify sanitation measures and identify microbial niches within the food industry. This project provides the first characterization of two EM tools currently in the marketplace. Specifically, we have substantiated the variability of EM tools used in EM programs within the food industry while contributing new knowledge on the release and recovery of TV and hNoV. **Impact Contact:** Dr. Kristen Gibson, keg005@uark.edu	
22.	**Impact of high protein diets on the prevention of obesity and diabetes (University of Arkansas System Division of Agriculture)**	**The Issue** Obesity is Arkansas' most preventable health problem and Arkansas is experiencing an epidemic of preventable weight-related illnesses including obesity, type 2 diabetes, hypertension, stroke and heart disease. In 2018, more than 35% of adults over the age of 18 were obese and nearly 34% were overweight, meaning that nearly 70% of adults in Arkansas are either overweight or obese. As we gain weight, our body composition changes and we have a higher ratio of fat to muscle in the body. This change in body composition can lead to the weight-related illnesses described above because fat burns a lot less calories than muscle. **Target Audience** Diet and health researchers, medical providers, general public **What has been Done**	Access to Safe & Nutritious Foods

		Literature supports that diets higher in protein aid in the treatment of weight-related illnesses and have been shown to increase the calories we burn, decrease hunger, regulate glycemic control and improve body composition (decrease our fat and preserve our muscle). The impact of protein source and the time of day when we eat protein to achieve optimal health benefits still need to be defined. Therefore, the Center for Human Nutrition at the University of Arkansas System Division of Agriculture is studying how plant versus animal proteins and how the time of day when we eat protein impact body composition and improves or reduces the incidence of weight-related illnesses. **Results** This research could lead to changes in dietary recommendations that are targeted toward dietary protein intake. Our research has identified that protein greater than the current dietary recommendations is a more ideal quantity of protein to consume for health benefits. **Impact Contact:** Dr. Jamie Baum, baum@uark.edu	
23.	**Youth Fishing and Aquaculture Education (University of Arkansas Pine Bluff)**	**The Issue** Youth education is a vital part of an extension program. Educational programs introduce students to the life sciences and the students gain an appreciation of the sciences and desire to continue their education in those disciplines. These students will one day be the research scientist and resource managers in the field. **What was Done** Aquatic Science Day was held at UAPB, attended by 175 students. The attendees were exposed to demonstrations related to aquaculture and fisheries, as well as introduced to career paths related to aquaculture and fisheries.	Increasing Opportunities for Families & Youth

		Results Some 200-youth participated in the fishing derby. Many youths, approximately one-third, reported this was their first time to go fishing and actually catch a fish. It is hard to place an economic value on such, time spent fishing at the minimum wage of $10 per hour would value this service at approximately $20,000. **Impact Contact**: Dr. Rebecca Lochmann; lochmannr@uapb.edu	
24.	**4-H Healthy Habits Program (University of Arkansas Pine Bluff)**	**The Issue** Childhood obesity is caused by many factors. The median income for Jefferson County is $28,000 annually. Cheap food is usually full of preservatives and are processed. The lack of fresh and nutritious foods (food deserts) that are reasonable in cost as well as the lack of nutrition education are major contributing factors of childhood obesity. Everyone should care because unhealthy children grow into unhealthy adults and having health Issues can be a contributing factor for missed work and lack of productivity. **Target audience** Children and youth in Jefferson County and beyond who are underserved or live in food deserts. They learned how to read labels to determine the health benefit as well as to cost compare. They learned simple, healthy, tasty recipes based on the USDA MyPlate guidelines. Over 1,500 youth and their families benefited from this program. **What was Done** Youth were engaged in various 4-H curriculum implemented under the Walmart Foundation Healthy Habits grant. All curriculum have engaging activities including games and cooking simple recipes based on the USDA MyPlate guidelines. When describing the activities, it is most helpful to NIFA when actions are connected to intended or actual Results. Youth	Increasing Opportunities for Families & Youth

		were taught healthy alternatives so they could make healthy meal choices and share them with their families. **Results** Youth tried fruits and vegetables that they had never eaten before, they learned to cook simple recipes, and shared the information with their families. This is an ongoing project which has a family component in this new grant cycle. This is to encourage whole family buy in of making healthy lifestyles choices. **Impact Contacts**: Easter Tucker, tuckere@uapb.edu; Teresa Henson, hensont@uapb.edu; Teki Hunt-Jimenez, huntjimenezt@uapb.edu	
25.	**Farm Stress and Mental Health First Aid (University of Arkansas System Division of Agriculture)**	**Issue** Emerging Issues such as suicide and heightened stress among farmers and agriculture workers, vaping and other addictive behaviors, as well as continued high rates of teen pregnancy and divorce illustrate the clear need for programs to address mental health and connect clients to local resources. The importance of free, accessible, trustworthy resources to improve knowledge of relationships, stress, and overall health cannot be overstated. **What has been Done** Division of Agriculture Extension programs offer invaluable resources to parents, couples, and individuals who seek to improve their psychological and relationship health. Mental Health First Aid is an 8-hour training program that was offered three times this year, once in each district. The purpose of MHFA is to train participants to recognize signs of distress and mental health concerns. In much the same way as traditional first aid, participants are equipped to use the content in their daily lives and work endeavors to make them stronger members of the community.	Increasing Opportunities for Families & Youth

		Results The Farm Stress program reached over 500 Arkansans this year, and countless more were made aware of the new program through media efforts and Extension personnel. Several national and international agriculture publications picked up the news release about our mental health educational efforts, and Farm Bureau posted a video interview about the Farm Stress program that has been viewed more than 2000 times. "It's great that we're finally talking about this. I'm going to put this book in the cab of the tractor so my husband will see it." --Participant in Farm Stress program at the Farm Bureau Women's Conference More information on Farm Stress and Mental Health First Aid programs: https://www.uaex.edu/life-skills-wellness/personal-family-well-being/farm-stress.aspx https://www.uaex.edu/media-resources/news/march2019/03-29-2019-Ark-mental-health.aspx **Impact Contact**: Dr. Debie Head, dhead@uaex.edu **Faculty contact**: Dr. Brittney Schrick, bschrick@uaex.edu	
26.	**Early Childhood Professional Training (University of Arkansas System Division of Agriculture)**	**Issue** Early childhood professionals in Arkansas are required to earn at least 15 hours of continuing education professional development training each year. **What has been Done** With our three, grant-funded childcare training programs, participants have the option of earning all 15+ hours with us. Our programs offer	Increasing Opportunities for Families & Youth

		updated, research-based, unbiased curriculum using three different delivery methods. **The Best Care:** The Best Care offers 10 hours of face-to-face, PDR verified training for childcare professionals across the state in 26, multi-county clusters. This program is funded through the Arkansas Division of Childcare and Early Childhood Education, and it reached 2151 participants in FY19. Of those participants, 84% reported knowledge gained, and 80% stated that they will change at least one behavior or practice. In 2019, 50+ trainings were offered statewide. **Best Care Connected:** Best Care Connected is an online program that offers five hours of professional development for Arkansas childcare professionals. This program is funded through the Arkansas Division of Childcare and Early Childhood Education, and 1496 participants were trained in FY18. Of those completing the program, 91% reported knowledge gain, and 91% stated that they will change at least one behavior or practice. **Guiding Children Successfully:** Guiding Children Successfully is an online or correspondence program offering up to 38 hours of continuing education for parents, foster parents, and childcare providers. This program, funded through the Arkansas Division of Childcare and Early Childhood Education, reached 1819 participants in FY19 and awarded over 14,000 training hours. **Best Care Out-of-School-Time:** To better meet the needs of childcare providers who work with school age children in after school, summer, and camp settings, Best Care Out-of-School-Time has become an online program. The first session will begin in January 2020. This year, we worked to transition material to the online courses format.	

		Impact Contact: Dr. Debie Head, dhead@uaex.edu	
27.	**Arkansas Extension Get Fit (University of Arkansas System Division of Agriculture)**	"Extension Get Fit" helps participants become more physically active: 94% increase **Issue** Only 65% of Arkansans have adequate access to locations for physical activity. This attributes to the 31% of the population reporting being physically inactive. Lack of physical activity can cause excess weight gain leading to obesity. Arkansans need affordable exercise programs and increased availability in rural areas. **What has been Done** The Extension Get Fit program offered affordable exercise classes teaching strength training, aerobics, balance, and flexibility to 1,259 participants in FY19. County Extension Agents lead the program for 12 weeks before a trained volunteer leader continues the classes. This format fosters community ownership, provides sustainability, and allows for the Agent to start another program site. Extension Get Fit programs are held in community centers, churches, schools, Extension offices, libraries, and worksites. **Results** Extension Get Fit assessments resulted in: • 98% of participants reported improved health • 97% of participants reported feeling physically stronger • 94% of participants reported feeling increased energy • 88% of participants reported improved sleep • 88% of participants reported increased joint pain • 94% of participants reported being much more active Quotes from Extension Get Fit participants "After cancer treatments, I feel the Extension Get Fit exercise has helped me regain my strength and	Increasing Opportunities for Families & Youth

		overcome the joint pain. "My doctor approves of what I am doing. I plan to keep it up. Thanks for caring about us!" "Before starting this program, I had Issues with strength, balance, and climbing stairs without pain. I strongly recommend this wonderful exercise program to anyone who wants to improve their overall health." **Impact Contact**: Dr. Debie Head, dhead@uaex.edu	
28.	**Family and Consumer Economics (University of Arkansas System Division of Agriculture)**	The Arkansas Cooperative Extension Service continues to be a leader in non-formal education to improve quality of life for Arkansans. Our programs help consumers build financial stability, enhance leadership skills, and contribute to local communities. We are uniquely situated to respond to Arkansas' needs. Agents in all 75 counties are trained in both the subject matter and in educational methods that meet the needs of adult learners. Cooperative Extension Service educators work to enrich individuals, families and communities. Family and Consumer Economics – 5,111 individuals participated in face-to-face Extension consumer economics educational programs. Participants reported increasing knowledge (88.4%) and intention to make at least one, positive money management behavior change (77.1%). As part of an on-going partnership with Family Service Agency, agents in 13 counties delivered 84 personal finance sessions to residents at 21 assistance eligible housing facility locations. Direct to consumer contact totaled 26,447 and an additional 113,239 consumers were reached through social media. Personal finance simulations allow youth to experience managing month-to-month expenses and trying to make ends meet. Participants were asked to respond regarding their ability regarding several personal finance skills. Students gained new knowledge about personal finance (89%) and indicated they then intend to use what they learn (78%). Half of participants reported making changes based on what they learned in Extension's personal finance programs. Participants said: *"I used to hate*	Increasing Opportunities for Families & Youth

		the idea of financial management. Now that I understand it more, it's not so overwhelming." "At the beginning I didn't care about budgeting; now I realize it will play a major role in my life." 3,036 youth participated in personal finance and consumer economics programs. *"Ready, Set, Graduate (an Extension personal finance simulation for youth) is the best program we have ever had in Salem High School."* Salem High School Administrator Estate Planning seminars were offered by eight counties. Of those who responded to the survey, participants reported that they increased knowledge a lot or quite a lot in basics of estate planning (84%), farm and land transfer (53%), and advance directives (65%). More than half intend to make at least one change. Some responses were *"I thought I was well-prepared but found out I am not. This was very good information for me." "Everything was important. I plan to update my trust."* Community and business leaders applied to become Master Money Mentors as part of a partnership with the Reach to Enrich Fort Smith project. This grant funded program involves several community partners joining forces to improve financial stability for low and moderate-income consumers in Sebastian County. Cooperative Extension Service educators trained the first group of volunteers who will conduct group outreach education and offer individual mentoring to program participants. This initial group will serve as the pilot project for Extension's Master Money Mentors program. **Impact Contact**: Dr. Debie Head, dhead@uaex.edu	
29.	**Arkansas Extension Homemakers Council (University of Arkansas System Division of Agriculture)**	The Arkansas Extension Homemakers Council was originally formed and continues to serve as a branch of outreach education for the Cooperative Extension Service. There are more than 3,650 members in 307 clubs. Major events including the state meeting, district rallies, and March workshop hosted 1,053 participants; sponsored by EHC. Volunteer hours totaling	Increasing Opportunities for Families & Youth

		344,740 were given for a total value of $8,766,738.20. The second annual AEHC Impact Survey revealed that, as a result of participation in EHC, respondents are more active as volunteers or leaders (93%); made positive changes based on the information they learned (63%); have social connection (82%); make a difference in their community (71%); and are more comfortable with leadership roles (60%). When asked "Why is EHC important to you?" replies included: *"The fellowship and friendships over the years have been a blessing in my life. Sharing skills with others is never ending and gives meaning to belonging to EHC."* *"EHC means so much to me because we are always learning things that we can share with our community."* *"I stay excited about the program. There are so many opportunities for us to use our skills to help others. We learn new information each month."* *"I lost my son 9 years ago. I was lost with nothing meaningful to do. I joined EHC and now have a purpose and something to do with others instead of just staying home."* **Impact Contact**: Dr. Debie Head, dhead@uaex.edu	
30.	**Arkansas 4-H Technology Programs (University of Arkansas System Division of Agriculture)**	Arkansas has a great need for engineering skills to be developed in our young people to fill jobs in areas that are in high demand. Through 4-H engineering programs, youth learn problem solving, creative and critical thinking, and build excitement for engineering and technology. In the job force, many employers search for skills like critical thinking and perseverance in their employees. By practicing these life skills in a 4-H science project, 4-H'ers develop skills in a more technical setting that reach a broader audience. Seaperch: In its 5th year in Arkansas, bolstered with a stronger partnership with a major Electric company in the South, Arkansas had their state contest with 45 teams consisting of 170 youth and 150 spectators. Already, new teams are asking for information for next year. Drones: The Arkansas 4-H program released a two-part Drone program for youth to learn aviation and flight skills. This program consists of an indoor	Increasing Opportunities for Families & Youth

		and outdoor portion. Every county received drones to teach lessons for youth in their area. This curriculum includes basic aviation techniques such as lift, drag, and parts of a drone, flight crew roles, and basic drone repairs. The outdoor curriculum is available through 15 certified drone pilots from across the state. This more-advanced curriculum includes more techniques such as how altitude and temperatures affect flight and simulation. Both portions have hands-on experiences with flight of a drone and the investigation of careers in this field. **Impact Contact**: Dr. Angie Freel, afreel@uaex.edu	
31.	**All-Terrain Vehicle (ATV) Safety Skills (University of Arkansas System Division of Agriculture)**	All-terrain vehicles (ATVs) are motorized vehicles with over-sized, low pressure tires, designed for uneven surfaces and off-highway work and recreation. Every year, there are about 650 deaths and 100,000 injuries involving ATVs. Arkansas consistently ranks in the top 10 states in ATV injuries and death. The 4-H ATV safety educational efforts directly reached 2,412 Arkansans in 2019 a 57% increase over the previous year. 972 were reached in educational sessions and 183 of them attended more than 5 sessions for extended education. Of the 543 youth surveyed, 91% of them indicated an increase in responsibility and 90% increased knowledge of safety strategies. Safety efforts included teaching the American Safety Institute (ASI) ATV Ridercourse®, which offers hands-on training, instructions on protective gear, local rules, and regulations. Classroom ATV safety education consists of static demonstrations on an actual ATV by county faculty plus scenario-based educational activities. Development concerning the commonly called "side-by-side" vehicles or Utility Task Vehicle (UTV) and Recreational Off-Road Vehicle (ROV) training is currently in progress. **Impact Contact**: Dr. Angie Freel, afreel@uaex.edu	Increasing Opportunities for Families & Youth

32.	**Baxter County Forward (University of Arkansas System Division of Agriculture)**	**Issue** Baxter County (Arkansas) is known for its beautiful lakes and rivers, many opportunities for outdoor recreation, natural beauty, and high quality of life. Yet in spite of these advantages, Baxter County is experiencing a population decline. It was this realization that became a catalyst that led to the formation of Baxter County Forward. **What has been Done & Initial Results** The development process was launched when the Mountain Home Area Chamber of Commerce requested the University of Arkansas System Division of Agriculture Cooperative Extension Service Breakthrough Solutions Program to lead an action planning process for the county. Baxter County Forward was formed, leading to a series of working sessions, a community survey with 538 responses, 7 action teams being formed, and a launch event featuring Jim Dailey, Arkansas Tourism Director as the keynote speaker. The Quality of Life Team assisted in the efforts to get an entertainment district passed by the Mountain Home City Council, generating publicity from USA Today, KY3, Arkansas Times, Talk Business, Arkansas Business, and boot.com. This ordinance incentivizes businesses to locate within the downtown area. The immediate outcomes have resulted in active discussions concerning the renovation of a number of empty store fronts on the square. Ed Levy, an architect with Cromwell Architects Engineers, came to assist the community with downtown revitalization. **Tourism, Marketing, and Branding Action Team** The Mountain Home Area Chamber of Commerce partnered with the Arkansas Small Business and Technology Development Center to bring in Pamela Star with Google to present a Growing With Google Seminar for Small Business. Attendees learned how customers can find their business online and how to promote their online presence. They also learned the best practices for creating a free Google My Business profile, improving their websites' visibility in Google's organic search results. The action team	Economic & Community Development

		also sponsored the Lake Norfork Poker Run, which brought in over 70 boats. **Business and Industry Action Team** The action team visited two business incubators - one in West Plains, MO and one in Northwest Arkansas - to learn best practices and to develop an incubator program in Mountain Home in conjunction with ASU Mountain Home. The action team met with the Arkansas Economic Development Commission to discuss the application to make Mountain Home a certified Competitive Community. **Funding and Finance Action Team** The action team is exploring the possible expansion of the A&P tax to the county; investigating the creation of a "Shark Tank"; establishing grant funding; and doing research on passing an economic development sales tax that would only be collected when the county has a project that requires financial incentives. **Drug Abuse Action team** The action team hosted a meeting with the local human resource leaders in order to discuss Recovery Friendly Workplaces; discussed ways to help employees seek help and make sure services are covered by their company's Employee Assistance Programs; coordinated with other groups in order to move people not only through recovery services, but on to training, employment, and housing; planned to recruit companies that hire people in recovery and/or felons; and will meet with EAST to design a Facebook page for local recovery resources. **Retiree Action Team** The action team is seeking certification by the America Association of Retirement Communities, which will increase the community's visibility nation-wide; working with the city to reconfigure the community's website with special emphasis on detailing the various venues that are appealing to seniors; working with the USDA Forestry Service and the City of Mountain Home in securing Tree City Certification for all of our city owned parks; supporting a $328,000 grant application for a bicycle/hiking trail connecting the McCabe Park Trail to ASU Mountain Home and extending	

		into our downtown area; working with the city to apply for a grant to provide low-impact exercise stations along an existing trail in Cooper Park; working to register Baxter County on the Arkansas Quilt Trail; publishing a brochure for seniors featuring regional assets and activities; researching how to attract retired military veterans by visiting military bases in surrounding states and researching their insurance requirements. https://www.uaex.edu/business-communities/strategic-planning/breakthrough-solutions.aspx **Impact Contact**: Dr. Stacey McCullough, smccullough@uaex.edu	
33.	**Ballot Issues Education Help Voters Make Informed Decisions (University of Arkansas System Division of Agriculture)**	**Issue** Research demonstrates the need for voter education on statewide ballot measures. In the 2014 and 2016 Arkansas statewide elections, only 23-30 percent of those surveyed could name at least one ballot measure. Less than 1% were familiar with all measures on the ballot in each election. In many instances voters who are familiar with an Issue may only know what they hear through paid advertisements from supporting or opposing groups. Arkansas is one of two states in which Extension offers voters research-based and unbiased information about ballot Issues so they can make an informed decision. **What has been Done** Public Policy Center (PPC) staff begin the education process by monitoring legislative action and citizen-petition submissions and sending monthly email newsletters about potential future ballot Issues. As the election nears, PPC staff create draft fact sheets that include how each proposal will appear on the ballot, answers to basic questions about each Issue, and reasons people may support or oppose the proposal. Fact sheets are reviewed by faculty experts, external legal and subject matter experts, supporter and opponent groups, and Extension administration and legal counsel.	Economic & Community Development

		Once fact sheets are finalized, a comprehensive voter guide is produced along with individual Issue guides. Fliers, display boards and presentations are created for county agents. Videos are produced and social media content is created. PPC staff provide Zoom training, educational materials and other support to county agents for program delivery. A total of 32,000 voter guides were printed for the November 2018 general election. After the election, agents said they would have ordered 18,800 more voter guides based on demand. Electronically, voter guides were downloaded 25,086 times. Ballot Issue education web pages attracted 220,546 unique visitors with 331,611 page views. Ballot videos posted to YouTube were viewed 16,989 times. Our monthly Ballot News and Notes electronic newsletter had 2,052 subscribers. A social media communications plan with suggested tweets and Facebook posts for agents included our hashtag #ARballot. The Arkansas Secretary of State's Office incorporated this hashtag into its Election Day posts. Social media posts from Extension's state-level accounts reached 148,851 people through Facebook and Twitter. Reach from county office social media is unknown. **Results** In an online pre-election public survey shared through social media, email and PPC website, 609 respondents indicated whether they were going to vote in the election. Of the 585 who said they would be voting, 80% who read our voter guide agreed that it was presented in a way they understood. More than 92% of respondents said they would seek out the guide in the future. After the election, a similar survey found that nearly 100% of respondents said they had the information they needed to make an informed decision with 93% saying they read the voter guide. Of those who didn't, the majority didn't know it existed. **Impact Contact**: Dr. Stacey McCullough, smccullough@uaex.edu	

34.	**Growing Corning Together (University of Arkansas System Division of Agriculture)**	**Issue** The closing of the Corning Walmart in June 2018 created a sense of panic and uncertainty among local citizens. Over 60 jobs were lost. Citizens began putting tremendous pressure on the Mayor and city council to do something to save the town. Corning, a city with just over 3,100 people, has experienced a steady decline in population (-15%) and sales tax revenue (-28%) over the last 10 years. The city has lost 871 jobs during this time. **What has been Done** Faculty from the Clay County Extension Office talked with local leaders, held public meetings, and provided guidance empowering citizens to form Growing Corning Together, a broad-based community development organization with the purpose of working together to revitalize the community and improve the quality of life now and for future generations. With technical assistance from Extension Community, Professional and Economic Development faculty and staff, the group created four actions teams: Things To Do, Business Retention, Downtown Revitalization, and Infrastructure. Sixty-five people attended the first meeting, and attendance at Growing Corning Together meetings has since grown to over 100 people. Most importantly, conversation about the community has changed from negative to positive, with hope for the future. **Results** Growing Corning Together has led to a variety of activities since being launched. A first ever citywide cleanup event was held with 100 volunteers. The group created a Facebook page, which now has 640 members. A survey to gather input from residents was conducted with 236 responses. A new spring festival (Hop Ally Rally) was created. It was attended by 250 people with over $5,000 generated to give back to the community.	Economic & Community Development

		Most recently, the City of Corning has received a grant for a drainage project and a loan for a major sewer project. A Booster Club golf tournament and banquet was held with 400 people participating. A community garden project has been initiated. A group is working to create murals and art projects in the downtown area. Six businesses have been newly opened or remodeled. Workforce training is being developed with the local high school and businesses. According to Arkansas State Senator Blake Johnson, "Growing Corning Together has been a unifying force for the city of Corning. They have successfully planned and implemented many community development efforts in the short period of time since their organization. The impact they have had on Corning is visible and tangible." That sentiment is echoed by Pam Lowe, Managing Editor of the Clay County Courier. "It is amazing what has been accomplished or in the works since last January. Change takes time, but what we have accomplished in the last seven months is astounding." More information: https://www.uaex.edu/business-communities/ced-blog/posts/2019/March/Corning_is_Growing_Together.aspx; https://www.facebook.com/groups/542900266172589/ **Impact Contact**: Dr. Stacey McCullough, smccullough@uaex.edu	