

2015 University of Arkansas and University of Arkansas at Pine Bluff Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

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

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

Consistent with the land grant mission, the UA Division of Agriculture and UAPB research and Extension faculty have a long history of providing leadership in the development and dissemination of innovative practices and emerging technology. Division researchers conduct basic and applied research for Arkansas producers, businesses, communities and families. During FY2015, Division of Agriculture research efforts resulted in the submission of 16 patent applications. Division of Agriculture and UAPB Extension educators delivered research-based education through 2,847,365 educational contacts with Arkansans. Division of Agriculture Extension educators employed diverse educational methods statewide including: 35,481 educational classes, 22,535 landowner visits, 70,716 individual consultations, 2,818 demonstrations, and 1,625 field days/tours/camps.

During 2015, the Division also delivered timely and responsive distance education webinars through the National Center for Agricultural Law on emerging issues including: the 2014 Farm Bill; Right-to-Farm Statutes; Animal Welfare Standards; Aquaculture/The Lacey Act; Basics of the Endangered Species Act; Drones in Agriculture; and Mandatory GMO Labeling Laws. 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 7,167 participants in FY2015 through 45 course offerings.

The focus of work conducted by Division of Agriculture and continues to be guided annually by grass-roots, community-based input from a diverse range of Arkansas citizens, mainly through the use of County Extension Councils and other local advisory groups. The UA Division of Agriculture formally engaged a large pool of stakeholders (including individual clientele, producers, schools, partner agencies and organizations, state government officials, community leaders, underserved groups, and legislators) in the design and development of the 2011-2015 Strategic Plan. Based on broad stakeholder feedback, the Division identified five emphasis areas to focus our efforts that include:

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

These five emphasis areas help to provide guidance for Division research and Extension programs and help to support integrated research/extension efforts in these areas.

With NIFA's change in Planned Program title requirements, the UA Division of Agriculture also chose to make significant changes in our NIFA plan of work and annual report to align planned efforts with these strategic emphasis areas.

2015 Arkansas Extension and Research Planned Program Impact Highlights

Agricultural Production & Processing

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

Challenges to sustained agricultural production and processing increased in 2015 as commodity prices continued to fall while production costs remained high. In the row crop area, prices for corn, cotton, rice, wheat and soybeans have fallen from 10% to 50% since 2011, with no turnaround in sight. Production costs have stayed at 2011 levels or increased slightly during the same period. This led to FSA analysts to predict in the fall of 2015, that up to 25% of current row crop farmers would not be able to farm the same land in 2016 either because of forced retirement, inability to secure adequate loans, or downsizing to address financial imbalance. If true, this would be the largest shift in row crop production operators since the 1980s. New pests continued to emerge in this sector with the second year establishment of the sugarcane aphid in sorghum, first detection of kudzu bug in soybean, additional spread of the emerald ash borer and crape myrtle bark scale in forests and urban landscapes, and the discovery of PPO-resistant palmer amaranth populations in the Delta. Emerging diseases in baitfish and other aquatic production in recent years led to more intense monitoring by disease labs in the state, as well as stricter certification efforts in the large aquaculture industry in Arkansas. An intense outbreak of avian influenza in the Midwest led to many new efforts in biosecurity extension, and the limited outbreak in north central Arkansas during 2015 resulted in widespread efforts to reach not only commercial poultry growers, but hobby and non-traditional poultry producers as well. Challenges related to invasive species, new pathogens, global economic turmoil, and the plethora of bizarre "research" reports and "recommendations" from low-quality and belief-driven "science" continue to demonstrate, as a Division of Agriculture specialist put it, "there has never been a time when land grant University research and extension were more needed" than today.

UA System Division of Agriculture and UAPB faculty and staff lead intense research and extension programs to provide relevant and timely best management practices to Arkansas crop producers. In 2015, Division weed scientists confirmed PPO herbicide resistance in field populations of palmer amaranth in NE Arkansas, raising multiple concerns for sustainability of crop production in the Delta as alternative weed control methods are becoming more and more limited. Best management practices based on Division research included crop rotation and residue management strategies to reduce the weed seedbank in the soil; the use of glufosinate-resistant soybean crops in rotation with other technologies; and the judicious use of preplant and pre-emerge herbicides with different modes of action where possible. Division and UAPB extension educators worked with more than 14,000 farmers, consultants, workers and industry personnel during the year to assure increased adoption of these BMPs.

Arkansas had about 44,600 farms on 13.8 million acres and another 19 million acres in managed forests as of 2013 (most current data available). The state ranked 16th in agricultural cash receipts of \$9.8 billion. Of this amount, crop production totaled \$4.8 billion and livestock/poultry \$4.6 billion. The public value of our agricultural and forest lands also enhanced the tourism and travel potential of the state through natural beauty, diversity of plant and animal life, and rural charm.

Nationally, Arkansas is 2nd in poultry production and among the top 25 states in production of beef cows, hogs, pigs, cattle, calves and meat goats. Poultry production is concentrated in the northwest section of the state, but during 2014 a major new area in north central and northeast Arkansas was opened to poultry production. Cattle are raised in every county, with a January 1, 2015 inventory of 1.6 million head. Horses continue to increase in popularity with 60,000 households having horses.

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

Arkansas has a large cow-calf production system, albeit made up mostly of smaller and part-time ranchers. This group has struggled to sustain production since the devastating drought of 2012, and the increasing cost of feed ingredients between 2010 and 2014. While feed prices slackened considerably during 2015, forage and feeding costs remain a barrier to reliable profit for many of Arkansas' cattle farmers. Hay usage per cow has increased over the past 40 years in the state, and innovative forage production systems remain badly needed in the southern half of the state. Growers rely heavily on bermudagrass pastures, with heavy hay usage in the winter months when this grass is dormant. Division animal and forage scientists developed experimental extended grazing bermudagrass systems and demonstrated these to producers in the region. Results showed that these systems reduced hay feeding days from 106 to only 37 days during the winter. In addition, total weaning weight per acre was 89% higher and net returns were \$494 per acre higher. If widely adopted, these BMPs would reduce winter hay need while increasing carrying capacity and net returns from the same amount of land.

Commercial poultry production is a huge industry in the state, with Arkansas ranking 2nd in broilers, 4th in turkeys, and 10th in eggs in 2014. During 2015, we saw an increase as well in "non-traditional" and "backyard" poultry productions, now with local production of eggs and meat birds in free-range, organic, and pasture-based systems. At the same time, the avian influenza outbreak in the Midwest during 2015 and the single turkey farm discovery in Boone County, AR during the year dramatically elevated concerns about biosecurity in the state. In response, Division extension staff increased biosecurity education across the state by conducting formal workshops in 20 counties to more than 800 specialty growers, inspecting specialty flocks in 30 counties, and initiating a new online biosecurity and poultry health course in collaboration with USDA APHIS. During the outbreak in north central Arkansas, extension staff worked one-on-one with 150 affected growers.

Nationally, Arkansas ranks 1st in rice production; 4th in cotton; 5th in grain sorghum; 9th in soybean; 14th in corn; and 20th in wheat production. The Division of Agriculture conducts extensive research and Extension programs to assist these industries and producers keep up to date and competitive. Our agronomic programs emphasize utilizations of new varieties in rice, soybeans and wheat; adoption of relevant best management practices, IPM and environmental quality practices. The Division of Agriculture has released 27 improved rice varieties since the beginning of the breeding program in 1980, contributing approximately \$137 million to the agricultural economy of Arkansas. Since 1980, Arkansas rice yields have increased from 4,110 lbs per acre to 7,400 per acre in 2015.

The Division of Agriculture and UAPB labs have continued to provide diagnostic services, not just to those in Arkansas, but across the United States, for little or no cost. In 2015, the Division of Agriculture's Plant and Nematode labs processed 7,201 samples and distributed 28 newsletters to over 6,000 subscribers. The UAPB Fish Disease Diagnostic lab processed over 3,200 samples for disease testing and the UAPB Health Inspection lab processed 21,750 samples for disease-free certification. This intense monitoring and quick feedback system helps the large and dynamic aquaculture industry in the state and the region stay productive, healthy, and risk-free as many fish are shipped nationwide from our area.

Commercial Horticulture encompasses the production of fruits, vegetables, turf, and ornamentals. Arkansas ranks in the top 25 states in production of at least 15 horticulture crops. The Division of Agriculture's blackberry breeding program is recognized worldwide, with nineteen varieties released to date, and planted throughout the US and in other countries. Total plants produced and sold to growers and home gardeners for 2012-2014 as reported by nurseries licensed to produce the Arkansas-developed blackberries was over three million plants. The potential crop area for these plants was over 1700 acres and wholesale fruit value of over \$90 million annually. This production includes both the summer-fruiting floricanne types and the innovative primocane-fruiting type, extending the production and marketing season for this high-value crop.

Over the past several years, there has been an overall decline in support for IPM education and emphasis at the national level. This has resulted in increased use of "blanket" or "preventative" pesticide applications to row crops in many states. UA Division and UAPB scientists and staff have battled this trend over the years, including 2015, in spite of declining resources. Division entomologists and plant pathologists initiated a new demonstration program in the Delta to compare blanket applications of insecticides and fungicides based on growth stage to applications based on IPM principles of scouting and using "only when needed". Results showed that blanket applications were less cost effective than IPM applications. This work will continue in several crops for two more years. Results will be presented in 2016 to more than 55 planned crop production winter meetings and events, which typically host more than 3000 active row crop farmers and consultants in the Delta region. Given the increasing economic difficulties of row crop producers combined with the risk of resistance development by crop pests where blanket applications result in high selection pressure, this educational work is of critical importance and should serve as a model for a national initiative.

Water quality and water quantity continued to be critical areas of emphasis in agriculture production during 2015. The Division of Agriculture conducts research and evaluated edge-of-field water quality data from the thirteen Discovery Farm sites in the state. Data from these sites showed very low movement of nitrogen and phosphorus. These early results were shared at the state and regional level with stakeholders and regulators. They have also lead to the creation of best management practices for producers to implement. Irrigation efficiency was emphasized in a major effort to teach growers proper use of computerized hole sizing software with poly pipe in furrow irrigated systems. Follow-up demonstrations showed an average water savings of 22% using this simple tool.

Most consumers of agricultural products are far removed from production and the abundance of internet "information" can complicate their understanding of the challenges and benefits of our modern science-based food, feed and fiber systems. During 2015, Division educators launched two modular online courses on biotechnology crops. These courses were marketed for use by the public, schools, and community colleges and had 128 participants. Another blended educational effort was the Arkansas Soybean Science Challenge project, funded through the Arkansas Soybean Promotion Board. In its second year, the project targeted high-school science students and included a five-hour online course, face-to-face lab instruction, a virtual field trip broadcast, incentive awards for high-school student initiated research, an Arkansas Department of Education approved online in-service training for teachers, a Pinterest site, and other online educational resources. The Virtual Field Trip broadcast alone reached 2,078 Arkansas students at 62 public and private schools across Arkansas, as well as students in Texas and Pennsylvania.

Gardening and landscaping continue to be of strong interest to citizens of Arkansas. Both UA Division and UAPB faculty and staff are heavily involved in extension education of gardeners, landscapers, and interested community volunteers in local food production and beautification of our living environment. A huge program in the state in this area is the Division of Agriculture's Master Gardener program. In 2015, this program certified 3,200 volunteers who logged 154,537 volunteer hours for their communities. The annual meeting was attended by 500 active Master Gardeners who contributed more than \$125,000 to the community as a result of this event. The "In the Garden Blog" by Janet Carson has grown to 1953 followers with 309 articles issued during 2015. This group led the efforts to highlight research-based gardening at the annual Arkansas Flower and Garden Show in February 2015 with more than 9500 persons in attendance.

Environment, Energy and Climate

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

Managing Arkansas's natural resources to protect and sustain these multiple beneficial uses for future generations is not without its challenges. Air and water quality concerns have evoked lawsuits, new state and federal regulations, as well as voluntary natural resource conservation programs, such as USDA-NRCS' and Mississippi Healthy River Basin Initiative (MRBI). Large-scale modeling studies of the Mississippi River basin point to agriculture as the leading source of excessive nutrients that cause hypoxia in the Gulf of Mexico. The State Assembly commissioned ANRC to update the State Water Plan while the Gulf of Mexico Hypoxia Task Force, consisting of 5 federal agencies and 13 states, held their Annual Spring Meeting in Little Rock in May 2015. The Division also jointly produces a regional newsletter entitled "Confluence" to provide information to the agricultural public on nutrient reduction and water quality protection efforts within the 13 states participating in the Gulf of Mexico Hypoxia Task Force. Other sectors of society, such as municipalities and urban areas also face nonpoint source water issues. Municipalities and urban areas are also required to address storm water management issues and provide education on reducing the impact of storm water on runoff water quality. Municipalities in three Arkansas counties have contracted with Extension to provide storm water education, providing research-based and unbiased information to Arkansans to assist with voluntary efforts to address nonpoint source water quality issues. In 2014, the State of Arkansas developed a process to update the State Water Plan, a comprehensive plan for addressing both water quantity and quality concerns.

Monitoring water quality and nutrient levels on a tributary to the Buffalo National River was assigned to an environmental task force in late 2013 by the Arkansas Governor's office and a subcommittee of the Arkansas General Assembly. This action was in response to public interest in a state-permitted swine farm in the Big Creek Watershed. The Big Creek Research & Extension Team was formed in fall 2013 and received \$340,000 from the governor's office to initiate the environmental study and monitor potential environmental impacts of the swine operation. Monitoring efforts have continued through FY2015. Members of this team, including the team leadership, include Division of Agriculture research and Extension faculty and staff.

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

Agricultural production and processing sustainability has been a focus of the Division of Agriculture and UAPB for many years. Evidence of this is the Division's hosting of the Center for Agricultural and Rural Sustainability (CARS), a nationally known center of excellence. Faculty associated with the Center have pioneered life cycle analysis of cropping practices, studied alternative production and marketing systems, organic agriculture, phytoremediation, alternative residue and water management, and trace gas emissions. In 2013, CARS was awarded a \$3 million grant by the Walmart Foundation to improve fresh strawberry production in the U.S. Since then, CARS faculty have conducted research on the processing of various strawberry products to ensure retention of anthocyanins, which are attributed to the vivid red color of strawberries. In 2014, the Walmart Foundation donated an additional \$3 million to fund the creation of the "Success in the Field" e-book, which outlines the accomplishments of the National Strawberry Sustainability Initiative.

The Division of Agriculture's Nitrogen Soil Test for Rice (N-STaR) was merely a research tool just a few years ago. The N-STaR program for determining optimum site-specific Nitrogen fertilization rates on rice has been adopted quickly by Arkansas rice producers. In 2015, 2,598 N-STaR samples were analyzed

and new producers are entering the program every year which increases the scope of N-STaR's impact on Arkansas rice production. More than half of the NSTaR recommendations have called for reduced N rates, making the program an economic and environmentally sustainable practice. For many fields, N applications were reduced without sacrificing yield, thus reducing potential greenhouse gas (GHG) emissions and reducing potential N losses to watersheds.

UAPB Aquaculture/Fisheries researchers assessed contribution of stocked fish to the 2014-year class at age-1 by stocking crappies into eight study lakes during fall 2014. Approximately 91,000 Black Crappie (*Pomoxis nigromaculatus*) from the Charlie Craig Hatchery were marked with oxytetracycline (OTC) and stocked into Sugar Loaf, Iron Fork, Beaver Fork, and Calion Lakes. Approximately 92,000 White Crappie (*P. annularis*) from the Joe Hogan Hatchery were marked with OTC and stocked into Charles, Poinsett, Saracen, and Des Arc Lakes. The objective was to facilitate growth that would add rings to the otoliths and separate the margin from the OTC mark. The OTC marking efficacy rate was 100% for Black Crappie and 100% for White Crappie.

Access to Safe and Nutritious Food

Food Safety

The Division of Agriculture continues to have a strong emphasis on food safety with efforts in both basic and applied research and supporting extension efforts for youth, the public and the food industry. Research efforts are focused mostly on gaining a better understanding of the ecology of food pathogens, improving food processing systems to minimize food pathogens and improving detection systems for *Listeria*, *Salmonella*, *EColi* and other major food pathogens. An example of current research is the development of forestry derived antimicrobials. Essential oils from pine by-products in combination with bacteriophages are being used to combat antibiotic resistant *Staphylococcus Aureus*. Success of this project would generate value-added forestry products from part of the biomass that is currently either left to rot or simply underutilized. The market potential for these byproducts could also be substantial for the State of Arkansas.

Arkansas has a large food industry with a need for food safety education of its workforce. These food safety educational programs help food processing companies remain nationally competitive and prevent foodborne illness. One such program is the Better Process Control School which has certified over 3,000 food processing employees since its inception in 1973. In 2015, five BPCS were offered in Arkansas and surrounding states (Oklahoma and Missouri). For the Cooperative Extension Service, the Better Process Control School has served as a springboard to other food-related workshops for industry to include food safety, food defense, food labeling, microbiology, sensory evaluation and other courses under development. The University of Arkansas System Division of Agriculture also offers restaurant managers, employees and food handlers the opportunity to take classes and an exam to become a Certified Food Protection Manager. In FY2015, 156 food industry employees received certification in Better Process Control, 460 food service managers and associates took a ServSafe class from the Division of Agriculture with a 58% pass rate to become a Certified Food Protection Manager. Improvements in restaurant and food service food safety have the potential to save Arkansas money and time by way of reducing cases of foodborne illnesses.

Food Processing Innovation

The State of Arkansas has a large food manufacturing sector that needs a qualified workforce. To meet this need, Division of Agriculture faculty have developed programs addressing the needs of the industry. Of particular importance is the development of culinary training for research & development (R&D) personnel working in the poultry industry. The curriculum developed has allowed numerous employees to achieve the status of Certified Culinary Scientist. This experience is meant to enable the food technologist to understand what the R & D chef wants to ensure the chef's vision and taste are translated to the production plant floor. The Division of Agriculture also contributes to the state's economic development by providing assistance to entrepreneurs. The Arkansas Food Innovation Center assists small food processing companies and entrepreneurs by providing necessary education and services such as: product development assistance; sample production; FDA process approval (FDA form 2541a); measurement of pH and water activity (Aw); provision of nutritional labels; development of food labels;

delivery of food-related workshops; and other forms of technical and business assistance, much of which is available through a dedicated website for entrepreneurs. The Center program generally assists 15-25 entrepreneurs each year, as well as a number of non-profit organizations. The efforts of the program and making the Division of Agriculture's food pilot processing plant available to entrepreneurs has resulted in five different start-up food companies launching food products in FY14. Over the past several years, several food companies have emerged with the assistance of the program.

Division of Agriculture faculty also conduct innovative research in food processing. Research activities in food chemistry and food processing include work to improve the quality of rice and improve rice processes; expand the utilization of soybeans and its co-products; assess the health benefits associated with fish, vegetables and other processed foods; and improve the sensory quality of processed foods

The Aquaculture/Seafood Marketing team at UAPB developed several pragmatic economic models and analytical tools that can be used to produce thorough analyses of seafood markets at regional, national and global levels. At the global level, the UAPB team collaborated with the International Food Policy Research Institute, the World Bank Group and the Food and Agriculture Organization of the United Nations under a project "Fish to 2030 Project" to forecast the commodity supply, demand and trade in the next 15 years for 115 countries/regions, including the United States. At the regional and national levels in the United States, the team analyzed consumers' preferences for seafood products based on weekly scanner data from ten regional markets, and developed a U.S. fish supply, demand and trade simulation model (USFish model). Preliminary findings have found U.S. consumers are likely to meet their increased demand for seafood by imported products, which is relatively cheaper in price, and will probably decrease their consumption of U.S. farm-raised catfish during the period up to 2030. In order to expand the market for U.S. farm raised catfish products in the United States, there is a need for marketing strategies that favor product distinctiveness and branding (independently or co-labeling with retailer) as well as identifying segments of market that are willing to pay a price premium for the U.S. farm-raised catfish products. Based on these findings, several U.S. aquaculture farmers and processors have started redesigning their business and marketing plans to expand their market size and share.

Nutritious Food, Food Security and Childhood Obesity

Arkansans face challenges when it comes to obesity and food insecurity. Arkansas has the third highest poverty rate in the nation, with one in four children living in poverty. Food security is defined as access at all times to enough nutritional foods for an active and healthy lifestyle. Arkansans in many areas of the state have limited access to nutritious and affordable food. The Division of Agriculture and UAPB's Expanded Food and Nutrition Education Program (EFNEP) and the Division of Agriculture's Supplemental Nutrition Assistance Program - Education (SNAP-Ed) were delivered in every Arkansas county in FY2015. They provided Arkansas's most vulnerable families and youth with hands-on opportunities to address food security challenges. SNAP-Ed programs were conducted at 563 locations throughout Arkansas including schools, Head Starts, senior centers, food banks and pantries, shelters, DHS offices, WIC offices and grocery stores. Lessons focused on: making healthy choices within a limited budget, learning how to read food labels, cook, grocery shop and increase physical activity.

Extension program evaluations identified some of the significant impacts of these programs. For example, 47% of EFNEP adult program graduates and 51% of SNAP-Ed participants reported they less often ran out of food before the end of the month after participating in Division of Agriculture and UAPB programming. With a focus on practical food preparation, cooking, tasting, and shopping, the Division of Agriculture and UAPB Extension programming is having a measurable impact on reducing food insecurity in Arkansas.

Research within the Division of Agriculture focuses on various aspects of adult and children health. For example, researchers are conducting joint research with the Arkansas Center for Health Improvement to examine whether participant in the USDA's Fresh Fruit and Vegetable Program can prevent weight gain among Arkansas public schoolchildren. It was found a negative 3 percentage point difference attributable to FFVP participation translates into a 15 percent reduction in overall obesity rate for these schools. In addition, Division of Agriculture and UAPB faculty are conducting novel research to determine the impact of diet and food composition and functional food components on body weight and health.

Increasing Opportunities for Families and Youth

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

In the areas of Health and Aging, Division of Agriculture Extension faculty delivered 4,653 program sessions geared to improving Arkansans' health in 2015, which reached 53,464 Arkansans. The Extension Wellness Ambassador program trained 8 new Ambassadors and engaged 5,885 people in addressing local health issues by implementing projects and conducting health improvement activities.

Individuals who participated in family economics educational programs gained the knowledge and skills they need to increase financial security and build wealth. Extension's personal finance educational programs gave 13,957 Arkansans the knowledge and skills they need to build financial security. Program participants learned the basics of financial management for spending, saving, credit management, and retirement and estate planning. They developed skills such as creating a spending plan, checking a credit report, shopping smartly, setting financial goals, etc. County FCS Agents conducted educational outreach across the state including programs, such as: Navigating Your Financial Journey (basic financial management); Your Farm, Your Legacy (estate planning seminar); and Get Real - Here's the Deal (youth personal finance simulation), just to name a few of the many topics and educational opportunities offered.

A key to happiness in family life is learning how to be an emotionally healthy individual, a good partner, and an effective parent. The Division of Agriculture Extension provided in-person and web-based educational resources and training in the areas of personal well-being, couple relationships, and parenting. Extension educators trained 966 people in our personal well-being, relationship and parenting programs.

Child Care Provider Education programs were delivered through Extension's statewide network. Our programs, supported through \$475,000 in external funding, are available in multiple formats (e.g., face-to-face, online, and self-guided) to accommodate different learning styles and work schedules. The RAND Institute, in a review of benefits and savings of early childhood intervention programs, calculated that for every dollar invested in such programs, there is an estimated return of \$2.50 to \$4.00. That means that the return on investment within the state of Arkansas for our child care professional training programs is between \$1.19 and \$1.90 million. In 2015, 5,430 child care professionals successfully completed 44,479 hours of training. As a result of the training, 96% of participants indicated their knowledge of effective child care practices increased.

The Arkansas Extension Homemakers Council and the Division of Agriculture Cooperative Extension Service are partners in providing education to families throughout Arkansas. The Arkansas Extension Homemakers Council's mission is to empower individuals and families to improve their lives through continuing education, leadership development, and community service. The organization is one of the largest nonprofit volunteer groups in the state with a membership of 4,412 and over 350 clubs. A total of 17,922 Extension Homemakers served as volunteers, contributing a total of 614,988 volunteer hours of time, with a value of \$14,187,773.16.

Both the Division of Agriculture and UAPB are uniquely positioned to teach and demonstrate scientific exploration. In 2015, 123,802 young people in Arkansas's 75 counties were reached through some aspect of the Arkansas 4-H youth development program. More than 700 4-H Clubs across Arkansas involved young people in hands-on education and service learning opportunities that enhanced their life skills, including decision making, problem solving, critical thinking, communications, service learning, and healthy lifestyle choices. In 2015, the 4-H program focused on three initiative areas: Healthy Living, 4-H Science and Citizenship Leadership. Impact programs were delivered in each of the areas (Yoga for Kids, ATV Safety, Robotics, Shooting Sports, Citizenship/Leadership Camp, One Day of Service, 4-H Day at the Capital, and Civic Engagement activities). As a result of Division of Agriculture and UAPB 4-H youth

programs, 237,479 expressed an interest and engaged in science-related activities. The Arkansas AG Awareness Adventures programs from UAPB has aided in youth having a better understanding of agriculture, its industry and communities.

Volunteer leaders are essential in the delivery and execution of programs with community clubs, project clubs, spin clubs, service learning and special interest activities. During 2015, 19,197 volunteers contributed 255,571 hours of time to the 4-H program, which was valued at \$5,896,022.97.

Economic and Community Development

Business resource support provided by the Division of Agriculture is delivered through the following programs: entrepreneurial development for both youth and adults; specially tailored programs for Hispanic audiences; and programs for agricultural businesses identified with Agri-tourism, cottage food production and farmers' markets. Other business-centered Extension education and program support is delivered through the Arkansas Procurement Assistance Center (APAC) and annual Income Tax Schools for accountants and professional tax preparers. These programs are focused to the needs of both established and start-up business professionals in ethnically and economically diverse communities.

Entrepreneurial development efforts are focused on the potential within the Latino community, individuals interested in downtown revitalization, and e-commerce opportunities. These programs have a broad youth and adult audience. Program participants developed business plans, learned about rules and regulations governing small business, experienced the application of new technologies, explored financing options, and learned financial management and accounting principles.

Community and economic development programming through APAC's procurement assistance counseling continues to produce significant value for Arkansans. In 2015, approximately \$44.7 million in contract value was secured by Arkansas' 900 client businesses. The federal formula for economic activity related to jobs credited this program with producing nearly 900 jobs in Arkansas. The most recent five-year program review reflects a return on investment of 142 to 1.

UA Division of Agriculture community development efforts are targeted to strengthen and build local capacity for both economic well-being today and prepared resiliency for dealing with future issues. Programs included visioning, strategic planning, and strategies for effective economic development. These programs are based on multi-state collaborative efforts including: established and reported commonly used metrics for the Southern Region; program outcome aggregation at the regional level; and shared investment in the Southern Rural Development Center and the Program Leadership Network.

Public Policy education is the newest formal component of the Division's Community and Economic Development effort. The Division of Agriculture's Public Policy Center houses the core capacity for this effort and includes both Extension and research responsibilities. The base effort is centered in statewide issue elections and the public understanding of ballot measures whether proposed by the legislative process or public referendum. Citizens are engaged through in-depth analysis of issues which is policy-neutral and without the language of advocacy. Educational materials and program components are developed in collaboration with the National Center for Agriculture Law and the UA Center for Agriculture and Rural Sustainability.

Policy research and education remain important program components, in terms of training county agents to deal with controversial issues, developing unbiased policy representative educational materials and educating the public regarding complex ballot questions and policy issues. The Center also supported education efforts regarding local ballot initiatives and controversial policy issues conducted by county Extension agents statewide.

The impact of the Division of Agriculture on leadership development in Arkansas communities has been evident since the early days of the 20th century through county Extension agent mentoring of farmers and rural people. Leadership program support is currently accomplished through both local and statewide leadership training seminars and fellowships. This system engages resources of the UA Division of Agriculture at every level. Leadership efforts span the program emphasis areas and demographics of Extension clientele. LeadAR, our core leadership program, is connected to an international network of leadership programs (IPAL) and alumni of the LeadAR program are connected through the International Leadership Association Conference (ILAC). The LeadAR program has proven effective in educating a

diverse pool of leaders from the public, non-profit and private sectors. The network of trained leaders now counts over 430 graduates as LeadAR alumni.

The efforts of the University of Arkansas System Division of Agriculture and University of Arkansas Pine Bluff research scientists and Extension educators in the five identified focus areas described in this Report of Accomplishments have continued to contribute to the discovery of new knowledge, the dissemination of needed educational programs and the well-being of Arkansans and their communities in 2015.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	350.0	21.6	468.0	26.8
Actual	258.0	22.4	461.2	28.1

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Expert Peer Review

2. Brief Explanation

Programs went through a three-tiered review process:

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

Stakeholder Program Identification and Review

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

For the Division of Agriculture Extension, county councils and advisory groups met during the summer of 2015 (at a minimum) to provide input, feedback and/or review of program implementation, redirection, or newly identified needs. Members of these groups were invited to participate in programs, field days, special tours, workshops and conferences throughout the year and for the duration of the program. All reviews of research and Extension programs included a stakeholder member or members of the community or industry most influenced by the program area. Open public forums were held to address

specific issues of importance to the stakeholder community or industry.

Administrative Approval and Review

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

External Review

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

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

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (County Extension Council and program advisory committee planning meetings.)

Brief explanation.

The University of Arkansas System Division of Agriculture and the University of Arkansas Pine Bluff have utilized both formal and informal mechanisms for ensuring the planned programs address areas of strategic importance to the state. Each Division of Agriculture planned program was based on the needs identified in a series of regional and statewide listening sessions with current and potential stakeholders representing the diversity of the population in the regions and state. Single issue meetings were held as needed to address emerging issues and to craft additional program responses if needed to promptly address the problem. The University of Arkansas Pine Bluff Dean/Research Director uses formal stakeholder input developed by the Agriculture Research & Extension Council and the Aquaculture-Fisheries Center of Excellence Advisory Committee. Both stakeholder groups provide meaningful suggestions for programmatic improvements. The Agriculture Research and Extension Council met summer and winter 2014 and summer 2015.

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

1. Method to identify individuals and groups

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

Brief explanation.

In 2015, the University of Arkansas Division of Agriculture sought input from diverse stakeholder groups. Stakeholders serve on county councils, advisory committees, and boards that advise and oversee the work of the Division. Individuals and stakeholder groups were identified by Arkansas Experiment Station faculty and administrators and by asking county Extension staffs to identify individuals in their local communities who were representative of one or more of the following fifteen stakeholder categories: county services (e.g., DHS, Food Bank or Pantry); financial sector (e.g., banks, agricultural lending, investments); faith-based sector (e.g., church, youth minister); education (public, private, vocational); commercial sector (e.g., chambers of commerce, industry); health (e.g., hospital, public health, doctor); agricultural production; agricultural businesses; county Extension council; 4-H program (e.g., leader, teen, alumni, foundation); government official (e.g., county, city); Extension homemaker; natural resources (e.g., wildlife, forestry, conservation); media (e.g., radio, newspaper, television); and youth services (e.g., community center, youth organizations). In addition to these criteria, Extension agents were also asked to identify individuals within the fifteen categories who were representative of the gender, racial, ethnic, and socioeconomic demographic make-up of the counties.

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

Program provides research and Extension support for all aquaculture producers in the state, other programs support under-served and diverse audiences.

The Agriculture Research and Extension Advisory Council (AREAC)

Members will serve on the Council 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

The primary advisory committee that provides feedback and input into the UAPB Aquaculture/Fisheries Program is the National Aquaculture/Fisheries Advisory Council. It includes 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. Both the Chicot and Lonoke County Extension programs derive their input from this committee's advice. The Lonoke County Agricultural Office also hosts an annual advisory committee meeting. UAPB Aquaculture/Fisheries Center staff is invited to participate in these meetings to facilitate information transfer between the 1890 Cooperative Extension Program, the 1862 State Extension Service and industry members.

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

1. Methods for collecting Stakeholder Input

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

Brief explanation.

During the summer of 2015, Division of Agriculture Extension faculty met with county council members and program sub-committees to identify local needs for the program planning year beginning October first. County profiles developed by state faculty were utilized to examine the diversity of needs and to understand the changing demographics within each county. Stakeholder-developed materials, such as the Farm Bureau policy development process was used to identify research needs. Several priority-setting activities were scheduled during 2015 with specific commodity and stakeholder groups to seek input on the research planning process.

In addition to the standard methods of obtaining stakeholder input described above, in 2010, the University of Arkansas System Division of Agriculture updated its strategic plan. The 2011-2015 strategic plan for the Division included input from internal and external stakeholders statewide. A total of 780 internal and external stakeholders participated in these processes. Specific surveys were conducted with individuals representing underserved or under-represented groups, women in agriculture and small farm operation producers. With the expiration of the current strategic plan, the University of Arkansas System Division of Agriculture is in the progress of creating a new strategic plan.

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

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

3. A statement of how the input will be considered

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

Brief explanation.

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

For UAPB Extension and Research, the input from stakeholders has been incorporated into outreach efforts with sweetpotato outreach programs and enhanced technical support for value-added processing with various agricultural commodities. The most recent stakeholder meeting resulted in suggestions by the group for conducting research that will provide a foundation for introducing additional herbicides for use in sweetpotato production. Both graduate research projects

and faculty research programs have been developed to address this stakeholder issue.

Brief Explanation of what you learned from your Stakeholders

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

For UAPB Extension and Research, input from stakeholders through the agricultural Extension agents and program assistants in the field continue to play a major part in program development. Farmers and packing house operators continue to voice the need to support increasing sweet potato production in Arkansas. Sweet potato research was expanded in the area of product development and the Extension program has given increased attention to farmer production problems. The Aquaculture-Fisheries Advisory Committee continues to give input for the research and Extension programs. Particular interests center around developing techniques for producing food fish more economically.

Division of Agriculture stakeholders participate in establishing annual Cooperative Extension program priorities for each of the 75 counties in Arkansas. During the statewide listening sessions in support of the Division of Agriculture five-year strategic plan, 172 policy makers and key community and state organizational leaders considered critical and emerging needs within our state, and the role of the Division in addressing those needs. This group voiced their concerns about population changes across the state and challenges facing communities in a competitive economy. We heard comments concerning the different issues Arkansans must struggle with every day, including maintaining a competitive edge in agriculture and childhood health and obesity.

The following emphasis areas were identified for 2011-2015:

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

The Division of Agriculture's 2011-2015 Strategic Plan outlines the specific objectives for each area and is based on what we learned from our stakeholders.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
5976705	1906550	4305083	2311233

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	5967760	1991247	4085096	2322840
Actual Matching	5976705	1699547	55726161	1887303
Actual All Other	44261177	0	8008842	0
Total Actual Expended	56205642	3690794	67820099	4210143

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	4708515	298388	1538760	302841

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Agricultural Production & Processing
2	Environment, Energy & Climate
3	Access to Safe & Nutritious Food
4	Increasing Opportunities for Families & Youth
5	Economic & Community Development

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural Production & Processing

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	13%	0%	13%	0%
111	Conservation and Efficient Use of Water	4%	0%	5%	0%
112	Watershed Protection and Management	4%	0%	6%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	4%	0%	10%	5%
204	Plant Product Quality and Utility (Preharvest)	6%	15%	9%	15%
205	Plant Management Systems	10%	12%	4%	15%
206	Basic Plant Biology	10%	0%	0%	0%
211	Insects, Mites, and Other Arthropods Affecting Plants	1%	5%	1%	5%
212	Pathogens and Nematodes Affecting Plants	1%	0%	1%	0%
213	Weeds Affecting Plants	7%	0%	8%	0%
216	Integrated Pest Management Systems	20%	0%	4%	0%
301	Reproductive Performance of Animals	2%	12%	4%	10%
302	Nutrient Utilization in Animals	2%	7%	5%	10%
303	Genetic Improvement of Animals	2%	0%	4%	0%
306	Environmental Stress in Animals	4%	0%	8%	0%
307	Animal Management Systems	2%	15%	5%	15%
311	Animal Diseases	4%	12%	7%	7%
601	Economics of Agricultural Production and Farm Management	4%	12%	6%	8%
603	Market Economics	0%	5%	0%	5%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%	5%	0%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	119.3	18.1	265.0	20.7
Actual Paid	111.2	17.0	359.0	24.9
Actual Volunteer	25.8	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2345429	1440243	2349417	2322840
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2348944	1236903	33609348	1768617
1862 All Other	1890 All Other	1862 All Other	1890 All Other
17395376	0	3308161	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Given the recent decline in crop commodity and cattle prices, while most input costs have remained high, agricultural producers in the state have been "squeezed" financially at near record levels during 2015. The two land grant entities in the state responsible for research and extension remain committed to helping farmers and the agricultural industry be more efficient and sustainable. In 2015, the University Of Arkansas System Division Of Agriculture and the University of Arkansas at Pine Bluff faculty and staff worked constantly to conduct discovery research on relevant best management practices and extended these recommendations via modern educational methods. For example, we released 239 reviewed mission-oriented publications in 2015 and circulated over 146,000 other educational materials to assure BMP adoption. We engaged audiences directly in over 5200 meetings, in more than 51,000 farm and one-on-one visits to address problems, at 521 field days and through 1953 field demonstrations. We observed more than 550,000 website hits and noted over 20,000 producers and related farm personnel adopting sustainable crop BMPs, 35 large fish farmers adopting new fish farming BMPs, over 1000 traditional and no-traditional poultry growers adopting production and biosecurity BMPs, and more than 4800 ranchers adopting new livestock and forage BMPs. Our staff processed over 200,000 soil and plant samples for analysis and recommendations, while the fish diagnostic laboratories processed 3200 samples for disease diagnosis and over 21,000 for disease-free certification - a major program to keep regional aquaculture healthy and shipping to customers nationwide. We recorded 87 small and socially disadvantaged farmers adopting new production BMPs, 91 adopting new and diverse crops, and 52 using new livestock BMPs in parasite management. Our scientists released one new fruit variety and two new soybean varieties during 2015 and registered 12 new patents for original discoveries. The aforementioned examples show only a portion of our broad and objective efforts to keep all producers efficient, profitable, and sustainable while underpinning the robust multibillion dollar processing industries in rice, poultry, and forestry in the state.

2. Brief description of the target audience

Target audiences for Agricultural Production & Processing include:

- Small and Socially Disadvantaged Farmers (SSDF)
- Agricultural food crop growers/producers
- Livestock/poultry producers
- Commercial poultry producers
- Commercial poultry company personnel
- Aquaculture producers/consultants
- Farm Pond Owners
- Non-farm private landowners
- Agricultural consultants
- Agribusiness/allied Industry personnel
- Horticulture production and service business personnel
- Local, state and federal agency personnel
- Master gardeners
- Community leaders
- Policy and decision makers
- Low-income families with children
- Low-income older adults
- Hispanic/Latino families
- African-American families
- Single women
- First responder emergency personnel
- Research funders
- General Public
- Policy makers
- Water and Natural Resource personnel
- Supply chain managers
- Processors
- Biotech industry
- Value-added industry
- Community Based Organizations

3. How was eXtension used?

eXtension was not used to a great extent in this program area, or for that matter, in Arkansas. UAPB faculty and staff indicated use of eXtension was limited to information reference only and infrequently at that. UA System Division of Agriculture faculty and staff used it to a minor extent for online information reference and fielded a very few number of information requests from eXtension expert question wranglers during 2015. A few faculty participated in eXtension COP maintenance and discussion on fire ants, invasive forestry pests, feral hogs, and water quality.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	945707	930812	33890	13641

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

Patent Applications Submitted

Year: 2015

Actual: 12

Patents listed

Patent title, Country, Serial Number, Filing Date, Inventors

Novel Mucosal Adjuvants and Delivery System (Chitosan), United States, 14/439,536, 4/29/2015, Pumford, Neil / Morgan, Marion / Shivaramaiah, Srichaitanya / Tellez, Guillermo / Wolfenden, Amanda / Hargis, Billy

Blackberry APF-236T, United States, 14/544,545, 1/20/2015, Clark, John R. / Boches, Peter Stefan.

Purification of Gamma-Tocotrienol from Rice Bran Oil Deodorizer Distillate, United States, 14/611,677, 2/2/2015, Howard, Luke / Kordsmeier, Mary / Brownmiller, Cindi

Compositions and Methods of Enhancing Immune Responses to Eimeria, United States, 14/623,050, 2/16/2015, Hargis, Billy / Barta, John / Bottje, Walter / Berghman, Luc / Kwon, Young Min / Cole, Kimberly / Cox, Mandy / Tellez, Guillermo

Vaccine Vectors and Methods of Enhancing Immune Responses, United States, 14/623,105, 2/16/2015, Hargis, Billy / Berghman, Luc / Layton, Sherryll / Bottje, Walter

Vaccine and Methods to Reduce Campylobacter Infection, United States, 14/623,196, 2/16/2015, Hargis, Billy / Pumford, Neil / Layton, Sherryll / Kwon, Young Min

Lactic Acid Bacteria and Their Use in Swine Direct-Fed Microbials, United States, 14/661,586, 3/18/2015,

Flooring Challenge Systems for Culling Poultry, United States, 14/740,513, 6/16/2015, Wideman, Robert

Stalk Cutter Device and Method of Use, United States, 62/109,917, 1/30/2015, Roberts, Trenton / Greub, Chester

Method of improving tolerance of plants to herbicides using seed insecticide treatments, United States, 62/142,160, 4/2/2015, Lorenz, Gus / Scott, Bob / Norsworthy, Jason / Hardke, Jarrod T.

Method Vectors, Cells, Seeds and Kits for Stacking Genes into a Single Genomic Site, United States, PCT/US2015/013845, 4/20/2015, Srivastava, Vibha

Antibody-guided Vaccines Targeting Chicken CD40 Generate Fast Mucosal IgA Responses in the Chicken (Joint with Texas A&M), United States, PCT/US2015/034229, 6/4/2015, Hargis, Billy / Bielke, Lisa

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	57	172	229

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of agricultural production education meetings related to food, fiber and bioenergy production

Year	Actual
2015	5271

Output #2

Output Measure

- # of demonstrations/on-farm research related to food, fiber and bioenergy production

Year	Actual
2015	1953

Output #3

Output Measure

- # of farm visits related to food, fiber and bioenergy production

Year	Actual
2015	51158

Output #4

Output Measure

- # of field days related to food, fiber and bioenergy production

Year	Actual
2015	521

Output #5

Output Measure

- # of educational materials distributed related to food, fiber and bioenergy production

Year	Actual
2015	146289

Output #6

Output Measure

- # of website hits and downloads related to food, fiber and bioenergy production

Year	Actual
2015	559071

Output #7

Output Measure

- # of diagnostic samples related to food, fiber and bioenergy production

Year	Actual
2015	200053

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

18	# of small or socially disadvantaged farmers adopting more diverse crops
19	# of small or socially disadvantaged farmers adopting livestock best management practices
20	# of new ideas/concepts for textile structures/end products from bio-fibers

Outcome #1

1. Outcome Measures

of clientele using improved crop best management practices.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	20069

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas has the third highest irrigated crop acres in the U.S. at 4,950,000 annually using almost 8 billion gallons of ground water per day. In the row crop region, only about 42 % of current groundwater use is considered sustainable, promising a huge water supply gap in the future as alluvial aquifer levels decline from 2-6 inches per year. Without adequate irrigation, modern crops cannot be grown consistently in the Mid-South.

What has been done

UA System Division of Agriculture scientists have developed or identified many best management practices to improve irrigation efficiency and save water. A major demonstration and education effort was initiated in the Arkansas Delta row crop region to encourage more growers to adopt these practices to save water and improve their profitability by reducing irrigation cost. Field demonstrations included use of flow meters to measure water use; surge valves to improve irrigation efficiency on different terrain; pump testing to improve pumping efficiency; multiple inlet irrigation in rice; and computerized hole selection to improve poly-pipe furrow irrigation. County

agents were trained to provide hands-on demonstrations and training to farmers and consultants in 25 Delta counties during 2015.

Results

Overall, 47% of growers and consultants that were trained adopted new irrigation water management (IWM) practices to improve efficiency. On these farms, growers reported from 10-30% water savings and county agents and scientists measured an average 18% reduction in water and energy use on test farms where IWM practices were adopted. Use of computerized hole selection increased to more than 154,000 acres in 2015. Pump testing resulted in many pumping plant repairs and improvements with a cost savings of \$511.66 per pump afterwards. It is estimated that if all rice farms had used Division irrigation efficiency practices in 2015, water savings would have exceeded 97 billion gallons. For irrigated soybeans, we demonstrated savings of 2.6 acre inches of water per season, over 200 billion gallons in water saved for the Arkansas soybean crop if IWM practices had been used on all acres.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

of clientele using improved fish farming best management practices

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
-------------	---------------

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The costs associated with raising catfish have continued to rise, making it more difficult for catfish producers to consistently make a profit. Competition from foreign imports has continued to increase at an alarming rate. New production techniques are needed that improve production efficiency and reduce cost to make catfish farmers more competitive.

What has been done

UAPB is a leader in the industry with the development of alternative culture technologies and production techniques such as split-pond production systems. Valuable commercial level production data are being collected through the UAPB research verification program. Split-pond production systems divide a traditional pond into two sections, a fish confinement zone (~20% of the pond) and a waste treatment zone (~80% of the pond). Split-pond systems allow the farmer to raise more fish per acre and are easier to harvest, aerate, feed, and treat for diseases.

Results

UAPB Extension personnel provided support in the management of water quality and fish diseases for farmers using split-pond systems. Assistance was also provided to a graduate student conducting a split-pond study at the Aquaculture Research Station at UAPB. Furthermore, extension personnel supported the catfish research verification program by providing assistance with sampling and management recommendations to farmers raising fish in these alternative production systems. Farmers seeking to convert existing catfish acreage to alternative systems were provided recommendations specific to their farm operations either with farm visits or over the phone.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

of livestock producers using best management practices.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4806

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increasing costs of production have caused beef cattle producers to consider alternative production systems and production practices. From 1976 to 2013 hay production per cow in Arkansas has increased 182%, from 2,250 pounds per cow annually to 6,495 per cow annually.

What has been done

In response to this increasing issue, Division of Agricultural animal and forage scientists implemented experimental bermudagrass pastures at the Southwest Research & Extension Center near Hope, AR and demonstrated grazing by cows at various stocking rates, rotational patterns, and interseeded pastures with wheat and ryegrass.

Results

Demonstrations and comparative experiments showed that hay feeding days decreased from 106 to 37 days. Total weaning weight per acre was 89% greater for the high stocking rate rotation, and net returns per acre increased by 107% or \$494 per acre for this option. Producers in southern Arkansas learned that rotational grazing, stockpiled bermudagrass, and complementary cool-season annual grasses could drastically reduce winter feed requirements and simultaneously increase carrying capacity and net return. Extension programs continue to assure widespread adoption of these practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
306	Environmental Stress in Animals
307	Animal Management Systems

311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

of poultry producers using best management practices.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1008

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Poultry production is a 2 billion dollar enterprise in Arkansas, and health and efficiency in growing broilers, turkeys and eggs is paramount to this successful industry. In recent years, water quality has become a more crucial component for reducing disease stresses in modern poultry systems in the state. This is especially true with the growing concern to minimize antibiotic use on poultry farms, including in drinking water.

What has been done

In response, the Division of Agriculture Poultry Science Department set up a water quality lab to provide technical expertise and identify water problems for poultry growers in the state and region. Each farm has unique watering challenges, so the lab provides specialized testing, tools and information to pinpoint specific problems and their causes. The lab also created a simple to use water diagnostic kit so they could quickly and correctly gather appropriate water samples.

Results

In 2015, the water lab analyzed 2663 samples, a new record. For the past five years, the lab has analyzed samples and provided problem-solving information to more than 9000 poultry operations in the region. Industry estimates a total savings of \$2,250,000 for growers during the past five years by correcting or preventing water-borne diseases into flocks by the water lab and as a result have pledged increasing support for its continued operation.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

of producers adopting GAP or other food safety related certification practices.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	228

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The production of fresh produce (e.g. lettuce, herbs, tomatoes, cucumbers, etc.) in controlled environments (e.g. greenhouses, chambers, vertical farms or food production) is a rapidly growing sector of specialty crops production approaching \$4 billion in farm-gate value nationwide. Contamination of fresh produce by human pathogens can occur during production, harvest, processing, wholesale storage, distribution, retail, and preparation. The Centers for Disease Control and Prevention (CDC) reported that an estimated 48 million people suffer from foodborne illnesses each year and in 2010 and 2011, about 1/3 of the major outbreaks were associated with fresh produce. In response to food safety concerns with fresh fruits and vegetable production,

Food and Drug Administration (FDA) prepared and released the 2015 FDA Food Safety Modernization Act (FSMA) Produce Final Rule which establishes new requirements for producers of fresh produce (including greenhouse-grown produce).

What has been done

In order to address food safety of greenhouse-grown produce and to help greenhouse produce growers comply with the new FSMA rules, we developed a team composed of researchers and educators from University of Arkansas System Division of Agriculture (Michael Evans), Iowa State University (Angela Shaw and Chris Currey), Texas A&M University (Joe Masanbi and Alejandro Castillo) and Cornell University (Neil Mattson) to develop educational and training materials for greenhouse produce growers.

Results

In 2015, we developed a series of 4 educational articles on Good Agricultural Practices required to ensure safe food handling and compliance with FSMA produce rules and published these articles in the national industry magazine "Greenhouse Grower." An example can be found at <http://www.greenhousegrower.com/varieties/vegetables/keeping-your-greenhouse-vegetables-and-fruits-safe-overview-of-best-food-safety-practices/> . Based on feedback from the magazine and informal contacts, we believe that greenhouse growers increased their knowledge of FDA FSMA requirements, increased FSMA compliance among controlled environment fresh produce operations, changed their attitudes towards compliance and a safer greenhouse-grown produce production and marketing system with less chance of contamination that could result in human illness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #6

1. Outcome Measures

of crop varieties or germplasm lines released.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas farmers produce more than 45 percent of the rice in the United States on about 1.5 million acres per year, grown under dynamic production conditions that differ from those in other rice growing areas. Because rice is such a small crop in the US, growers rely on land grant university breeding programs for improved, locally adapted and profitable rice varieties. Farmers help support these breeding programs with a self-imposed check-off assessment on each bushel of rice grown in the state.

What has been done

The Division of Agriculture employs three full-time rice breeders and many related staff to work on improvement of rice cultivars for Arkansas growing conditions. Other Division faculty and staff develop other management recommendations during development so that each new variety is released with a recommended management package for optimum production and reliability. This holistic approach results in the least risk to growers of failure by a new introduced variety.

Results

Since 1980, the Division breeding programs have released 27 improved varieties. Adoption has varied from 22% to more than 70% of acreage in any given year. In 1980, the statewide rice yield was 4,110 lbs per acre and this has risen to 7,400 lbs per acre today. In 2015, Division varieties contributed roughly \$137,000,000 to the agricultural economy of Arkansas.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

of producers using improved biosecurity practices

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1209

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Poultry is the leading industry of Arkansas animal agriculture, ranking third in broilers; eighth in eggs; and producing more than 30 million turkeys annually. The impact to the economy of the state of Arkansas from an uncontrolled outbreak of disease such as Avian Influenza or Exotic Newcastle disease would be devastating. The recent outbreak of Avian Influenza, December 2014-June 2015, caused the death and destruction of over 48 million+ birds (commercial layer chickens, turkeys, game fowl, and small hobby chicken flocks) in the Midwest and two counties in Arkansas. Federal costs alone exceeded 700 million dollars and damage to the state and nation's economy is still being felt in higher egg and meat costs.

What has been done

To prevent such disasters, Division of Agriculture poultry scientists responded by increasing statewide education of growers about biosecurity principles and practices. USDA/APHIS provide additional funding for the development of improved educational materials and a series of presentations and "hands-on" work with the growing array of poultry producers in the state besides commercial industry. The Division's poultry health veterinarian conducted numerous seminars in more than 20 counties, surveilled small flocks in more than 30 counties, and initiated development of an online biosecurity and poultry health course for non-traditional poultry producers.

Results

The limited outbreak of avian influenza in one turkey flock in Arkansas resulted in a quarantine and near panic among area small flock producers. It was contained as a result of intense effort by USDA APHIS and the Arkansas Livestock and Poultry Commission and other agencies. Division scientists and county agents provided most of the answers and educational materials to more than 150 concerned poultry owners in the quarantine region and hosted several meetings to address questions and allay fears. Attendees indicated the need for more information on biosecurity and prevention of poultry diseases of all types. Statewide, more than 500 updated biosecurity DVDs were distributed during 2015. Attendance at 20 presentations across Arkansas exceeded 800 interested small poultry producers including pasture poultry owners, organic poultry producers and backyard flock owners. The development of an online course was widely supported by surveyed attendees and will be launched during 2016.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

of diagnostic plant health and nematode samples submitted.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	7201

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Science-based diagnostic service and education continue to be fundamental to successful IPM of crop production in the US and Arkansas. While the WEB is filled with do-it-yourself identification guides for pests, many novices come to incorrect conclusions leading to expensive and sometimes disastrous results. The correct diagnostic and research-based best management practice recommendations remain critical and are not that easy to do, in spite of the information age. The UA System Division of Agriculture Plant Health Clinic represents a science-based approach to regional diagnostics, serving Arkansas stakeholders, but also providing information to scientists interested in detection, invasive species, and epidemiology.

What has been done

In response to the ongoing and dynamic needs of crop protection in the state, the Clinic staff provide unbiased identification and recommendations thru diagnostic lab services, newsletters, presentations, field visits and training.

Results

In 2015, the Clinic diagnosed 2,605 plant samples and issued 28 newsletters to more than 6000 subscribers. These newsletters are also archived and searchable for reference (<http://www.uaex.edu/farm-ranch/pest-management/plant-health-clinic/Plant%20Health%20Clinic%20Newsletter%202016%20-%20Issue%201.pdf>) for example. Clinic staff trained master gardeners in 9 counties, advanced training for 60 green industry nursery personnel, and provided a remote diagnostic service and display at events with over 19,000 attendees during the year. The Clinic Diagnostician organizes and edits the popular publication MP467 Arkansas Small Fruit Management Schedule (<https://www.uaex.edu/publications/pdf/MP467.pdf>) used by thousands in the state and region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants

Outcome #9

1. Outcome Measures

of fish samples submitted for disease testing.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Annually, Arkansas Fish Producers lose over \$2 million worth of fish due to diseases. Timely accurate disease diagnoses can save the producer time plus money. Additionally, new problems are beginning to emerge such as the "hot aeromonas" bacterial strain which could potentially devastate the remaining catfish industry in Arkansas.

What has been done

Approximately 3200 samples were submitted to the four UAPB fish disease diagnostic laboratories for diagnosis during 2015. These samples were processed and appropriate treatment recommendations were made to producers. The atypical or "hot" strain of aeromonas bacteria

remains on two farm in Southwest Arkansas and two farms in Southeast Arkansas. Losses on those farms were estimated at over 150,000 pounds of food and stocker sized fish. VFD's (veterinary feed directives) were attained for the 4 infected farms and fish losses ceased. Additional catfish losses are also attributed to parasitic infections and other bacterial diseases (ESC or Enteric Septicemia of catfish).

Results

Appropriate treatments provided by UAPB Extension personnel saved the Arkansas aquaculture producers approximately \$1.15 million versus not treating the problem. The bacterial outbreak of the Aeromonas strain has been particularly devastating on infected farms in Alabama, with producers reporting losses of nearly \$3 million in 2009 - 2015. Our rapid response to the problem and the implementation of on the farm bio-security protocols helped control the spread of the disease in Arkansas.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

of fish samples submitted for disease-free certification.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	21750

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Preventing the spread of OIE listed diseases in farmed raised fish is imperative to the success and continued operation of fish farms in Arkansas. Outbreaks of these diseases can result in the destruction of all fish on the farm in which the disease was detected and movement of fish from Arkansas to other states from farms not testing positive for the disease.

What has been done

To assist fish producers, the UAPB Fish Health Inspection Laboratories in Pine Bluff and Lonoke, AR, conducts disease testing on OIE listed viruses and on disease deemed important by various states and countries. In 2015, the labs conducted testing on 21,750 fish for APHIS certification for export to other states and counties.

Results

The two APHIS approved labs have enabled baitfish producers through the Arkansas Baitfish Certification Program to ship of more than \$700,000 of fish to different countries, and approximately \$1M of fish throughout the United States. These labs and the annual and semiannual inspections that are conducted have prevented this industry from not being able to ship fish during 2012 Viral Hemorrhagic Septicemia outbreak. All great lakes connecting states were ordered by USDA to stop all shipments of fish. Our producers were able to demonstrate that their fish had been tested for several years and were free of this disease. Extension personnel work closely with regulators to ensure safe and legal movements of Arkansas products.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

of samples submitted for exotic animal or poultry disease testing.

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

of small and socially disadvantaged farmers reporting increased profitability

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	123

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Most pastureland and forages grown by Small and Socially Disadvantaged Producers (SSDP) needs inner or cross fencing and watering facilities so that the ranchers can practice rotational grazing, improve grazing efficiency, and incorporate new forage management practices.

What has been done

To help livestock SSDP improve their pasture and forage BMPs, the University of Arkansas at Pine Bluff (UAPB) Small Farm Program (SFP) partnered with the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). These partnerships provided information to SSDP about NRCS-EQIP funds and conservation practices as well as the FSA Microloan program. Producers were made aware of conservation practices such as cross fencing, watering BMPs, and protection of heavy use areas in pastures.

Results

Several SSDP who had never used the EQIP Program before, signed-up for the program as a result of our educational programs, and received funding to help install cross fencing, watering facilities and practices, and protection of heavy use areas. The cross fencing allowed the cattle to be rotationally grazed which improved grazing efficiency and reduced soiling of forage and damage to land. New watering facilities were installed to provide cattle clean and accessible drinking water in new paddocks created by cross fencing. Gravel was placed around water facilities to discourage cattle from congregating for long periods and creating muddy spots in heavy use areas. In addition, 15 SSDP used the new FSA Microloan program (\$50,000 loan limit) to purchase about \$750,000 in cattle to improve their herds and forage practices.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

of clientele who initiated specialty food-related enterprises

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a strong and increasing interest in production of local foods, including fresh fruits in Arkansas. Many areas of Arkansas have rich histories of successful fruit production and marketing but local production has declined in recent decades. New technology has become available that could encourage revitalization of local production by extending the growing season and providing more control over input costs and organic production where desired.

What has been done

In response to this increasing interest and the advent of new technologies, UA System Division of Agriculture horticulture scientists designed and implemented a number of demonstrations in the state to teach and encourage local producers. New high tunnel technology was demonstrated near Fayetteville, AR a strong local market for fresh strawberries and a movable tunnel system was built and demonstrated near Clarksville, AR - a historically important production area that has declined in recent years. We also held hands-on workshops at three locations, conducted field days during the growing season in North Arkansas, and held an experiential school for interested growers in the Fayetteville area. We asked attendees to complete surveys at selected events to indicate interest in new strawberry production and associated technologies.

Results

During the course of these educational efforts, we observed increased interest among attendees at the various workshops and field days. Most attendees indicated increased knowledge of best practices demonstrated and an increased interest in further learning. We successfully demonstrated extension of the strawberry production season in Arkansas using modified high tunnel technology to start picking berries in mid-winter instead of waiting until spring. We noted less need for pesticides and more control over production and input costs, even for organic production. By extension of the growing season and support of local markets, we believe local producers could improve their chances of successful local production of strawberries and other fresh fruit in the state.

4. Associated Knowledge Areas

KA Code Knowledge Area

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

Outcome #14

1. Outcome Measures

of producers adopting herbicide resistance best management practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	14470

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Herbicide-resistant weeds, including palmer amaranth in the Southern US, have become the single biggest challenge to consistent crop production in some areas including the row crop region of eastern Arkansas. It is estimated that more than 2 million acres in the Arkansas Delta are challenged currently with management of resistant weeds, costing millions to affected growers. In 2015, protoporphyrinogen oxidase inhibitor (PPO) resistance in palmer amaranth was confirmed in four counties in Northeast Arkansas. PPO herbicides have been widely used for decades in soybean production, so this latest herbicide resistance development is very unwelcome news, as alternative methods of control for this weed species dwindle.

What has been done

In response, UA System Division of Agriculture weed scientists have increased monitoring of resistant weed populations and efforts to develop appropriate management practices and educate growers.

Results

Monitoring in 2015 showed that 15 counties in the Arkansas Delta had confirmed fields with palmer amaranth resistant to both glyphosate and PPO herbicides. The distribution and scope of these populations is not known so additional monitoring is planned for 2016. Several alternative best management practices using different modes of action herbicides were recommended based on past research and growers were educated on all possible alternatives following these

discoveries. More than half of surveyed growers indicated they would adopt at least one alternative practice in 2016 and beyond to limit development and spread of these new weed populations in their region. Educational materials and popular press articles (example <http://www.uaex.edu/media-resources/news/august2015/08-07-2015-Ark-PPO-resistant.aspx>) were well received and of high interest as growers prepared for the next growing season. Given the rapid development of resistant populations of palmer amaranth in the decade in the South, this is a battle that will continue for a long time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
206	Basic Plant Biology
213	Weeds Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

of pesticide applicator training participants certified or re-certified

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	5276

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Integrated pest management (IPM) is a very broad area encompassing pest management in agriculture, urban and industrial settings, for public health concerns, trade issues, etc. The Environmental Protection Agency (EPA) requires that pesticides be used properly and judiciously. The Agency also requires that most individuals and businesses that apply pesticides receive proper and recurrent training on pest management and the proper use of pest control products. The pesticide safety education program (PSEP) in Arkansas is the primary way that pesticide applicators are trained and certified on the proper and safe use of pesticides. Integrated pest

management has been an integral part of this training since its inception in 1974.

What has been done

The PSEP is responsible for educating, training, and certifying over 26,000 private, commercial, non-commercial pesticide applicators. The PSEP works closely with the Arkansas State Plant Board to ensure that Arkansas' pesticide applicators are competent and licensed to use pesticides safely and effectively. Once certified, the applicators must be retrained (recertified) every 3-5 years and Extension provides virtually all of this training. The responsibilities of the Arkansas coordinator for PSEP include training, preparing, and equipping county agricultural Extension agents for their role in certifying and recertifying private applicators (farmers/ranchers). The PSEP has also developed a Pesticide Training, Licensing, Education, and Recommendations webpage (<http://www.uaex.edu/farm-ranch/pest-management/education-licensing.aspx>).

Results

Division of Agriculture county extension agents reported in 2015 that over 5000 clientele increased their knowledge of best pesticide management practices as a result of attending pesticide safety education classes. Agents also reported almost 3000 individuals adopted new best pesticide practices as a result of these classes. The primary topics of these classes and the accompanying educational materials include: integrated pest management, pesticide labeling, applicator safety, pesticide regulations, drift minimization, environmental protection, application equipment & calibration, and the Worker Protection Standard. In addition to providing training for pesticide applicators we trained Master Gardener members, landowners not needing a pesticide license because they don't use restricted use pesticides, city/county/state employees wishing to improve education and reduce liability, on the safe use of pesticides and the principles of pest management during 2015.

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

of small or socially disadvantaged farmers adopting crop best management practices

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	87

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to 2012 Census there are approximately 325 Socially Disadvantaged Row Crop Producers (SDRCP) in the Arkansas Delta. These producers rarely attend Extension row crop production meetings. This has resulted in a lack of information being received on the control of the new super weed - Glyphosate Resistant Pigweed (GRP) and best management practices to control GPR. Consequently, many SDRCP find themselves with fields of uncontrollable GRP which results in low yields and unprofitable fields.

What has been done

The UAPB extension associates (EAs) reached out to many SDRCP to inform them about the GRP problem and the control methods recommended by Extension. The Extension GRP fact sheet was provided to each SDRCP along with other Extension best management practices. In addition, producers were informed about the NRCS's EQIP conservation practices that provided funding to develop a plan to control GRP and funding to implement the plan. The EQIP program also provided funding for soil testing and following the recommendation.

Results

Approximately 65 SDRCP used the Extension GRP Fact Sheet as a guide to control GRP in their fields. Twenty five SDRCP submitted soil samples and followed the test recommendations. Fifty SDRCP signed up for EQIP's herbicide resistant weed practice where a plan was developed to control their GRP and funding was obtained to implement the plan. Another 25 producers started using extension recommended varieties. After using the Extension recommendations, producers estimated yield increases by approximately 30 percent and production costs went down by about 30 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #17

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Home gardening and related landscaping remains a strong and growing interest among Arkansas stakeholders. One of our growing concerns is the abundance of non-scientific information and advice utilized by the public from the WEB, where quality control is limited and many gardeners have problems as a result of trying unproven practices.

What has been done

The Division of Agriculture horticulture program has addressed this issue by improving the skills of our Master Gardeners, who help with keep our science-based web pages current and interactive. We have improved advanced training for MGs and engaged them in many state and local horticultural events. We held a Master Gardener appreciation day at Garvan Gardens to encourage interaction with a broad range of experts. We have also increased our blog activity and displays at educational events in order to engage more public consumers interested in scientific gardening.

Results

Our Master Gardener program has grown to 3200 trained volunteers who logged 154,537 volunteer hours in the state as well as 84,556 educational hours during 2015. This group held their annual rotating conference in Benton County with over 500 active members in attendance and a local economic impact of more than \$125,000. More than 500 Master Gardeners attended

the appreciate day at Garvan Gardens and all indicated increased knowledge of subject topics covered. Our interactive webpages continued to garner the most visits of any on the Cooperative Extension website during 2015, indicating the high level of interest in gardening statewide. Our blog followers increased to 1953 who read each issue, which varies from 3-7 times per week (<https://uofacesmg.wordpress.com/>). Master gardeners, county extension agents and state horticulture and other ANR staff hosted the educational display at the annual Flower and Garden show in Little Rock, AR during February 2015 with over 9500 visitors over 3 days in spite of very difficult weather conditions. All in all, local gardening and food interest appears to be at an all time high and the need for valid, research-based information and education has never been more critical.

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

of small or socially disadvantaged farmers adopting more diverse crops

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	91

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small livestock producers including socially disadvantaged and limited resource farmers (SSDF) continue to struggle with rising feed costs, lack of high quality and adequate forages year round for beef cattle and small ruminants, and animal parasites. Although each farm has a unique set of challenges, nearly all producers contacted were in agreement that locally available or grown feed resources to reduce feeding costs was a great need.

What has been done

In response, UAPB faculty undertook the study and development of improved research-based solutions to benefit SSDF growing cattle and small ruminants in the state. An example of this work was the completion of an experiment to compare an alternative browse plant (Cleome gynandra) to conventional forage plants available in most pastures in the state of Arkansas for goat production. We tested the production potential and palatability of this plant as a food source for goats and beef cattle under controlled conditions.

Results

Results showed that the browse plant, Cleome gynandra (African spider plant), could be a suitable alternative forage plant for goats in Arkansas because of its nutritional and anti-parasitic activities against common parasites of goats, e.g. Haemonchus contortus. The body condition and other parameters measured in beef cattle and meat goats grazing summer and winter annuals (cereal grasses and legumes) were maintained or increased significantly (>10%) and cost-effectively (>20%) over conventional feeding systems like the use of hay plus protein/energy supplements. Results were presented to 45 UAPB students enrolled in animal science courses, and 35 SSDF growing livestock were reached through producer workshops, farm visits, a field day, phone and other media. Interest among students in this project led to an increased enrollment in animal science courses of 20% and 10% of producers contacted reported a 20% increase in livestock-related income from adoption of alternative browse plant recommendations. We anticipate additional adoption and use of this solution in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #19

1. Outcome Measures

of small or socially disadvantaged farmers adopting livestock best management practices

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small and Socially Disadvantaged Farmers (SSDF) often rely on small ruminant production to supplement or completely provide farm income, especially on marginal lands. Young and pregnant and lactating female small ruminants are particularly susceptible to *Haemonchus* infection that often kills them. Small ruminant producers need more effective methods of controlling *Haemonchus* on their farms to reduce economic losses. Many SSDF are also new or beginning farmers and do not know how to scientifically manage livestock, thus needing livestock management training in order to be more successful.

What has been done

In response, the UAPB animal scientist conducted five small ruminant parasite management workshops across the state to educate producers on the use of FAMACHA scoring, fecal egg counting and chemical de-wormers to reduce the development of resistance, cost of medicine, and death rate due to gastrointestinal parasites. Workshops on small ruminant management for new and beginning farmers and ranchers (8) were also held in different regions along with 2 youth workshop/field days to introduce them to small ruminants and parasite management. A New Agent Training for Cooperative Extension Service agents and one for NRCS personnel on small ruminant management and grazing behavior was conducted.

Results

As a result of these efforts, 15 new Cooperative Extension Service agents and 32 NRCS employees gained knowledge to help SSDF raise livestock and small ruminants more successfully. Over 120 goat and sheep producers learned integrated parasite management methods, while 20 goat producers in southeastern and central Arkansas reduced the frequency of deworming herds - reducing costs by an estimated \$460 per farm and reducing the risk of resistance development to anthelmintics. Over 60 new or interested small ruminant producers learned about the basic needs and management requirements for a successful small ruminant enterprise. In addition, 300 youth and adults learned about small ruminants and the important role they play in agriculture in Arkansas and 25 youth learned about parasite management for small ruminants.

4. Associated Knowledge Areas

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

Outcome #20

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Industry professionals (product designers, textile experts, manufacturing, and marketing experts) and consumers are concerned about getting accurate information about sustainability. Sustainability as related to social and environmental climate change is the biggest issue facing the textile product supply chain. Natural bio-fibers such as hemp, kenaf, alpaca, etc. are being re-evaluated to see what role they can play in reducing the environmental impact on textile production.

What has been done

In response to this re-awakening interest in US and sustainable textiles, UAPB faculty began evaluation of the physical performance of industrial hemp commercial textiles, based on recent interest in this old fiber crop plant. As a result of these studies, we developed a research paper and book chapter about the potential of hemp in production of natural and traditional community-based textiles. We also developed three novel proprietary concepts for yarn/textile structures using sustainable fibers including hemp.

Results

Results of this work showed that woven commercial industrial hemp exhibited very high shrinkage, excessive raveling during shrinkage, and low wrinkle recovery. Any of these characteristics would disqualify it from mass market usage. While hemp-based textiles were considered very strong, our results suggest that textiles derived from hemp will remain specialty textiles for the near future. While we believe that traditional textiles and natural fibers can open new markets and help sustain small communities in the future, more research on fiber plants is badly needed to identify those with the most applied potential.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The crop season started with heavy rainfall, delaying planting, while an unusual hot night spell in late June to mid-July damaged yield and quality of the state's rice crop. Nevertheless, yields were considered average at harvest. Lower commodity prices than in previous years, combined with high input costs with the exception of energy (which decreased) have placed many producers in financially difficult straits with FSA estimating in fall of 2015 that up to 25% of current row crop farmers would not be farming the same land in 2016 because of going out of business, downsizing, or re-organization. This has resulted in many delays in forward purchasing for 2016, creating many problems for input suppliers. The loss of certain critical insecticides due to environmental lawsuits has increased pressure on row crop farmers to find acceptable alternatives, which are fewer than before. Cattle prices have declined in the past 18 months while feed and other input costs have stayed high. Cattle farmers that were making record profits only recently were again struggling by the end of 2015. Poultry producers were damaged by the avian influenza detection in 2015 in Boone County, AR which was managed with a quarantine. However, this event and the much larger events in the MidWest greatly affected the ability of the industry in Arkansas and the U.S. to supply international trading partners where many countries had placed imports from the U.S. on hold. Eggs and poultry meat prices rose considerably as 48 million birds were lost in the Midwest - higher prices placed additional burdens on many consumers trying to climb out of the recent economic decline in Arkansas that began about 2008. Federal and state revenues to support public research and extension continue to decline or tighten, making the need for efficiency in the two land grant institutions paramount. However, the decline in expert capacity over the past 30 years as a result of these public funding decisions has reached a tipping point in the state for the continuation of some programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

UAPB Extension personnel provided support in the management of water quality and fish diseases for farmers using split-pond systems and to the catfish research verification program by providing sampling and management recommendations on alternative production systems. Feedback continued to support farmer interest in alternative aquaculture species and more sustainable management systems.

Grazing demonstrations in southern Arkansas showed that hay feeding days could be decreased from 106 to 37 days, while achieving higher total weaning weights and profit per acre. Surveyed producers attending these demonstrations indicated increased understanding of rotational grazing, stockpiled bermudagrass, and complementary cool-season annual grasses in reducing winter feed requirements.

A new set of 4 educational articles on Good Agricultural Practices for greenhouse managers on FSMA produce rules and food safety were published and well received nationally. Based on feedback from media sources, greenhouse growers increased their knowledge of FDA FSMA requirements, increased FSMA compliance among controlled environment fresh produce operations, changed their attitudes towards compliance and a safer greenhouse-grown produce production and marketing system with less chance of contamination that could result in human illness.

The bacterial outbreak of the *Aeromonas* strain in fish in Alabama over the past few years has heightened tension in the industry. UAPB extension personnel worked rapidly and responsively in Arkansas to ensure appropriate biosecurity BMPs were in place and the result has prevented spread of this disease in the state. Response from growers has been overwhelmingly positive to this effort, with 100% engagement by farmers surveyed.

Surveys in 2015 showed that 15 counties in the Arkansas Delta had confirmed fields with palmer amaranth resistant to both glyphosate and PPO herbicides. More than half of surveyed growers in the Delta indicated they would adopt at least one alternative herbicide resistant weed management practice in 2016 and beyond to limit development and spread of these new weed populations in their region. Herbicide resistant palmar amaranth remains the number 1 crop threat in Arkansas according to recent farmer surveys in the row crop region of the state.

Targeted educational workshops resulted in 15 new Cooperative Extension Service agents and 32 NRCS employees gained knowledge to help small and socially disadvantaged farmers in Arkansas raise livestock and small ruminants more successfully. Goat and sheep producers indicated increased knowledge of sustainable parasite management, and producers in southeastern and central Arkansas responded to our workshops by reducing the frequency of deworming herds - reducing costs by an estimated \$460 per farm and reducing the risk of resistance development to anthelmintics. New or potential small ruminant producers indicated increased knowledge about the requirements to run a successful small ruminant enterprise and 300 youth and adults increased knowledge about small ruminants and the important role they play in agriculture in Arkansas. Farm Bill education efforts in 2015 were very successful, reaching over 3000 participants with 851 individual consultations. Feedback from these efforts ranged from "the Division provided an invaluable service to Arkansas farmers with this program about the most confusing farm bill in history" to "I greatly appreciate the availability of faculty experts for one on one questions about this extremely confusing Farm Bill".

Key Items of Evaluation

Positive feedback for plant diagnostic, poultry water quality, aquaculture diagnostics and disease free certification as well as fish and poultry biosecurity was widespread in 2015. The need for increased science-based education and information was repeatedly noted in surveys and feedback. In the Delta, concern about herbicide resistant weeds and the need for sustainable, unbiased information were at an all-time high in 2015. Small and

socially disadvantaged farmers responded to targeted education efforts by adopting BMPs to improve their income in small ruminant enterprises. The best indicator of success is continued or increased support by stakeholders and this was widely evident in our 1862 and 1890 land grant mission programs during the year.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Environment, Energy & Climate

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%	0%	2%	0%
102	Soil, Plant, Water, Nutrient Relationships	12%	0%	16%	0%
111	Conservation and Efficient Use of Water	2%	25%	7%	20%
112	Watershed Protection and Management	10%	25%	8%	15%
123	Management and Sustainability of Forest Resources	5%	0%	6%	0%
133	Pollution Prevention and Mitigation	8%	25%	3%	15%
134	Outdoor Recreation	0%	10%	0%	10%
135	Aquatic and Terrestrial Wildlife	0%	0%	2%	0%
136	Conservation of Biological Diversity	2%	0%	2%	0%
141	Air Resource Protection and Management	2%	0%	2%	0%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	7%	10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	21%	0%
204	Plant Product Quality and Utility (Preharvest)	5%	0%	4%	10%
402	Engineering Systems and Equipment	5%	0%	3%	0%
403	Waste Disposal, Recycling, and Reuse	15%	15%	1%	20%
511	New and Improved Non-Food Products and Processes	5%	0%	5%	0%
601	Economics of Agricultural Production and Farm Management	9%	0%	4%	0%
605	Natural Resource and Environmental Economics	5%	0%	5%	0%
610	Domestic Policy Analysis	5%	0%	1%	0%
901	Program and Project Design, and Statistics	0%	0%	1%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	18.3	1.8	129.3	0.9
Actual Paid	15.3	1.3	157.3	2.2
Actual Volunteer	1.1	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
323283	163406	1121241	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
323767	97514	13997411	115641
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2397696	0	2188643	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Division of Agriculture and UAPB research and extension faculty made contributions to the focus area of Sustainability, including nutrient cycling in organic apple production, alternative residue and water management, trace gas emissions to the atmosphere, poultry production and poultry waste management, and economics of sustainable blackberry production.

The N-STaR program for determining optimum site-specific Nitrogen fertilization rates on rice has been adopted quickly by Arkansas rice producers. 2598 N-STaR samples were analyzed in 2015 and new producers are entering the program every year which increases the scope of N-STaR's impact on Arkansas rice production. More than half of the NSTaR recommendations have called for reduced N rates, making the program an economic and environmentally sustainable practice.

Nitrogen availability and the microbial community involved in nitrogen cycling has been investigated in an apple orchard receiving annual additions of ground covers and organic nutrient sources. Soil microorganisms are responsible for the decomposition of residues and the cycling of nutrients, impacting the sequestration of nutrients such as C and N, the fertility of the system, and the potential for non-point source nutrient pollution if releases are in excess and improperly timed with plant needs.

Since agricultural management practices are closely tied to the perception of long-term sustainability, the effects of alternative residue and water management practices on soil properties and processes and crop production in a wheat-soybean double-crop production system on a silt-loam soil are being investigated. The effects of nutrient source, cultivar, soil texture, crop rotation, and water management scheme on methane emissions from rice are also being investigated.

Improved feed efficiency in animal breeding stocks to maintaining sustainable poultry and livestock industries in the US are under investigation. Swine feed trial data is being incorporated into a NIFA funded GHG model to assist in farm and regional level decision making. As part of this same project manure separation efficiency trials and thermos-chemical manure conversion to biogas trials have been performed. Research is being conducted to develop rapid and accurate tests for assessing bird health and pathogen defense in poultry. 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 user-friendly interactive economic decision support tool using spreadsheet software was developed to simulate blackberry production in Arkansas and across the southern United States to assist producers in assessing the economic impacts of different production practices and potential returns available from blackberry production. This tool represents the first of its kind for blackberry production, which, with real farm economic data, may be applicable to any blackberry production system in the US. This economic tool will help existing and new fruit producers to evaluate production and marketing decisions, determine potential returns, prepare budgets and compare different scenarios.

The Arkansas Water Resources Center, funded by the 319 Nonpoint Source Program of the Arkansas Natural Resources Commission, collected water samples from 20 streams in the Upper Illinois River Watershed and the Upper White River Basin. These water samples were analyzed for chloride, nitrogen, phosphorus, sediment and sulfate at its water quality lab, which is certified by the Arkansas Department of Environmental Quality. The data was organized, and then water quality trends were evaluated using flow-adjusted concentrations and appropriate statistical techniques.

The Arkansas Water Resources Center noticed three distinct findings that were important to the State. First, the increases in algae (measured as chlorophyll-a) in Beaver Lake coincided with increased nitrogen inputs from the watershed - this is important in understanding why Beaver Lake might not meet its water quality standards. Second, the recent reductions in phosphorus from the City of Springdale's wastewater treatment plant has reduced phosphorus concentrations in Spring Creek - however, these improvements have not been observed further downstream in the Illinois River yet. Finally, there is an increasing trend in chloride and sulfate concentrations in these streams - why is an important question, but it might be related to salt use during winter. These data are critical to our understanding of how we influence water quality with what we do in our watersheds.

Division scientists conducted research on production of sweet sorghum, hybrid Populus and genetically superior Loblolly pine with a view toward bioenergy/renewable energy production.

According to the American Coal Ash Association, over half of the 115 million tons of coal combustion residuals (CCRs) that were generated in 2013 by coal-fired power plants in the U.S. were disposed of in landfills or in surface impoundments. These disposal methods are expensive and pose significant environmental concerns. The bulk of the 52 million tons of CCRs that were beneficially reused in 2013 were used in the manufacture of either concrete or wallboard. However, not all CCRs are suitable for use in these products and other beneficial uses need to be identified. Among the criteria that the USEPA uses to define a beneficial reuse of CCRs are: 1) the CCR must provide a functional benefit, 2) it must substitute for the use of a virgin material, and 3) in the absence of specific regulatory standards, it must not be used in "excess quantities" (<http://www.epa.gov/coalash/frequent-questions-about-coal-ash-disposal-rule>). Based on nearly eight months of field monitoring following a single application of CCR to a managed grassland, we have recently shown that a representative, locally-generated CCR meets these criteria when applied to soil as a substitute for agricultural lime and as a source of plant-available calcium and sulfur. In order for land application to become a USEPA-approved beneficial reuse of CCRs, it must be demonstrated that land application of CCRs to managed grasslands results in "environmental releases to ground water, surface water, soil, and air that are comparable to or lower than those from analogous products made without CCRs". Our preliminary results suggest that application of a CCR to managed grassland results in releases of environmentally sensitive elements to soil and water that are comparable to those when CCR is not applied. Additional research will be needed in order to confirm these results, but the preliminary results appear to be very promising.

Soil chemical analyses have been used as the basis for P, K and micronutrient recommendations for nearly 100 years and this process represents the best science for estimating fertilizer needs to ensure crop nutrient requirements are met, but not exceeded. Unfortunately, interpretation of soil analyses and the fertilizer recommendations have seldom been validated. Division research sought to validate the accuracy of existing P and K fertilizer recommendations for flood-irrigated rice. Twenty-four field trials were established from 2013 to 2015 in which six composite soil samples were collected from each site to

determine the recommended P and K rates, resulting in improved accuracy of recommendations on 20-25% of the Arkansas rice acres.

Wildlife education activities included addressing nuisance wildlife problems, habitat management, developing wildlife enterprises, and youth education.

To assess contribution of stocked fish to the 2014-year class at age-1 crappies were stocked into eight study lakes during fall 2014. Approximately 91,000 Black Crappie *Pomoxis nigromaculatus* from the Charlie Craig Hatchery were marked with oxytetracycline (OTC) and stocked into Sugar Loaf, Iron Fork, Beaver Fork, and Calion Lakes. Approximately 92,000 White Crappie *P. annularis* from the Joe Hogan Hatchery were marked with OTC and stocked into Charles, Poinsett, Saracen, and Des Arc Lakes. All lakes were stocked at a density of 50 fish/acre, per the 2002 AGFC Crappie Management Plan. Approximately 30 fish per vat used during OTC marking process were transferred to UAPB. Those fish were held for 60 d and fed *Artemia* and formulated feed. The objective was to facilitate growth that would add rings to the otoliths and separate the margin from the OTC mark. Those fish were euthanized and stored in a freezer until otoliths could be extracted. Fish were removed from the freezer, thawed, and sagittal otoliths were removed. Otoliths were view under fluorescence to verify the efficacy of the OTC mark. The OTC marking efficacy rate was 100% for Black Crappie and 100% for White Crappie. Rice straw, one of the largest biomass in the world, and big bluestem (*Andropogon gerardii* Vitman), a warm season perennial grass, have been considered a potential biomass feedstocks for lignocellulosic ethanol production. Nevertheless, the association of lignin with cellulose and hemicellulose has hindered the efficient utilization of rice straw and big bluestem for cellulosic bio-fuel. The objective of this study was, therefore, to down-regulate genes involved in lignin biosynthesis pathway such as cinnamate 4-hydroxylase (C4H), hydroxycinnamoyl CoA: shikimate hydroxycinnamoyl transferase (HCT), coumarate 3-hydroxylase (C3'H), cinnamoyl CoA reductase (CCR), and cinnamyl alcohol dehydrogenase (CAD) to reduce lignin in rice and cinnamoyl CoA reductase (CCR), and cinnamyl alcohol dehydrogenase (CAD) to reduce lignin in big bluestem through terminator-less constructs.

2. Brief description of the target audience

- Youth
- Agri Business
- Row Crop Agricultural Producers
- Small and limited-resource Farmers
- Consultants
- Forest Landowner Groups
- Forest Industry
- Loggers
- Natural Resource Professionals
- Landowners
- Educators
- Agency personnel
- Livestock producers
- Watershed and other Not-for-profit organizations
- General public
- Researchers
- Policy makers
- Research funding personnel and agencies
- Pond Owners
- Fisheries Biologists with Arkansas Game & Fish Commission, U.S. Fish & Wildlife Service, and U.S. Forest Service.

3. How was eXtension used?

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	70801	24994	2616	221

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

Patent Applications Submitted

Year: 2015
 Actual: 1

Patents listed

Stalk Cutter Device and Method of Use. Roberts, Trenton / Greub, Chester. U.S 62/109,917

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	166	144	310

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2015	27

Output #2

Output Measure

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

Year	Actual
2015	6

Output #3

Output Measure

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

Year	Actual
2015	35

Output #4

Output Measure

- Number of locations for bioenergy crop demonstrations.

Year	Actual
2015	2

Output #5

Output Measure

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

Year	Actual
2015	167

Output #6

Output Measure

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

Year	Actual
2015	242

Output #7

Output Measure

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

Year	Actual
2015	0

Output #8

Output Measure

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

Year	Actual
2015	5

Output #9

Output Measure

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

Year	Actual
2015	3745000

Output #10

Output Measure

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

Year	Actual
2015	19

Output #11

Output Measure

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

Year	Actual
2015	4

Output #12

Output Measure

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

Year	Actual
2015	1

Output #13

Output Measure

- Number of Evaluations of Swine Manure Solids as Value-Added Products

Year	Actual
2015	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals adopting one practice from the recommended list of energy conserving practices.
2	Number of energy audits conducted.
3	Number of graduate students working on bioenergy projects or biofuels labs.
4	Life cycle inventory methodology and data for row crops for greenhouse gases.
5	Number of N-StaR samples processed.
6	Number of new assessment and management tools developed, including models and measurements of greenhouse gas emissions
7	Number of current year citations of climate related publications.
8	Number of program participants who indicate a change in behavior, based on lessons learned during Environment, Energy & Climate programs.
9	Number of participants (both youth and adult) indicating new knowledge gained as a result of Environment, Energy & Climate programs.
10	Number of program participants indicating new knowledge of water quality and conservation best management practices
11	Number of producers who changed or adopted new production and/or conservation management practices or technologies
12	Number of program participants indicating the adoption or implementation of new water quality and conservation best management practices.
13	Number of farm pond owners who indicate new knowledge of pond management
14	Number of fisheries biologists indicating new knowledge of populations of important Arkansas fisheries
15	Number of soil-test phosphorus (P) and potassium (K) validation studies for rice
16	Number of research projects on organic ground cover
17	Number of Comprehensive Conservation/Water Quality Projects

18	Number of Technologies developed for Improving Drinking Water Quality and Availability
19	Number of landowners and managers trained to develop forest stewardship plans
20	Number of evaluations of new biofuels sources
21	Number of demonstrations of biodegradable plastic groundcover

Outcome #1

1. Outcome Measures

Number of individuals adopting one practice from the recommended list of energy conserving practices.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

134	Outdoor Recreation
136	Conservation of Biological Diversity
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

Outcome #2

1. Outcome Measures

Number of energy audits conducted.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of graduate students working on bioenergy projects or biofuels labs.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
136	Conservation of Biological Diversity
601	Economics of Agricultural Production and Farm Management

Outcome #5

1. Outcome Measures

Number of N-StaR samples processed.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2598

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas rice producers have relied on soil test recommendations for applying Nitrogen to the crop which are based on response curves from limited test sites. Scientists have been seeking a site specific-test for making N recommendations in rice. N-STaR is a unique, field specific test which identifies the available N from soil samples submitted to the University of Arkansas N-STaR Soil Testing Lab. Recommendations from N-STaR may reduce N rate recommendations

significantly without sacrificing yield, thus saving money and potentially reducing N losses to the environment.

What has been done

The Division of Agriculture's soil fertility team were the first to identify a novel method of soil testing and analysis to customize N recommendations on silt loam soils of Arkansas. A series of laboratory experiments and field trials led to the development of N-STaR (Nitrogen-Soil Test for Rice), a field-specific soil N test for rice in Arkansas. N-STaR is a soil-based N test that quantifies the N that will become available to rice during the growing season. Using a steam distillation procedure and analyzing an 18 in deep soil sample (in contrast with a typical 4 in sample), researchers were able to accurately predict the N needs of rice produced on silt loam soils 89% of the time. N-STaR samples submitted by rice growers ensure proper N recommendations to achieve optimum rice yields on a field-specific basis. N-STaR recommendations should optimize rice yields on all fields, but yields can be increased substantially where native soil N is very high or very low. N-STaR has been available for rice produced on silt loam soils in Arkansas for the 2012-2015 rice crops. N-STaR for clayey soils was on a limited release in 2014 and is now available for all soils in Arkansas.

Results

N-STaR has been adopted quickly by Arkansas rice producers. In 2012, 2500 N-STaR samples were submitted for analysis. The number of N-STaR samples increased to 3300 in 2013, 4500 in 2014, but dropped slightly during 2015 to 2598 due to the adverse weather conditions that prevented many fields from being sampled. New producers are entering the program every year which increases the scope of N-STaR's impact on Arkansas rice production. More than half of the N-STaR recommendations have called for reduced N rates, making the program an economic and environmentally sustainable practice. The success of N-STaR technology in rice has led researchers to explore similar programs targeting wheat and corn in Arkansas.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Number of current year citations of climate related publications.

2. Associated Institution Types

- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	465

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A number of studies indicate children today have fewer outdoor learning experiences than previous generations, and that future generations will have poorer health from sedentary indoor lifestyles. The Arkansas 4-H Wildlife Program offers youth (ages 5 to 19 years) the opportunity to get outdoors while learning wildlife science. Youth develop life skills and gain a deeper understanding of wildlife and its management through program activities at local, county, district, and state levels and interacting with resource professionals.

What has been done

The Arkansas 4-H Wildlife Program curriculum is based on the national award-winning 4-H Wildlife Habitat Education Program (WHEP). Learning focuses on species biology and life history, habits and habitats, habitat evaluation and practices, and plan writing.

At the district and state level, the Arkansas 4-H Wildlife Program supports local and county programs by offering various opportunities to 4-H youth for learning about wildlife throughout the year. The activity year begins with a Practice Session in February to prepare youth and leaders for the State Contest in April; District and State Wildlife O-Rama's in June and July; WHEP National Invitational in July; Forestry and Wildlife Camp for 9 to 19 year olds at the C.A. Vines Arkansas 4-H Center in September; a Wildlife Field Day in the fall; and a new Food Plot Contest to be piloted in March - December 2016. Based on reports from club leaders and county agents, plus participation records in state programs, on average each dedicated youth receives at least 20 contact hours of instruction, with Senior team members who represent Arkansas at the National Invitational reporting more than 80 contact hours.

Keys to success include: (1) a diverse advisory committee of professionals and volunteers; (2) committed county agents and volunteer 4-H club leaders who teach youth locally; (3) clear and consistent program structure; (4) keeping the program fresh by rotating species, habitats, and field locations annually; (5) an affordable, family-friendly learning environment, and (6) a focus on education with (a) attention to stages of development (i.e., Cloverbud, Junior, Senior) and (b) resources for learning beyond the competitions.

Results

An estimated 3,000+ Arkansas youth and 4-H leaders have participated in the Arkansas 4-H Wildlife Program since its inception in 1994.

Through these experiences, several program graduates decided to pursue wildlife careers. Many others will become well-informed landowners who understand how to improve wildlife habitat on their land. All have a better understanding of wildlife science and deeper connections to the outdoors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
134	Outdoor Recreation

136 Conservation of Biological Diversity
403 Waste Disposal, Recycling, and Reuse

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	385

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rice straw, one of the largest biomass in the world, and big bluestem (*Andropogon gerardii* Vitman), a warm season perennial grass, have been considered a potential biomass feedstocks for lignocellulosic ethanol production. Nevertheless, the association of lignin with cellulose and hemicellulose has hindered the efficient utilization of rice straw and big bluestem for cellulosic bio-fuel.

What has been done

Experiments were designed to down-regulate genes involved in lignin biosynthesis pathway such as cinnamate 4-hydroxylase (C4H), hydroxycinnamoyl CoA: shikimate hydroxycinnamoyl transferase (HCT), coumarate 3-hydroxylase (C3'H), cinnamoyl CoA reductase (CCR), and cinnamyl alcohol dehydrogenase (CAD) to reduce lignin in rice and cinnamoyl CoA reductase (CCR), and cinnamyl alcohol dehydrogenase (CAD) to reduce lignin in big bluestem through terminator-less constructs.

Results

In rice, four of the ten silenced lines tested, CAD-1, C4H-3, CCR-12, CCR-16, showed reduced lignin content ranging 3.2-5.6%. In big bluestem, CAD transgenic lines showed reduced lignin content up to 17% and in CCR transgenic lines, lignin content was reduced up to 12%.

Lignin analyses in progenies selected lines with reduced lignin for cellulosic bioethanol assays will continue in 2016-2017.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	389

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Irrigation of cropland is critical to long term success in the Arkansas Delta. If groundwater levels continue to decline at current levels, certain areas in Arkansas will be without the ability to irrigate crops. As the water levels decline, there would be a \$12 per acre ft increase in pumping costs as the well depth increased just 30 feet.

What has been done

In response to producer demand for more efficient and effective irrigation events, a computer hole selection program (Pipe Planner) was used to determine the number and size of holes needed to irrigate an irregularly shaped field in a more efficient and timely manner. The goal was to reduce the amount of time and/or eliminate excess water at the bottom of the field resulting in significant savings of inputs. The estimated cost of using flood irrigation was \$60 per acre.

Results

A research verification field of 46 acres was formerly irrigated using levees. Each irrigation took 168 hours (7 days) to complete. Pipe Planner illustrated the best fit for this irregular field based on shape and well flow rate was to divide the field into two sections and irrigate separately. The program also chose the proper hole diameter for each row to supply the correct water flow. Results show that irrigation time was reduced by 96 hours, cost per irrigation was reduced by \$20 per acre compared to \$60 per acre, the field watered more uniformly, there was less water induced stress and minimal waste on the bottom of the field.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The production of animal derived food and products generates manure and mortality byproducts. Management of these byproducts has potentially significant impacts on food production, societal wellbeing, human and animal health, and environmental quality. Concerns of farmers, neighbors, and consumers has resulted in numerous regulations and policies that livestock producers and those that manage manure and mortality byproducts must adhere. This presents challenges for regulatory agencies, service organizations, livestock producers, and the general public in navigating the regulations and policies.

What has been done

In keeping with the land grant mission of dispersal of research based information, a series of functional relationships among regulatory agencies, service organizations, livestock producers have been developed and maintained over the years. These relationships serve both as access to information and conduits to the dispersal of knowledge. At times this manifests itself as an independent consultant providing input into the dialog between a regulatory agency, a design engineer, and a livestock producer seeking an acceptable management system and necessary permit to operate.

Results

The results of these facilitated interactions are a more informed manure/mortality management community that has an increased capacity to make and implement beneficial policies and practices. The recipients of these benefits are livestock producers, regulatory agencies, service organizations, neighbors, and consumers of animal based products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics

Outcome #12

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	38

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A number of technologies and management practices have the potential to reduce the overdraft on the Mississippi Valley Alluvial and Sparta Aquifers. In Arkansas groundwater withdraws from the alluvial aquifers are only about 42 percent sustainable and 54.6 percent sustainable from the Sparta/Memphis aquifer. Recent success with on-farm demonstrations in Mississippi has shown a 47% reduction in water use while maintaining profitability. Implementation of such practices on a large scale will improve water sustainability in Arkansas. Without sustainable irrigation practices, yields could be 30-50% less in the future if water becomes limited. Aquifer overdrafts pose a real concern about the future of row crop production. For example, in Arkansas 3.8 Million acres are expected to have limited or no water resources by 2050 according to a recent study.

What has been done

Twenty-six on-farm demonstrations were conducted to compare Irrigation Water Management Practices to farmer managed irrigation practices. Flow meters were installed on paired fields of furrow irrigated corn, soybeans, cotton and peanut fields. IWM fields consisted of computerized hole selection, surge irrigation, ET-based scheduling with an Atmometer, and soil moisture monitoring. Agents and producers followed Extension recommendations for termination. Cost of water was determined for the irrigation pumps at each demonstration.

Results

Results:

-No significant difference in yields between control fields, CHS fields, or IWM fields (p=0.864)

were found.

-For water use, IWM fields used 25% less water with IWM demonstrations than the control fields (p<0.001). Given the season, this is only an indication of the potential savings for a normal or dry year. In soybeans this equated to about 2.6 ac-in/ac difference.

-No significant difference between 30 or 60 inch beds in a sandy loam soil was found in one trial this year.

-Three termination studies were conducted as part of these demonstrations and in two of the three, no yield difference was observed. Additional work to validate existing termination recommendations may be warranted. One demonstration evaluated deep tillage and found a significant yield increase of 4 bu/ac, where deep tillage with IWM had the highest yield. This result is similar to a three-year, three-site research study evaluating deep tillage.

-Several of the pumps tested shows savings potential, one pump in particular if slowed 150 rpm in engine speed would have reduced the irrigation cost by \$447 for the year.

-Another demonstration showed that by not using one of the three pumps in a pump network system that they could have saved \$291 annually and still met crop water demand.

-One farmer was so impressed with the improvement of surge irrigation, he purchased surge valves for all of his fields. Others observed the improvement it made in the soil water profile from the soil moisture sensors. This often resulted in fewer irrigations and improved ability to capture and certainty of being able to wait on rain events.

Impact:

County agent led Irrigation Water Management (IWM) demonstrations found a 25% reduction in water use while maintaining yields in 2015 on 26 furrow corn, soybean, cotton and peanut irrigated fields. Wide-spread adoption of these IWM practices could have a dramatic impact on the overdraft of Arkansas aquifers if implemented. Additional improvements in profitability from pump evaluation and deep tillage were also proven.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

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

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

White and black crappie are important species of game fish in Arkansas.

What has been done

To assess contribution of stocked fish to the 2014-year class at age-1 crappies were stocked into eight study lakes during fall 2014. Approximately 91,000 Black Crappie *Pomoxis nigromaculatus* from the Charlie Craig Hatchery were marked with oxytetracycline (OTC) and stocked into Sugar Loaf, Iron Fork, Beaver Fork, and Calion Lakes. Approximately 92,000 White Crappie *P. annularis* from the Joe Hogan Hatchery were marked with OTC and stocked into Charles, Poinsett, Saracen, and Des Arc Lakes. All lakes were stocked at a density of 50 fish/acre, per the 2002 AGFC Crappie Management Plan. Approximately 30 fish per vat used during OTC marking process were transferred to UAPB. Those fish were held for 60 d and fed Artemia and formulated feed. The objective was to facilitate growth that would add rings to the otoliths and separate the margin from the OTC mark. Those fish were euthanized and stored in a freezer until otoliths could be extracted. Fish were removed from the freezer, thawed, and sagittal otoliths were removed. Otoliths were view under fluorescence to verify the efficacy of the OTC mark.

Results

The OTC marking efficacy rate was 100% for Black Crappie and 100% for White Crappie

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water

134	Outdoor Recreation
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

Number of soil-test phosphorus (P) and potassium (K) validation studies for rice

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Soil samples are collected by farmers and consultants, submitted to a soil-test laboratory for analysis and the report along with fertilizer recommendations is sent back to the client. Soil chemical analyses have been used as the basis for P, K and micronutrient recommendations for nearly 100 years and this process represents the best possible science for estimating fertilizer needs to ensure crop nutrient requirements are met, but not provided in excess. Unfortunately, the accuracy of interpretation of soil analyses and eventually the fertilizer recommendations have seldom been validated.

What has been done

Our ongoing research sought to validate the accuracy of existing P and K fertilizer recommendations for flood-irrigated rice. Twenty-four field trials were established from 2013 to 2015 in which six composite soil samples were collected from each site to determine the recommended P and K rates. Each trial contained six P and K fertilizer treatments, which included a no P or K treatment, the recommended rates of P and K rates, and alternate combinations of P and K to examine the accuracy of the rate calibration.

The trial yield results showed that existing fertilizer recommendations based on soil-test P and K accurately predicted crop response to P fertilization in 33% and 38% of the trials when significance was interpreted as significant at the 0.10 level and results were weighted across soil-test categories (e.g., suboptimal, medium and optimal or greater fertility). The accuracy of the P recommendations was not affected by the level of significance (0.05 to 0.25) and the interpretation for K improved slightly as the level of significance became more liberal. For both nutrients, the accuracy of the recommendations varied among the three fertility categories. Crop response prediction errors were greatest for soils that had suboptimal fertility levels and received fertilizer recommendations and seldom occurred for soils having optimal soil fertility levels.

Results

Despite lower than desired accuracy for predicting crop yield response to fertilization, P and K availability indices were positively correlated with plant P and K concentrations at key stages. The soil-test P values that define the suboptimal soil fertility levels were adjusted for the 2016 cropping season and will improve the accuracy of recommendations on 20-25% of the Arkansas rice acres.

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

Number of research projects on organic ground cover

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A common practice in organic fruit production is the application of organic ground covers to supply nutrients while enhancing other soil properties. Organic farmers need regionally appropriate information for proper soil management to optimize organic production.

What has been done

Two studies were conducted to determine how 12 treatment combinations of four ground covers (compost, wood chips (tree trimmings), paper mulch, and mow-and-blow) and three organic fertilizers (poultry litter, organic commercial fertilizer, and a no-fertilizer control) applied every year in April from 2006 to 2013 affected soil properties. Soil biological and chemical properties were measured at the 0-10 cm soil depth before (March) and after (May) yearly ground cover applications (April) to determine how nutrient contents and microbial populations responded to additions immediately (May) and long-term (March) and if responses were the same each year or changed through life of the orchard. In addition to biochemical and chemical analyses, molecular analysis was performed on soils from March 2007 and 2013 to determine treatment effects on the

denitrifying community.

Many results were apparent in the analysis of soils collected each March and May that were not apparent when soils were analyzed only in 2007 and 2013, showing how dynamic the system is and how subject the system and/or results are to prevailing environmental conditions each year. Soil organic carbon (C) and nitrogen (N), microbial biomass C and N, ammonium-N, and enzyme activities increased through time, peaked during 2009-2011, and declined to levels with relatively few differences between 2007 and 2013 values. In contrast, molecular analysis of denitrifiers showed measurable treatment effects of compost differentiating from other treatments in 2007. The dissolved organic C was also greatest in compost treatments in 2007. Organic matter increased through time in all ground cover treatments, with compost resulting in the greatest increase. Soil water content, electrical conductivity, microbial biomass nitrogen (N), ammonium-N, and nitrate-N were all greater in 2013 than in 2007. Denitrifier species richness increased from 2007 to 2013 in soil receiving compost and wood chips and was greatest in soil receiving these two ground covers in 2013. Diversity of denitrifiers in wood chips significantly increased from among the least in 2007 to among the most in 2013.

Organic ground covers and fertilizers add nutrients that are released through time by the activity of microorganisms. Microorganisms decompose organic substances and in that process release nutrients.

Results

Our results indicate that annual additions of surface ground covers and nutrients alter the microbial community such that it is not continually growing over time which is significant because the additions have added organic matter to the soil, and thus the expectation might be of accumulation of a larger microbial biomass. However, the microbial composition, as evidenced by the subset of the community investigated (denitrifiers), is quite dynamic, and altered differently (i.e. shifting in composition and diversity) and at different timelines by the applications. Microbes responded by the first sampling (1 year after the first set of applications) in the compost treatments compared to others, and, by year seven, microorganisms were responding positively to woodchips.

4. Associated Knowledge Areas

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

Outcome #17

1. Outcome Measures

Number of Comprehensive Conservation/Water Quality Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Division of Agriculture teams assess the impacts of on-farm conservation through the Arkansas Discovery Farms Program and the operation of the C&H Farm at Mt. Judea, Newton County, on the quality of receiving waters.

What has been done

The two programs have assessed:

1. Conservation practices that limit nutrient runoff from poultry production facilities
2. Adoption of rotational grazing on soil health and water quality, and use of cover crops to minimize sediment and nutrient runoff from row crop settings, fate and transport of nutrients and bacteria from land-applied swine effluent to pastures of the C&H Farm
3. The impact of farming operations (effluent holding ponds and land-application of effluent) on the quality of critical water features on and surrounding the C&H Farm including springs, ephemeral streams, creeks and ground water.

Results

Discovery Farms: While preliminary, results after two years, suggest that elevated nutrient and sediment runoff from around poultry production areas are decreased three fold by directing runoff into ponds or through grassed waterways. Further, the concentration of N and P in runoff from the poultry houses was greatly reduced when it enters a farm pond. This decrease can be attributed to P sorption by suspended and deposited sediment, dilution, as well as by algal and macrophyte uptake. While conservation tillage and cover crops decrease nutrient and sediment runoff, no significant difference between conventional and conservation operations is yet to be realized. A decrease in dissolved P between irrigation water added to several fields and concentrations in surface runoff water were observed for rice and corn fields on a Discovery Farm. Approximately 30 kg P ha⁻¹ was added to each of the fields prior to rice and corn plants.

Big Creek: Nitrate-N concentration in Big Creek below the C&H Farm continue to be greater than those measured at the upstream site. Based on numerous stream-water monitoring studies conducted by USGS, U.S. EPA, and Land-Grant entities, we know that there are temporal and spatial factors, such as land use in the drainage watershed, which influence stream water nitrate-N concentrations. We will continue to monitor nitrate-N and other constituents to determine if and when they exceed known standards. For nitrate-N, the drinking water standard is 10.0 mg/L., which has not been exceeded. Standards or thresholds related to recreational or increased algal

productivity involve phosphorus and not nitrogen forms. Bacteria concentrations in Big Creek were high both above (20,140 and 173,290 MPN/100 mL as E.coli and total coliform, respectively) and below the C&H Farm (1,203 and 20,120 MPN/100 mL as E.coli and total coliform, respectively) during storm flow grab sampling on 10/13/2014, as well as trench flow below the holding ponds. However, no consistent or prolonged trends in nutrients or bacteria concentrations were evident at or among any of the monitoring locations. Two fields measured in December, 2015; one background site and one that had hog manure application in April 2014. Several datasets were collected and the following observations were made from the Electrical Resistivity Imaging (ERI) analysis: ERI provided delineation of boundaries between soil, epikarst, and competent bedrock, the potential for rapid transport pathways in the underlying bedrock as joints or potential karst features were observed as conductive electrical features in a resistive background, Soil depth was measured to range from 0.7 to 3.0 meters (2.25 to 10 feet). On both fields, the depth of soil is less moving away from the stream and towards higher elevations, which is consistent with the direction to which the alluvium would be deposited near the stream, the average epikarst thickness is highly variable, ranging from 2 to 23 meters thick (6 to 75 feet), and there seems to be a correlation between the presence of applied hog manure and increased electrical conductivity in soil, but additional work is required to evaluate this potential relationship.

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

Number of Technologies developed for Improving Drinking Water Quality and Availability

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Most reservoirs in the U.S. used for drinking water were built 40 to 50 years ago. These reservoirs typically have a lifespan of 50 years. Therefore, much of this drinking water supply is nearing the end of its effective life. Since it is very difficult to build new drinking water reservoirs, researchers and engineers are attempting to create methods to extend the life of our existing reservoirs.

What has been done

Division of Agriculture researchers have developed water treatment technology to solve problems that impair drinking water quality. One of the greatest problems managers of drinking water reservoirs face is the buildup of nutrients (nitrogen and phosphorus) in these water bodies. Water flowing into the reservoirs naturally contains nutrients and organic matter that is absorbed as rain falls in the watershed, flows across the surface into streams and into the reservoir. Water can be contaminated with excess nutrients from fertilizer, animal waste, and wastewater treatment plant effluent if not properly managed. Excess nutrients can cause problems when reaching reservoirs by causing algae blooms. Algae can rapidly remove dissolved oxygen from the water causing fish kills that will create food for bacteria that will cause even further oxygen removal from the water. Water without oxygen will also allow metals such as iron and manganese to dissolve in water. These dissolved metal create problems when treating raw water for use as drinking water and can greatly increase the expense for treating the water. The nitrogen contained in water can be removed through natural ecological processes, but phosphorus is very difficult to remove from the reservoir once it enters the water body. As reservoirs age, more and more phosphorus will build up in the reservoir eventually overwhelming its ability to retain quality water. The key to improving water quality and extending the life of a reservoir is to not only reduce the amount of new nutrients entering the reservoir, but to create conditions to allow natural processes to remove the nitrogen and convert the phosphorus to a chemical state that is not available to algae. It is also desirable to remove the phosphorus from the reservoir.

Results

A new technology developed in the Division of Agriculture to oxygenate reservoir sediments to reduce the oxygen demand that is exerted on the water and reduce the likelihood that the oxygen is removed from water. A key requirement for implementing this technology is to understand and quantify the rate of oxygen demand exerted by the water body including that from the water itself and also sediment oxygen demand.

Another application of the technology is to use ozone to treat drinking water from impacted reservoirs and help offset the negative impacts of eutrophic waters in a more cost effective manner than the treatment chemicals currently used.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation
402	Engineering Systems and Equipment

Outcome #19

1. Outcome Measures

Number of landowners and managers trained to develop forest stewardship plans

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	844

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources

Outcome #20

1. Outcome Measures

Number of evaluations of new biofuels sources

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over 65 million pigs in the US produce 4.67 kilograms per day of manure per animal. Thus, the total amount of swine manure generated annually is more than 110 million metric tons. Disposal of the high volume of swine manure creates environmental and economic opportunities and issues. There are no available data related to the energy contents and the thermal degradation behavior of the chemically coagulated swine manure solids. Also, there is no data on the maximum values of coagulants that will hinder the use of the final product as biofuel and/or compost feedstock.

What has been done

Fresh swine manure was collected from an Arkansas farm. Three coagulants, namely agricultural lime [CaCO₃], hydrated lime powder [Ca(OH)₂], and lime slurry [Ca(OH)₂], were used to coagulate solids from fresh swine manure. They were added to fresh swine manure based on the calcium (Ca) mass per liter of liquid manure. Four levels of coagulants concentrations (0.00, 4.89, 9.77 and 19.77 gm Ca/liter) were tested, in triplicates, during the course of this study. Physical, chemical, and thermochemical characteristics of the solid separated swine manure were determined in triplicates.

Results

From the experimental work described, several important arguments can be drawn. Manure separated solids contain the majority of nutrients and volatile solids. Increasing the coagulant concentration decreased the acceptability of the solid separated swine manure as a biofuel source. On the other hand, increasing the coagulant concentration increased the acceptability of the solid separated swine manure as a composting source.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

Outcome #21

1. Outcome Measures

Number of demonstrations of biodegradable plastic groundcover

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

650 to 700 acres of commercial tomatoes are produced in Bradley County, AR annually. To maximize production, tomato producers use plastic mulch and drip irrigation to reduce weed competition and water conservation. After the cropping season, the mulch and drip irrigation have to be removed by hand and properly disposed.

What has been done

After seeing an informational article on biodegradable mulch in a vegetable produce magazine, the county agent contacted local industry personnel for additional information. A producers meeting was conducted and included representatives of the biodegradable mulch company. During the meeting, he explained how the product performed and how the breakdown was triggered.

Results

A total of 10 acres of bio-degradable mulch was laid on two Bradley County tomato producer farms. Farm visits were made on a regular basis to evaluate the mulch integrity. Initial breakdown of the mulch was noticed on top of the beds around the first of June. By mid-July, the top of the beds were mostly broken down. After the field was cleaned up and cultivated, the residual mulch under the ground along the edges was mostly intact. With additional cultivation and exposure to the sun, the residual mulch showed continued breakdown. If the mulch continues to degrade as anticipated, producers could save between \$120 to \$150 per acre per year on field cleanup costs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The outlook for forestry and forest products, at least in the short term, does not provide incentive for Arkansas forest landowners to make substantial investments in improvements of forest land. In Arkansas, where very little infrastructure related to biofuels has evolved, there is little incentive for producers of biofuels feedstocks to invest in alternative biofuels crops and related equipment. Interest in growing alternative biofuel crops in the state today is low, where traditional row crops enjoy reasonable profitability and the short term outlook for oil prices does not favor investment in biofuel alternatives. With oil currently at very low prices, there is little interest in renewable biofuels in Arkansas.

The Big Creek research effort led by the Division's team of water resource protection scientists is authorized to continue monitoring water quality, including nutrients and bacterial concentrations, in a sensitive watershed, but the state funding for this long-term effort is uncertain.

The emergence of a viable and dynamic Carbon Market could have a big impact among Arkansas forestland and cropland managers.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Since the interest in sustainable energy has declined due to low energy costs, the evaluation process is stalled. Field demonstrations of renewable energy crops and technology for developing sustainable energy through biomass sources were decreased substantially and it is widely believed that these technologies are not economically viable in

the short term. If oil and gas prices rebound, the evaluations may include: benefit/cost analyses, participant surveys of knowledge gained, and adoption of recommended practices.

Development and implementation of greenhouse gas (GHG) estimates from agricultural supply chains requires a retrospective assessment of the activities associated with production of an agricultural product, inventorying current activities, and analysis of case studies for validation of the analyses. Innovations for reducing GHG emissions require comparisons by regions, production practices, climate, and soil type.

Several strategies have been used for program assessment to determine program results, outcomes and impacts. Extension educators use a variety of recommended methods to gather needed information. Collection methodology and assessment tools will be programmatic and audience centered, often by before-after program assessments, behavioral changes, observation, and questionnaires. Data relevant to shifts in production methods, acreage, cropping systems, and enrollment will be compared to historic levels and trends.

Longitudinal evaluation will be conducted by subcomponents of this program through various research based methods. Data will be collected from producers, consultants, and other agricultural practitioners, through telephone and mail surveys and questionnaires at producer meetings and other on-site visits and observations made by Extension faculty. NASS will continue to be a dependable source of indirect data. Electronic audience response (clickers) will be increasingly available and useful in broad based audience participation. Methodologies and survey content is being explored and tested in the current fiscal year.

Comprehensive program and departmental evaluation reviews for Research, Extension and Teaching Programs are conducted on a five to seven year cycle by various research based evaluation methods. In 2015, the Division's Poultry Science Department and Animal Sciences Departments were reviewed by an elite team of peer reviewers. The Review Boards are composed of a Chairman, focused reviewers for the teaching program, the research program and the Extension program in each department. Each team has a local, knowledgeable stakeholder reviewer. A comprehensive report of findings and recommendations is submitted by the Review Board and each department is asked to write a detailed response to the report, which is submitted to the Division administration. The Department of Agricultural Education, Communication and Technology is scheduled to be reviewed in 2016.

Key Items of Evaluation

Adoption of N-STaR can be predicted and quantified by the number of soil samples submitted for N-STaR analysis. While the numbers were lower in 2015 than 2014, the prolonged rainy season prevented farmers and consultants from pulling soil samples. The number of new N-STaR indicates that more farmers are adopting the N-STaR recommendations, which frequently call for reduced rates of N on rice.

Patents awarded are a good evaluation of novel research discoveries, but the full impact of those discoveries is best measured by the number of successful commercial licenses and revenue from those licenses.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Access to Safe & Nutritious Food

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	5%	0%	20%	15%
502	New and Improved Food Products	0%	0%	10%	15%
503	Quality Maintenance in Storing and Marketing Food Products	0%	0%	10%	15%
504	Home and Commercial Food Service	10%	0%	0%	0%
701	Nutrient Composition of Food	0%	0%	10%	0%
702	Requirements and Function of Nutrients and Other Food Components	10%	40%	20%	5%
703	Nutrition Education and Behavior	25%	10%	10%	25%
704	Nutrition and Hunger in the Population	15%	0%	0%	0%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%	50%	20%	25%
724	Healthy Lifestyle	15%	0%	0%	0%
806	Youth Development	10%	0%	0%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	51.1	0.5	80.0	4.8
Actual Paid	74.6	0.5	65.5	1.8
Actual Volunteer	7.5	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
936914	88677	381173	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
938319	6794	5490607	3045
1862 All Other	1890 All Other	1862 All Other	1890 All Other
6948827	0	1310313	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

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

Division of Agriculture and UAPB faculty will conduct novel research to determine the impact of diet and food composition and functional food components on body weight and health.

The Division of Agriculture and UAPB faculty and staff will develop, evaluate and disseminate education and curricula incorporating research and teaching for food safety and processing. Programs include:

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

Research activities in food safety include work to better understand the ecology of food pathogens, improve food processing systems to minimize food pathogens and to improve detection systems for Listeria, Salmonella, E. Coli and other major food pathogens.

Research activities in food chemistry and food processing include work to (1) improve the quality of rice and improve rice processes, (2) expand the utilization of soybeans and its co-products, (3) assess the

health benefits associated with fish, vegetables and other processed foods, and (4) improve the sensory quality of processed foods.

2. Brief description of the target audience

- Youth
- School personnel
- Parents
- Adults
- Child Care Providers
- Researchers
- Food Manufacturers
- Farmers (Farmer's Markets)
- Farmers
- Limited resource farmers
- Entrepreneurs and Restaurants
- Food Service Employees and/or Food Handlers
- Employers & Employees
- Health Professionals
- Consumers
- State & federal agencies
- College Students
- Catfish farmers and processors

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	215388	51913	247901	7922

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

Patent Applications Submitted

Year: 2015
 Actual: 2

Patents listed

Vaccine Vectors and Methods of Enhancing Immune Responses, US 14/623,105, Inventors: Hargis, Berghman, Layton, Bottje
 Vaccine and Methods to Reduce Campylobacter Infection, US 14/623,196, inventors: Hargis, Pumford, Layton, Kwon

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	3	84	87

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2015	36488

Output #2

Output Measure

- Number of youth contacts in 4-H/ Youth Food, Nutrition, and Physical Activity programs related to eating healthy and being active

Year	Actual
2015	238734

Output #3

Output Measure

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

Year	Actual
2015	87369

Output #4

Output Measure

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

Year	Actual
2015	43

Output #5

Output Measure

- Number of projects focused on increased understanding of the ecology of fecal indicators and pathogens

Year	Actual
2015	6

Output #6

Output Measure

- Number of projects focused on increased understanding of preharvest and postharvest processes impacts on microbial and chemical threats

Year	Actual
2015	4

Output #7

Output Measure

- Number of projects focused on novel food processing technologies

Year	Actual
2015	5

Output #8

Output Measure

- Number of projects focused on improving the quality of food

Year	Actual
2015	12

Output #9

Output Measure

- Number of projects focused on the impact of food on nutrition and health

Year	Actual
2015	3

Output #10

Output Measure

- Total competitive federal Grant \$ for program area

Year	Actual
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2015 681179

Output #11

Output Measure

- Total other competitive grant \$ for program area

Year	Actual
2015	3306874

Output #12

Output Measure

- Number of participants in educational programs leading to graduation from the Better Process Control School

Year	Actual
2015	160

Output #13

Output Measure

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

Year	Actual
2015	463

Output #14

Output Measure

- Number of participants in quarterly HACCP roundtables

Year	Actual
2015	96

Output #15

Output Measure

- Number of culinary workshops for food technologists

Year	Actual
2015	5

Output #16

Output Measure

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

Certified Culinary Scientist

Year	Actual
2015	36

Output #17

Output Measure

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

Year	Actual
2015	4

Output #18

Output Measure

- Number of food processing laboratory services provided

Year	Actual
2015	1080

Output #19

Output Measure

- Number of nutritional labels developed

Year	Actual
2015	81

Output #20

Output Measure

- Number of food processing approvals developed (2541a)

Year	Actual
2015	10

Output #21

Output Measure

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

Year	Actual
2015	17692

Output #22

Output Measure

- Number of acceptable low sodium recipes developed

Not reporting on this Output for this Annual Report

Output #23

Output Measure

- Number of briefings to catfish farmers and catfish processors

Not reporting on this Output for this Annual Report

Output #24

Output Measure

- Number of newsletters, fact sheets, etc.

Year	Actual
2015	48850

Output #25

Output Measure

- Number of field days held

Not reporting on this Output for this Annual Report

Output #26

Output Measure

- Number of presentations to catfish farmers and processors

Year	Actual
2015	3

Output #27

Output Measure

- Number of emails, phone calls, and conference calls to catfish farmers and processors

Year	Actual
2015	10

Output #28

Output Measure

- Number of workshops and training sessions conducted

Year	Actual
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2015

15953

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants receiving certification in Better Process Control
2	Number of participants receiving certification in ServSafe
3	Number of participants in other workshops related to Food Safety including HACCP, food safety, food defense, food labeling, and food microbiology workshops receiving attendance certification
4	Number of growers and producers receiving GAP certification or equivalent
5	Number of youth demonstrating improved knowledge of food safety or hand washing
6	Number of Online Master of Agriculture (Food Safety Emphasis) graduates employed in the food industry
7	Number of viable technologies developed or modified for the detection and characterization of foodborne pathogens
8	Number of viable prevention, control and intervention strategies for food borne threats in the food system
9	Culinary workshop participants passing the examination to become a Certified Culinary Scientist
10	Number of viable technologies developed or modified for improving food processing systems
11	Number of viable technologies developed or modified to improve the nutritive quality of foods
12	Number of small businesses started as a result of the food entrepreneur assistance program
13	Number of young participants who increase consumption of foods recommended by the dietary Guidelines for Americans.
14	Number of children who increase physical activity
15	Number of adults who improve food preparation skills
16	Number of participants who decrease sodium intake
17	Number of adult participants who increase consumption of foods recommended by the Dietary Guidelines for Americans

18	Number of adult participants who decrease consumption of foods recommended by the Dietary Guidelines for Americans
19	Increased understanding of food safety issues in imported catfish and catfish-like products as compared to U.S. farm-raised catfish by public agencies, the aquaculture industry, and the general public
20	# of adult participants who reported they less often run out of food before the end of the month following completion of a nutrition education program.
21	Number of studies conducted to better understand factors affecting childhood obesity

Outcome #1

1. Outcome Measures

Number of participants receiving certification in Better Process Control

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	156

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The food processing industry in Arkansas needs continuous training to remain globally competitive. Workshops and training sessions offered and conducted will allow them to remain prosperous and competitive.

What has been done

The Institute of Food Science & Engineering and Cooperative Extension Service in Fayetteville has been offering the Better Process Control School (BPCS) since 1973 which is one of the oldest in the nation and required for FDA controlled canning industries. Twenty-eight BPCS are offered nationally each year and historically Arkansas is the only contiguous state except for Texas offering the program. The number of Better Process Control Schools and number of students has ramped up the past 2 years and the number of BPCS conducted within the region has averaged 4 per year for 2 years in a row.

Results

Since starting the Better Process Control School in Fayetteville in 1973, over 3,000 people have

been certified mostly from major canning companies in the region. This allows for these Arkansas-based companies to train a large number of their employees at a reduced cost since travel expenses are minimal. In 2015, five BPCS were offered in Arkansas and surrounding states (Oklahoma and Missouri). For the Cooperative Extension Service, the Better Process Control School has served as a springboard to other food-related workshops for industry to include food safety, food defense, food labeling, microbiology, sensory evaluation and other courses under development.

The IFSE will continue to conduct additional workshops in Food Defense and Food Labeling at the request of local industry. The food labeling workshop is an FDA co-sponsored workshop falls under the FDA umbrella of Food Safety because of new requirements in the labeling of allergens. Over half of all recalls in the past decade have been due to undeclared allergens. The IFSE will also conduct additional workshops for entrepreneurs and business startups on labeling, GMPs, documentation of operations, SSOPs etc.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of participants receiving certification in ServSafe

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	271

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Centers for Disease Control and Prevention estimates that each year approximately 48 million people gets sick, 128,000 are hospitalized and 3,000 die of foodborne diseases. Additional estimates provide the most accurate picture yet of which foodborne microbes cause the most illnesses in the United States. They include Salmonella, norovirus, Clostridium perfringens, and Campylobacter. Specific to Arkansas, the state has over double the desired CDC target rate for salmonellosis per 100,000 individuals.

What has been done

The University of Arkansas System Division of Agriculture Cooperative Extension Service offers a comprehensive approach to address food safety from industry to the individual. Taught in many Arkansas counties the ServSafe® Food Safety Program for Managers course provide the necessary tools for industry managers to effectively teach food service employees best practices in food safety. For the past four years the Cooperative Extension Service has expanded its reach with the ServSafe® Managers program. In partnership with the Arkansas Hospitality Association who received a workforce education and training grant Extension was able to offer the course at a reduced cost to ensure high quality food safety training for food industry employees provided across the state.

Results

In 2015 over 460 individuals were trained using the ServSafe® Managers curriculum by the University of Arkansas System Division of Agriculture Cooperative Extension Service. Of those participants 58% or 271 of 463 received certification which means they received a 75% or higher on a comprehensive exam covering principles of the FDA Food Code developed by the National Restaurant Association. Individuals appreciate Extension's efforts in food safety. A ServSafe® Managers participant in Newton County, Arkansas relayed this about ServSafe® "I feel that knowing the correct way to handle food makes my job easier and safer for my customers." A participant from a training in Searcy County also relayed "I am required to have my ServSafe® certification. I am excited to implement all that I have learned in the kitchen to keep our food safe and clients healthy."

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	42

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of growers and producers receiving GAP certification or equivalent

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over the past few decades, there has been an increase in the concern of foodborne illness resulting from the consumption of fresh produce. On average 37% of foodborne illnesses result from the consumption of produce such as melons, tomatoes, greens, and berries that do not receive a heat treatment prior to consumption. In January 2013, the FDA published proposed regulations on Good Agriculture Practices as part of the Food Safety Modernization Act that require certain field operations that would prevent the fecal contamination of fresh produce. Final regulations were published October 2015.

What has been done

The Institute of Food Science & Engineering at the University of Arkansas has previously developed a voluntary GAP program for small scale growers such as those who sell at farmers markets and to schools in the "Farm to School" program. This program is currently being used throughout Arkansas mainly for the "Farm to School" Program. In 2015, Train-the-trainer

workshops were held for 11 Division of Agriculture faculty in Joplin MO. From that point, GAP workshops can happen in several places in Arkansas. The Produce Safety Alliance (PSA) will conduct the train the trainer session to facilitate the FDA requirements for large scale produce growers.

Results

Many small scale produce growers have been requesting assistance in developing a voluntary GAP program in order to be able to sell at farmers markets and to schools. This should improve the food safety of produce being sold at farmers markets and to school systems. Many large scale growers are anxious to be FDA GAP compliant and will have one year to complete the one-day training course.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	8308

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Naturally Occurring Toxins

Outcome #6

1. Outcome Measures

Number of Online Master of Agriculture (Food Safety Emphasis) graduates employed in the food industry

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	32

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Bacteriophages have been widely used in food industry to control pathogens in foods. A unique component of the activity was to determine if coating solution can help increase bacteriophage's antimicrobial activity. There is limited information in the US on application of propolis to fresh foods to control pathogens. Food manufacturers will be interested in this activity because bacteriophages and propolis are natural antimicrobials, not a chemical preservative.

What has been done

Bacteriophages-specific to Salmonella typhimurium and Escherichia coli O157:H7 were mixed in chitosan and hydroxypropyl methylcellulose coating solution. Stability of bacteriophages were determined at 4°C by checking phage titers in coating solutions at days of 0, 1, 4, and 7. Propolis was extracted and mixed in chitosan and hydroxypropyl methylcellulose coating solution to contain 4 and 15% of propolis. Fresh beef and lettuce inoculated with Listeria monocytogenes and Escherichia coli O157:H7 were treated propolis in chitosan and hydroxypropyl methylcellulose coating solution and stored at 4°C. Survivors of Listeria monocytogenes and Escherichia coli O157:H7 over storage were determined at days of 0, 3, 6, 9, and 12.

Results

Bacteriophages were stable in chitosan and hydroxypropyl methylcellulose coating solution except Salmonella-specific bacteriophage in chitosan coating solution over 7days. Counts of Listeria monocytogenes and Escherichia coli O157:H7 on propolis treated beef and lettuce were reduced by 2-5 log reductions after 12 day storage.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Culinary workshop participants passing the examination to become a Certified Culinary Scientist

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The energy required for drying rice has been reported to account for over 50% of the total energy consumed for production and processing of rice. Many factors can impact the amount of energy used in removing sufficient water from harvested rice in order to render it safe from respiration and microbiological impacts. Little information exists on the amount of energy required for rice drying in on-farm driers, and the factors that determine the efficiencies of these driers.

What has been done

Energy use and efficiency of an on-farm, cross-flow dryer located in Pocahontas, AR were measured by performing five tests during the harvest season of 2011 and three tests during the harvest season of 2012. Thermal energy requirements were expressed in terms of energy per unit mass water removed, by dividing the energy requirements of the burner by the total mass of water removed for each drying run. Thermal energy efficiency was calculated as the ratio of theoretical energy requirements to the measured energy requirements.

Results

Thermal energy use to dry rice in the on-farm dryer ranged from 2,840 to 5,840 kJ/kg water removed for the eight tests conducted during the 2011 and 2012 harvest seasons. Thermal energy efficiency ranged from 44% to 90%. The cost to dry rice from the initial moisture contents, ranging from 16.6 to 21.7%, to ~13% ranged from 7.7 to 12.0 ¢/kg water removed. There was a strong correlation between energy use and ambient air temperature. It was also found that energy use was linearly correlated to the difference between the drying air temperature and ambient air temperature, which is an indicator of the energy required to heat air to the drying temperature. Equations were developed to predict energy use, efficiency, and drying cost, such that management decisions can be made in regards to variables such as when drying is conducted during a day, or the impacts of harvesting at various moisture contents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

Outcome #11

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Around 34.5% of adult Arkansans were recently reported as obese, which ranks Arkansas as the third most obese state in the US, behind Louisiana (34.7%) and Mississippi (34.6%). The US obesity epidemic has resulted in significant levels of related diseases, such as cancer, heart disease and type-2 diabetes. However, studies have shown that about three grams daily of dietary conjugated linoleic acid (CLA) confers great human health benefits in reducing the clinical indicators of these diseases. This includes improving immune function and promoting weight loss in obese persons. Nevertheless, it is difficult to obtain sufficient CLA in a healthy diet to realize these clinical benefits.

Dietary CLA is produced primarily by cow rumen fermentation and is present in beef and milk fat at low levels of around 0.2-1%. However, about 3 grams of CLA needed to be consumed daily to obtain the related health benefits. Unfortunately, obtaining the optimum level of CLA by increasing consumption of beef and dairy products would also necessitate a substantial increase in dietary intake of saturated fat and cholesterol, which would be highly undesirable. Therefore, there is a need for commonly consumed foods that contain high CLA levels and are low in saturated fat and cholesterol to be commercially available. This would then enable the average consumer to easily obtain the optimum dietary CLA levels to minimize the risk of acquiring obesity related diseases.

Soy oil is a major Arkansas commodity and the primary US vegetable oil. It contains 50% linoleic acid, is low in saturated fat and is cholesterol-free. Therefore, if soy oil linoleic acid were converted to CLA it could be a significant dietary source of CLA.

What has been done

We have adapted equipment originally designed for oil hydrogenation to produce a legally "trans

free," 20% CLA soy oil, without using hydrogen gas or hydrogenation. We are collaborating with Riceland Foods to ensure the processing conditions and processing aids are compatible with commercial practices to enable industrial hydrogenation units to be adapted for this purpose. Furthermore, in the last year processing costs have been reduced by lower processing aid doses and using inexpensive reagents. Time and temperature processing conditions have also been modified to be compatible with industrial practices. This was achieved by using statistical optimization experimental design and modeling techniques.

Soy CLA-rich oil was used to produce margarine, shortenings and chocolate products. Soy CLA rich oil can also mimic the functionality of saturated fat and thus serve as "saturated fat substitute." Therefore, CLA-rich oil not only provided health benefits associated with CLA, but also could serve as a saturated fat replacer. Therefore, the novel CLA-rich oil has the potential to replacing hydrogenated fats and providing the health benefits of CLA.

Incorporating CLA-rich oil into poultry feed not only significantly increased egg CLA levels but also increased the egg quality in terms of yolk height, color and viscosity. The CLA-rich egg's desirable physical properties were used to enhance mayonnaise salad dressing quality.

Results

A US patent for CLA rich oil production was obtained and a provisional utility patent has been filed that describes recent process improvements. This CLA-rich soy oil produced by this technology would allow consumers to obtain the clinically effective daily intake of CLA to combat obesity related diseases. A half ounce serving of 20% CLA oil would provide 3.1g CLA/day and a typical 7 g serving of CLA-rich margarine will provide 0.6g CLA. Thus, 5 margarine servings will provide the required 3.2 g/CLA day with only 185 calories/day, which is well within the maximum recommended 700-980 fat calories/day. In contrast, an 8 ounce serving of beef or milk will only provide 0.27g and 0.06g of CLA, respectively.

This CLA-rich soy oil provides consumers with nutritionally significant amounts of CLA in a variety of foods, while enhancing the food textural properties and providing a potential alternative to hydrogenated fats. The importance of this finding has increased with the FDA proposed revocation of the GRAS status for partially hydrogenated oils.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	9

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

The Institute of Food Science & Engineering (IFSE) and the Cooperative Extension Service in the Department of Food Science at the University of Arkansas in Fayetteville assists small food processing companies and entrepreneurs by providing technical assistance in several areas. The use of the Arkansas Food Innovation Center (AFIC) has provided the platform which to help entrepreneurs. This past year we have conducted several workshops providing training to entrepreneurs in many areas. A three-phase workshop was held in Fayetteville in spring and three one-day workshops were given in Little Rock, Pine Bluff and Forrest City.

Results

The AFIC currently has approximately twenty active entrepreneurs using the facility. With this growth of the AFIC by entrepreneurs, some entrepreneurs are beginning to outgrow the AFIC which are success stories in the making.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

Number of young participants who increase consumption of foods recommended by the dietary Guidelines for Americans.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	7032

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over 38% of school-aged children in Arkansas are overweight or obese. Arkansas children and teens are falling short of nutrition and physical activity recommendations. Approximately sixty-percent (288,969) of Arkansas students receive free and reduced price lunches.

What has been done

SNAP-Ed partners with schools in which 50% or more of students receive free and reduced-price meals. Nutrition education is delivered in classrooms, school gardens, cafeterias, after school programs and summer programs. Lessons emphasize MyPlate guidelines, Arkansas grown foods, physical activity and food preparation. Information and recipes are sent home to parents to reinforce what the children are learning. In FY15, SNAP-Ed nutrition educators worked with 224 schools in 63 counties to deliver 9,858 nutrition lessons.

Results

School-aged children who participated in SNAP-Ed school nutrition programs were surveyed. As a result of SNAP-Ed in schools, Arkansas students made the following improvements in 2015:

75% (4688/6245) reported increased knowledge about Arkansas foods.

75% (807/1071) reported improved food preparation skills.

72% (4109/5671) reported they intend to follow MyPlate guidelines.

57% (4775/8371) reported they gained knowledge of MyPlate.

39% (3194/8183) reported eating closer to the recommended amount of vegetables.

36% (2082/5814) reported decreased consumption of sugar sweetened beverages.

4,390 parents of school-aged children who participated in SNAP-Ed school nutrition programs

were surveyed. As a result of SNAP-Ed in schools in 2015, Arkansas families reported the following:

- 82% reported their child talked to them about healthy foods and snacks.
- 78% reported their child talked to them about being physically active.
- 75% reported their child asked for more or different fruits, vegetables, milk, or yogurt.
- 70% reported their child is more willing to try new foods.
- 57% made changes in their family's eating as a result of what their child learned.
- 63% serve more water
- 52% serve less sugary drinks
- 53% serve less sugary foods
- 17% switched to whole grains
- 49% serve more dairy
- 41% serve lowfat or fat free milk
- 33% serve vegetables they haven't tried before
- 30% serve fruits they haven't tried before
- 55% serve more vegetables
- 59% serve more fruit

What SNAP-Ed youth are saying:

"I am drinking more water and drinking less soda, Thanks for the water bottle!" ~5th grade student, Craighead County

"I've started eating snap peas since you brought them to class for us to try." ~6th grade student, Cleburne County

"I changed the way I look at my plate as something needs to be healthy not just good." ~Youth Participant, Lonoke County

"We learned new food choices and healthy snacks we can make at home." ~Youth Participant, Pulaski County

What SNAP-Ed Parents are Saying:

"My kids now come home with recipes that they want to cook or make for me. With them interacting and preparing it themselves, they enjoy eating healthier. It has been a great program." ~Ashley County SNAP-Ed Parent

"We eat better, got our sugar under control and the adults in the house have lost weight!" ~White County SNAP-Ed Parent

"My son is excited and eager to shop for new fruits & veggies after learning about them at school- not just learning, but the hands on making snacks & trying them at school. We have tried many more because he seeks them out at the store." ~Miller County SNAP-Ed Parent

"My child and I are both more willing to try fruits & vegetables with meals & as snacks and are more active." ~Crittenden County SNAP-Ed Parent

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
806	Youth Development

Outcome #14

1. Outcome Measures

Number of children who increase physical activity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4715

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #15

1. Outcome Measures

Number of adults who improve food preparation skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	890

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

Number of participants who decrease sodium intake

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1705

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #17

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3372

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Arkansas, 69% of adults are overweight or obese, 11.5% have diabetes, 42% have high blood cholesterol and 39% have high blood pressure. Research shows that even small changes in diet and small decreases in weight can lower the risks for diabetes, heart disease and hypertension.

What has been done

Multiple educational approaches were used to respond to issues related to chronic illness and obesity. Healthy weight classes were offered in 6 counties. Participants learned to plan healthy meals, balance calorie intake with calorie expenditure, read food labels, reduce portion sizes and decrease fat and sodium intake. Cooking classes offered in 20 counties helped people learn skills that enable them to plan and prepare healthier meals at home. Participants learned to cook using healthier techniques, eat more locally grown foods and save money by eating at home more often. Thirteen counties offered programs to help 232 people with diabetes better manage their disease. General nutrition programs were offered in 19 counties. Programs focusing on healthy weight, diabetes self-management and choosing and preparing healthy foods resulted in 19,864 contacts through 2,632 direct education methods. Programs provided to adults through the Expanded Food and Nutrition Education Program resulted in 66,834 direct education contacts through 15,060 educational sessions.

Results

Of adult participants in general nutrition programs and EFNEP programs who were asked:

91% reported improvements in one or more nutrition practice

62% reported increased fruit and/or vegetable intake

54% reported increased lowfat or fat-free dairy intake

37% reported increased whole grain intake

Of participants in healthy weight programs who were asked:

100% reported decreasing weight

71% reported decreased blood pressure

43% reported decreased blood glucose

43% reported lower blood cholesterol

Changes like these can reduce the risk for diet-related chronic diseases and save participants money. Programs that help Arkansas reduce weight and improve health can reduce health care costs. Health experts estimate that every \$1 invested in proven community-based disease prevention programs could save Arkansas ~\$5 in future health care costs.

What participants are saying:

"This program has helped me to get off pain medicine and better control my blood pressure. It gave me the tools to control my weight. I can read labels and identify different sugars. I dropped a size in my clothes and lost 10 pounds." ~ Healthy Weight participant, Ashley Co.

"As a diabetic I feel I am always fixing and eating the same foods. After attending the Living Well with Diabetes class, I have cooked two of the recipes sampled in class!" ~ Living Well with Diabetes participant, Jackson Co.

"I am thrilled that I am able to learn a healthier way of cooking. This class is making a huge difference in the way I prepare food." ~ Mediterranean Cooking participant, Miller Co.

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1278

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #19

1. Outcome Measures

Increased understanding of food safety issues in imported catfish and catfish-like products as compared to U.S. farm-raised catfish by public agencies, the aquaculture industry, and the general public

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fish and seafood products are among the most traded foodstuffs worldwide and their international trade is rapidly increasing. There have been significant changes observed in the composition of U.S. seafood consumption over time. The fierce price competitions from relatively cheaper imported products have turned out to be a barrier for growth of various segments of the domestic industry. This has continued to pose challenges to the domestic industry as today seafood imports capture almost 94 percent domestic market share.

Considering the importance of the catfish sector and its essential role as a source of food and creator of employment and income in the U.S., there is a need for a more focused, specific and comprehensive analysis of the possible future of fish production, demand, trade, prices and key factors that might influence supply and demand which can be of additional guidance in developing strategic domestic and trade policies. Moreover, the review of past research related to aquaculture reveals a strong production focus, leaving many marketing (demand side) questions unanswered.

What has been done

The Aquaculture/Seafood Marketing team at UAPB developed several pragmatic economic models and analytical tools that can be used to produce thorough analyses of seafood markets at regional, national and global levels. At the global level, the UAPB team collaborated with the International Food Policy Research Institute, the World Bank Group and the Food and Agriculture Organization of the United Nations under a project "Fish to 2030 Project" to forecast the commodity supply, demand and trade in the next 15 years for 115 countries/regions, including the United States. The global study focused on 16 fish species categories and two fish products (fishmeal and fish oil), but also included 45 other agricultural commodities.

At the regional and national levels in the United States, the team analyzed consumers' preferences for seafood products based on weekly scanner data from ten regional markets, and developed a U.S. fish supply, demand and trade simulation model (USFish model). This study marries the consumer preference and market modeling literature to capture the complex dynamics of the U.S. seafood market, particularly the catfish segment. The study had four main

activities. The first explored the current trends in the seafood retail markets based on the available scanner data that includes Wal-Mart data. The second analyzed implicit prices of seafood product attributes and the effect of marketing activities on seafood prices. The third developed a U.S. fish supply, demand and trade simulation model (USFish model). Lastly, the fourth generated projections of the U.S. catfish supply, demand and trade using the USFish model and recommended policies and strategies based on the findings of the study.

Results

Modeling results reveal that per capita seafood consumption in the U.S. is expected to increase over the next 15 years or so. Under the business-as-usual scenario (if current trends continue), U.S. consumers are likely to meet their increased demand for seafood by imported products, which is relatively cheaper in price, and will probably decrease their consumption of U.S. farm-raised catfish during the period up to 2030. In order to expand the market for U.S. farm raised catfish products in the United States, there is a need for marketing strategies that favor product distinctiveness and branding (independently or co-labeling with retailer) as well as identifying segments of market that are willing to pay a price premium for the U.S. farm-raised catfish products.

The team shared the findings with various sections of the aquaculture/seafood industry within the U.S. and to some extent globally. Based on these findings, several U.S. aquaculture farmers and processors have started redesigning their business and marketing plans to expand their market size and share. Researchers at Harvard University invited the UAPB team to use some of the models to investigate the impact of aquaculture on nutrition in developing countries.

4. Associated Knowledge Areas

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

Outcome #20

1. Outcome Measures

of adult participants who reported they less often run out of food before the end of the month following completion of a nutrition education program.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With an estimated population of 2,966,369 Arkansas is ranked 2nd in the nation for household food insecurity at 19.9% or 590,307 at risk individuals. Arkansas is ranked 1st in the nation for households with very low food security at 8.1%. Not surprisingly Arkansas has high childhood food insecurity rates at 28.4%. That means that one-fifth of households and over one-quarter of Arkansas' children are not sure where their next meal is coming from. Associated with adverse health outcomes, including behavioral problems in children and obesity and type 2 diabetes in specific subpopulations of adults, food insecurity has the potential to negatively impact a wide range of individuals and activities.

What has been done

The University of Arkansas System Division of Agriculture Cooperative Extension Service's Supplemental Nutrition Assistance Program - Education (SNAP-Ed) and Expanded Food and Nutrition Education Program (EFNEP) were delivered in provide Arkansas' most vulnerable families and youth with hands-on opportunities to address food security challenges. With goals to teach food resource management and address food security issues SNAP-Ed and EFNEP aimed to increase knowledge and influence behaviors such that food security is improved among participants.

Results

Over 2000 adults were surveyed by the University of Arkansas System Division of Agriculture Cooperative Extension Service regarding their personal food security. Adults who received nutrition education from the federal grant programs, SNAP-Ed and EFNEP, that target low-income individuals, reported improved food security. For example 47% or 833 of 1878 EFNEP adult graduates reported they less often ran out of food before the end of the month after receiving education and 51% of SNAP-Ed participants that were surveyed or 208 individuals reported less often running out of food before the end of the month as a result of participating in a SNAP-Ed program.

4. Associated Knowledge Areas

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

Outcome #21

1. Outcome Measures

Number of studies conducted to better understand factors affecting childhood obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Strategies that encourage the consumption of healthier foods such as fruit and vegetables may be one way to address childhood obesity. Children and adolescents in the United States do not consume the recommended amounts of fruits and vegetables. The United States Department of Agriculture (USDA) guidelines recommend that children eat 6 to 13 serving of fruits and vegetables each day, but earlier work shows that US children only eat 3.5 servings per day on average.

What has been done

Researchers in the UA Division of Agriculture collaborated with the Arkansas Center for Health Improvement to examine whether participation in USDA's Fresh Fruit and Vegetable Program can prevent weight gain among Arkansas public schoolchildren. The FFVP program is intended to increase fruit and vegetable consumption among students in the nation's poorest elementary schools by providing reimbursement to schools for offering fresh fruits and vegetables, free to students, during the school day and separately from lunch and breakfast meals. To assess the FFVP program, the researchers used a unique multi-year, statewide dataset of public-school body mass index (BMI) screenings. Findings, published in the peer-reviewed journal: Applied Economic Perspectives and Policy, show a clear benefit to program participation in terms of statistically lower BMI measures among participating children and a three percentage point reduction in obesity rates among participating schools.

Results

Among the low-income FFVP schools examined in the study, the school-level obesity rate was around 20 percent. Thus the negative 3 percentage point difference attributable to FFVP participation translates into a 15 percent reduction in overall obesity rate for these schools. This is a meaningful dent in the childhood obesity problem by any measure. The study concludes that the benefits of FFVP participation are economically meaningful, especially considering that the cost for each student in participating schools has been estimated to be only \$50 - \$75 per year.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Recent food safety "outbreaks" have heightened concern among the public about the safety of, not only processed and restaurant food, but also fresh foods in the store or from local growers. This has led to increased government regulations such as the Food Safety Modernization Act, which has created a still confusing litany of potential on-farm rules, certification standards, and so forth. We have responded with improved certification and on the farm safety information for producers, but lack of capacity has hampered our efforts. This is further complicated by changes in farm worker populations, where many immigrant workers in the state have to be engaged in their first language. Increasing public priorities in local foods, community food systems, and farmer markets - and the resulting programmatic and economic factors associated with these movements will continue to create additional demand on our limited resources. We plan to continue our food service safety programs, and hope that public policy changes will help in this arena over time.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Food Security:

- 61% (1187 of 1945) of EFNEP adult graduates more often planned meals in advance.
- 52% (1007 of 1941) of EFNEP adult graduates more often compared prices when shopping.
- 47% (883 of 1878) of EFNEP adult graduates less often ran out of food before the end of the month.
- 56% (1076 of 1935) of EFNEP adult graduates more often used a list for grocery shopping.
- Of 1767 reports average EFNEP adult graduate cost savings per month was \$12.80 per participant.
- 51% (421 of 887) of surveyed EFNEP 6th-8th grade youth improved in their responses

to: Using measuring cups and spoons?

- 35% (316 of 886) of surveyed EFNEP 6th-8th grade improved in their responses to: Following directions in a recipe?
- 46% (21 of 44) of surveyed EFNEP 9th-12th grade improved in their responses to: In the last month, if your family did not have enough food, how often did you help by going to a food pantry or finding other free or low-cost food resources?
- 51% (208 of 407) of surveyed SNAP-Ed adults reported less often running out of food before the end of the month as a result of participating in a SNAP-Ed program.
- 56% (370 of 655) of surveyed SNAP-Ed adults reported saving money on groceries as a result of participating in a SNAP-Ed program.

Food Safety

- 28% (510 of 1853) of EFNEP adult graduates more often followed the recommended practices of not allowing meat and dairy foods to sit out for more than two hours. Furthermore 50% (922 of 1853) ALWAYS follow the recommended practice.
- 55% (1036 of 11893) of EFNEP adult graduates more often followed the recommended practices of not thawing foods at room temperature. Furthermore 15% (279 of 1893) ALWAYS follow the recommended practice.
- **77% (173 of 289) of surveyed SNAP-Ed adults reported adopting one or more food safety practice as a result of participating in a SNAP-Ed program.**
- **75% (3093 of 4271) of surveyed SNAP-Ed youth reported or demonstrated they more often practice personal hygiene such as hand washing as a result of participating in a SNAP-Ed program.**
- 73% (1778 of 2405) of surveyed 4-H participants reported or demonstrated they more often practice personal hygiene such as hand washing.
- 73% (271 of 463) ServSafe® Managers course participants received certification.
- 100% (82 of 82) ServSafe® Food Handler course participants completed the Food Handler Course Assessment and received the course completion certificate.
- 563 food preservation workshop attendees indicated they intended to adopt at least one food preservation practice following an education, class seminar or workshop.

Childhood obesity

For youth EFNEP uses age appropriate evaluation tools with K-2nd using the same tool, 3rd-5th using a different tool, 6-8th using a different tool, and finally 9th-12th is using a different tool. Every state uses the same evaluation tool as required by our Federal partners. Food resource management and food security are only assessed in the 6-8th grades and 9-12th grades, respectively.

For EFNEP youth outcomes:

- 77% (3026 of 3913) Children and youth improve their abilities to choose foods according to the Federal Dietary Recommendations or gain knowledge
- 46% (1799 of 3903) Children and youth improve their physical activity practices or gain knowledge

For SNAP-Ed, process evaluation is critical because it allows ongoing monitoring of the program and enables timely refinements which help achieve success. Process evaluation activities include tracking the number of SNAP-eligible and potential eligibles reached, the number of materials distributed at educational displays and the number of events and methods used to reach the target audience. SNAP-Ed reports planned events in the UACES Arkansas Information Management System (AIMS) online electronic reporting system.

Formative evaluation assures the best possible program by identifying appropriate target audiences and ensuring program messages and activities are relevant and meaningful to them. Methods used to evaluate the program include observing participant behavior,

informal talks with the participant about the educational activity, giving short surveys, holding group discussions with participants to gain feedback to assess a project as it progresses or to determine improvements and adjustments needed to attain the program objectives.

Outcome/impact evaluation is conducted with direct contact programs. Pre-and post-tests or post-then pre-tests are used to assess knowledge, attitude, and behavior change among youth and adults. A series of evaluation questions are in place for county agents to use to develop appropriate questionnaires that fit their programs and are aligned with UACES outcome/impact indicators. For SNAP-Ed. Youth, evaluations collect information on knowledge gain and diet and physical activity practices.

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

- 72% reported they intend to follow MyPlate guidelines
- 36% reported eating closer to the recommended number of cup equivalents from the fruit group most days
 - 39% reported eating closer to the recommended number of cup equivalents from the vegetable group most days
 - 36% reported eating closer to the recommended number of ounce equivalents of whole grains most days
 - 35% reported eating closer to the recommended number of cup equivalents of low fat or fat free foods from the dairy group most days
- 30% reported increasing physical activity or reduced sedentary time
- 28% reported understanding the importance of balancing food intake and physical activity
- 36% reported decreasing consumption of sugar sweetened beverages
- 75% reported increased knowledge about Arkansas foods
- 75% reported improved food preparation skills

Key Items of Evaluation

In 2015 for Arkansas EFNEP 100% of adult graduates and 100% of youth graduates complete pre- and post- evaluations. For adults' data is collected using a national tool called the Behavior Checklist. The Behavior Checklist asks a set of 10 plus three additional questions specific to Arkansas EFNEP. Included in the Behavior Checklist and specific to food security is the Food Resource Management Domain and a one item Food Security question. In Arkansas the Food Resource domain has been checked for reliability and showed good internal consistency (Cronbach's alpha >0.7). Additionally a 24-hour dietary recall is collected at the first lesson and after the last lesson to assess changes in diet quality. The 24-hour dietary recall is delivered by a trained peer educator using a 2-pass method and collecting the previous 24 hours' food intake. Adult participants are additionally asked the amount they spent on food last month both pre- and post- education. For youth EFNEP uses age appropriate evaluation for children and youth in Kindergarten through the twelfth grade. Every state uses the same evaluation tool as required by Federal partners. Food resource management and food security are only assessed in the 6-8th grades and 9-12th grades, respectively.

For SNAP-Ed evaluation adults are surveyed frequently using a pre- and post- methodology. Youth evaluations specific to food security and food resource management are not collected.

For food insecurity key evaluation items for adults are:

Food resource management:

- How often do you plan meals ahead of time? (EFNEP)
- How often do you compare prices before you buy food? (EFNEP)
- How often do you show with a grocery list? (EFNEP)
- Saving money on groceries as a result of participating in a SNAP-Ed program. (SNAP-Ed)

Food insecurity:

- How often do you run out of food before the end of the month? (EFNEP and SNAP-Ed)

Change in dollar amount spent on food:

- Amount spent on food last month: (EFNEP)

For food insecurity key evaluation items for youth are:

- How confident are you in using measuring cups and measuring spoons? (6th-8th)
- How confident are you in following directions in a recipe? (6th-8th)
- In the last month, if your family did not have enough food, how often did you help by going to a food pantry or finding other free or low-cost food resources? (9th-12th)

ServSafe® training is evaluated using pass rates for the ServSafe® Food Safety Program for Managers Exam. Test takers must pass the exam with a minimum a score of 75% to show competency to earn a 5 year ServSafe® Managers Certification.

In 2015 for Arkansas EFNEP 100% of adult graduates and 50% of enrolled youth complete pre- and post- evaluations. For adults' data is collected using a national tool called the Behavior Checklist.

The Behavior Checklist asks a set of 10 plus three additional questions specific to Arkansas EFNEP. Included in the Behavior Checklist and specific to food safety is the Food Safety Domain which includes two questions. For youth EFNEP uses age appropriate evaluation tools with K-2nd using the same tool, 3rd-5th using a different tool, 6-8th using a different tool, and finally 9th-12th is using a different tool. Every state uses the same evaluation tool as required by our Federal partners. Food safety is evaluated for all ages of youth.

For SNAP-Ed evaluation adults are surveyed, frequently using a pre- and post- methodology. SNAP-Ed and 4-H youth evaluations for food safety use a one item survey tool and similar to adults pre- and post- methodology is encouraged.

For Childhood obesity, key evaluation items included:

Youth

Increase knowledge concerning one or more healthy food/nutrition choice

Adopt one or more healthy food/nutrition practice

Eat nearer to the recommended number of cup equivalents from the Fruit and/or Vegetable Group

Eat nearer to the recommended number of cup equivalents from the Dairy Group

Eat nearer to the recommended number of cup equivalents from the Grains Group

Engage more often in regular physical activity

Increase ability to balance calories from food and beverages with calories expended

Improve food preparation skills

Parents

Do you eat/serve more fruits?

Do you eat/serve more vegetables?

Do you try fruits you have not tried before?

Do you try vegetables you have not tried before?

Do you eat or drink/serve more dairy (milk, yogurt)?

Do you drink/serve low-fat or fat-free milk?

Have you switched from white bread/pasta to whole grain?

Do you eat/serve high fat or fried foods less often?

Do you eat/serve sugary foods less often (candy, cookies, sugar-coated cereal, honey buns)?

Do you drink/serve sugary drinks less often (soda, sweet tea, fruit punch)?

Do you drink/serve more water?

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Increasing Opportunities for Families & Youth

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
607	Consumer Economics	5%	0%	22%	0%
723	Hazards to Human Health and Safety	10%	0%	0%	0%
724	Healthy Lifestyle	10%	0%	14%	0%
801	Individual and Family Resource Management	10%	0%	0%	0%
802	Human Development and Family Well-Being	10%	45%	25%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%	0%	1%	0%
805	Community Institutions, Health, and Social Services	10%	55%	0%	0%
806	Youth Development	35%	0%	1%	0%
902	Administration of Projects and Programs	0%	0%	10%	0%
903	Communication, Education, and Information Delivery	0%	0%	27%	0%
	Total	100%	100%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	132.2	1.3	1.8	0.4
Actual Paid	131.9	3.6	13.3	0.0
Actual Volunteer	274.6	0.4	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1904205	298921	19473	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1907059	358336	1117620	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
14122946	0	805178	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Health and Aging

Extension Health and Aging programs aim to improve health at every stage of life by educating and engaging Arkansans to address locally relevant health issues. Programs like Extension Get Fit, which includes Strong Women & Men, Walk Across Arkansas, and Fit in 10, help young and old Arkansans increase physical activity, improve health, and improve quality of life. The Extension Wellness Ambassador Program trains and engages community volunteers to address local health issues by implementing projects and conducting health improvement activities. Programs like Keys to Successful Aging help older Arkansans extend productivity and independence into later life. Extension Health and Aging programs work 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

Strengthening Families

The need for quality care for Arkansas's children is greater than ever. To provide the best care possible, Arkansas's child care professionals are required to get a minimum of 15 hours per year of verified training to maintain their licensure Best Care, Best Care Connected, and Guiding Children Successfully programs provide Arkansas's child care professionals with the verified training they need in multiple formats (i.e., face-to-face, online, & self-guided) to accommodate different learning styles and work schedules.

A key to happiness in family life is learning how to be an emotionally healthy individual, a good partner, and an effective parent. In-person and Web-based educational resources and training are provided in the areas of personal well-being, couple relationships, and parenting.

People are spending more time than ever before surfing the Web, checking emails, and using social media outlets. To better reach this audience, we also focused much of our effort on providing Arkansans with quality, research-based family life education online.

Family Economics

Arkansas had the 7th highest poverty rate (18.7 percent) in the country. Pockets of extreme poverty remain throughout the state, and 16 counties in the state had a poverty rate 25 percent or greater. Extension conducted its programming through a network of local offices in each of Arkansas' 75 counties. Extension educators are adept at reaching these audiences and disseminating information via methods and locations that meet the needs of our target audiences.

Empowering Youth

In 2015, 4-H Clubs across Arkansas involved young people in hands-on education and service learning opportunities that enhanced their life skills, such as decision making, learning to learn, leadership, and communication. The Division of Agriculture partnered with communities, schools, and other agencies to address major issues facing Arkansas youth.

2. Brief description of the target audience

- Employers and Employees
- Consumers
- Farmers - regardless of agriculture enterprise or means capability or ethnicity
- Health Professionals
- School personnel
- Child Care Providers
- Adults
- Youth
- Entrepreneurs, Hotel management, Restaurant management
- Master Gardeners, Extension Homemakers (Councils), County Extension Councils
- Military Families
- Homeowners
- State and Federal Agency Personnel
- General Public
- Project and program funding organizations
- Public Health Officials
- Policy Decision-makers
- Civic leaders and organizations
- Married couples or those considering marriage
- Business leaders - Industry, small, large, rural, urban, consultants and other
- Parents, Grandparents, caregivers, volunteers, 4-H members
- Low income youth
- Minority youth and families living in public housing

3. How was eXtension used?

eXtension was used as a resource for reference materials, program ideas, and training modules. Extension educators were encouraged to utilize eXtension to expand outreach efforts, Clientele were referred to eXtension for additional information. uaex.edu webpages link to several resources on Financial Security eXtension pages.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	754247	230577	449643	73825

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	17	6	23

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2015	687

Output #2

Output Measure

- Number of educational products and materials developed or updated for print, electronic media, radio, podcasts or display

Year	Actual
2015	547

Output #3

Output Measure

- Number of clientele in individual & family resource management programs

Year	Actual
2015	13957

Output #4

Output Measure

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

Year	Actual
2015	376575

Output #5

Output Measure

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

Year	Actual
2015	161877

Output #6

Output Measure

- Web content utilization data tracking including hits, clicks and content utilized

Year	Actual
2015	156372

Output #7

Output Measure

- Number of Health and Aging programs delivered

Year	Actual
2015	4653

Output #8

Output Measure

- Number of participants in Health & Aging programs

Year	Actual
2015	53464

Output #9

Output Measure

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

Year	Actual
2015	3037416

Output #10

Output Measure

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

Year	Actual
2015	48555

Output #11

Output Measure

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

Year	Actual
2015	19152

Output #12

Output Measure

- Number of youth participating in community service and volunteering

Year	Actual
2015	4312

Output #13

Output Measure

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

Year	Actual
2015	0

Output #14

Output Measure

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

Output #15

Output Measure

- Number of students participating in ACS tournaments.

Year	Actual
2015	79

Output #16

Output Measure

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

Year	Actual
2015	966

Output #17

Output Measure

- Number of child care providers trained

Year	Actual
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2015 5430

Output #18

Output Measure

- Number of Extension Wellness Ambassadors graduates

Year	Actual
2015	8

Output #19

Output Measure

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

Year	Actual
2015	5885

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants (youth and adult) who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of leadership development education programs
2	Estimated dollar value of program support volunteers provide to the organization and communities (includes: EHC; 4-H, Jr. Master Gardeners; Leadership students, Young Scholars, etc.).
3	Number of program participants who indicate a change in behavior, based on lessons learned from University of Arkansas 1862 and 1890 sponsored Research and Extension programs
4	Number of participants who adopted at least one positive health practice
5	Number of participants reporting a reduction of at least one risk factor for chronic disease after completing a health education program
6	Number of youth engaged in community service and volunteerism.
7	Number of youth increasing awareness of community and community issues
8	Number of adopting behaviors to prevent injury prevention behaviors such as: seatbelt use, helmet use, distraction-free driving, ATV use, bicycle, shooting sports safety, etc.
9	Number of 4-H youth who increase knowledge of healthy food choices
10	Number of youth indicating healthy physical activity habits
11	Number of youth that practiced positive communication skills
12	Number of youth that increased their understanding of the consequences of risk behaviors
13	Number of youth that express interest and engage in sciences related activities (Young Scholars, 4-H Science, Arkansas Ag Awareness program and Aquaculture programs)
14	Number of Small Steps to Health & Wealth participants who report increased personal financial well-being
15	Number of Small Steps to Health & Wealth participants who report increased health well-being
16	Number of Small Steps to Health and Wealth participants who report behavior change
17	Number of adult participants who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of Extension Wellness Programs

18	Number of participants who changed at least one personal well-being, couple or parenting practice as a result of participating in family life programs
19	Number of child care provider training program participants who changed at least one behavior/practice.
20	Number of participants who intended to change at least one well-being, couple or parenting practice as a result of participating in family life programs.
21	Number of child care professionals who increased their knowledge as a result of child care professional programs
22	Number of participants improving functional fitness after participating in Extension Exercise program
23	Number of youth indicating improved eating habits

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	685

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code Knowledge Area

806 Youth Development

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	20083796

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Number of program participants who indicate a change in behavior, based on lessons learned from University of Arkansas 1862 and 1890 sponsored Research and Extension programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	19379

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of participants who adopted at least one positive health practice

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1857

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas is the least physically active state in the US and has the highest rate of adult obesity. Physically active Arkansans experience better health outcomes and lower healthcare costs than their sedentary counterparts. Limited access to fitness facilities and programs means rural citizens, who tend to be less healthy than those in urban areas, are geographically isolated from resources that could help them live healthier lives. The Extension Get Fit program is increasing access to physical activity and improving health.

What has been done

The Extension Get Fit Program uses a volunteer delivery model to expand access to group exercise classes for Arkansans across the state. In 2015, this program reached 54,395 participants with twice-weekly sessions. Participants improved upper body strength (77%), lower body strength (75%), aerobic endurance (69%), upper body flexibility (70%), lower body flexibility (76%), and agility and balance (73%). Participants also increased overall physical activity levels (93%), increased energy (89%), and decreased pain (50%).

Results

Extension Get Fit programs aim to improve overall fitness through strength training, which is shown to also increase bone density and reduce fall risk. Based on fitness test results, we estimate that Extension Get Fit programs contributed to healthcare cost savings totaling \$8.3 million for 2015, including hospitalization, treatment and rehabilitation cost savings from reduced fall risk alone.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

Outcome #5

1. Outcome Measures

Number of participants reporting a reduction of at least one risk factor for chronic disease after completing a health education program

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	739

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
802	Human Development and Family Well-Being
806	Youth Development

Outcome #6

1. Outcome Measures

Number of youth engaged in community service and volunteerism.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Student involvement in "very real projects and issues in their own communities can empower citizens, making them feel capable of affecting change" (Stoneman, 2002, p. 223). Opportunities to learn about citizenship and become involved play a critical role in the transition from adolescence to adulthood. Arkansas 4-H develops youth by engaging them to give back to their communities. Youth and adult partnerships to tackle locally-identified needs are a cornerstone of 4-H. Programs develop youth leadership skills and provide opportunities for youth to apply skills learned to improve their communities.

What has been done

In 2015, Arkansas 4-H received funding from the Arkansas legislature for program enhancement. Strategies included 1)County-based citizenship events, 2) Service learning activities, 3)Voter Education, 4)Leadership Initiatives, and 5) 4-H Day at the State Capitol. 200 youth attended the annual Teen Leader Conference that is planned, organized and instructed by youth. Subject matter included teens as teachers, stressors, public speaking, and Land Grant University history.

Results

More than 4,000 youth from 42 counties were engaged in citizenship educational activities at the county level. In 2015, 459 community service activities were conducted throughout the state by 4-H club members. The 4-H Day at the Arkansas Capitol had 432 youth participating in legislative functions alongside their State Representatives and Senators. One Day of Service - Twenty - three counties participated in projects that made a difference to communities and recipients: 1,110 total participants; 3500 hours donated; hours of time donated valued at \$74,760.00; 6,163 people directly reached.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Number of youth increasing awareness of community and community issues

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	349

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3009

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Serious ATV injuries affect more than 120,000 people each year in the United States. Arkansas ranks third in the nation in injury rates for those age 16 and under and averages more than 15 ATV-related deaths per year. Nearly 90% of ATV crashes in Arkansas occur with drivers under age 16 driving an adult-sized ATV. Recent research demonstrates that children under age 16 suffer a disproportionate share of injuries, do not wear helmets, and fail to receive formal ATV training.

What has been done

The Division of Agriculture has the capability to reach youth and adults in every county in the state with ATV Safety messages. The Division's 4-H Youth Development program offers the ATV Safety Institute's (ASI) RiderCourse program to help youth and adults learn to safely and properly ride ATV's. Twenty-seven Division faculty and staff are trained to teach the four-hour ASI ATV RiderCourse.

Results

In 2015, 224 youth and adults participated in the 29 ASI ATV RiderCourse classes and 2,785 Arkansans were reached with the 4-H ATV Safety message through 193 educational programs. This program is made possible through partnerships with many businesses, state agencies, and other organizations. In addition, school and community-based ATV safety educational programs are provided to clientele.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #9

1. Outcome Measures

Number of 4-H youth who increase knowledge of healthy food choices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1542

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #10

1. Outcome Measures

Number of youth indicating healthy physical activity habits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1228

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas youth suffer from a complex, two-pronged problem: hunger and obesity. Arkansas children rank second in the US for food insecurity and are among the most overweight or obese; 38% weigh in with health-threatening Body Mass Index numbers (CDC). USDA data indicate 19% of Arkansas households are food insecure. Children suffer a poverty rate of 30%, above the national average of 22% (US Census Bureau, 2012). The majority of Arkansas youth are not physically active; only 25% meet physical activity recommendations.

What has been done

4-H Healthy Living programs engage youth and their families in hands-on opportunities to enhance physical, social, and emotional well-being. The 4-H approach is holistic and promotes healthy eating, physical fitness, the capacity to recognize and direct emotions, and ability to develop and maintain positive social interactions and relationships. Efforts in Arkansas center around two main programs: 4-H Yoga for Kids and Healthy Lifestyle Choices. These programs help youth to develop an awareness and positive attitude about healthy living while increasing their knowledge, skills, and competencies in physical, social and emotional well-being.

Results

Youth healthy living programs, including Yoga for Kids, reached nearly 60,000 Arkansas students in 2015. Educators representing fourteen states received training as Yoga for Kids Instructors. The 236 instructors trained (107 in Arkansas) are increasing access to physical activity during the school day and afterschool hours. Youth healthy living participants reported healthy physical activity habits (71%) and positive attitudes toward physical activity (83%). Seventy-two percent

shared what they learned with their families, taking home the message that physical activity is important for health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #11

1. Outcome Measures

Number of youth that practiced positive communication skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2264

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #12

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	643

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #13

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	237479

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #14

1. Outcome Measures

Number of Small Steps to Health & Wealth participants who report increased personal financial well-being

Not Reporting on this Outcome Measure

Outcome #15

1. Outcome Measures

Number of Small Steps to Health & Wealth participants who report increased health well-being

Not Reporting on this Outcome Measure

Outcome #16

1. Outcome Measures

Number of Small Steps to Health and Wealth participants who report behavior change

Not Reporting on this Outcome Measure

Outcome #17

1. Outcome Measures

Number of adult participants who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of Extension Wellness Programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #18

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	896

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #19

1. Outcome Measures

Number of child care provider training program participants who changed at least one behavior/practice.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	5104

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research indicates that for every dollar spent on early childhood intervention and training programs, there is a \$2.50-4.00 return on investment (ROI). That means the ROI within the state of Arkansas for our early childhood professional training programs is between \$1.19 million and \$1.90 million annually. This return on investment is realized as early childhood professionals learn the latest research-based practices and implement them in their child care programs. They are also realized in the lives of the children who benefit from these practices by receiving better care and preparation to enter school.

What has been done

Best Care, Best Care Connected, and Guiding Children Successfully provide Arkansas' early childhood professionals with the verified training they need. The training programs are research-based and developed by subject matter specialists in the areas of child development, nutrition, health and safety, and resource management. Programs are delivered through Extension's statewide network so they are readily available to Arkansans in all 75 counties. In addition, training is available in multiple formats (i.e., face-to-face, online, & self-guided) to accommodate different learning styles and work schedules.

Results

In 2015, with a budget of \$475,000 in external funding, we trained 5,430 Arkansas early childhood professionals who successfully completed 44,479 hours of training through our three training programs. Our Best Care (face-to-face) program trained 2,797 professionals who completed 27,970 hours of training. Our Best Care Connected (online) program trained 1,367 professionals who completed 6,835 hours of training. Our Guiding Children Successfully (self-guided) program awarded 9,674 clock hours of training to 1,266 childcare professionals state wide. As a result of the training, 96% of program participants increased their knowledge of effective child care practices and 94% of participants adopted a recommended practice.

4. Associated Knowledge Areas

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

Outcome #20

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	13507

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #21

1. Outcome Measures

Number of child care professionals who increased their knowledge as a result of child care professional programs

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	12900

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #22

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2416

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #23

1. Outcome Measures

Number of youth indicating improved eating habits

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	41

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Clientele availability is a constant factor affecting programs attendance and participation in the Increasing Opportunities for Families and Youth. The Division CES programs are competing with other priorities for our target audience's time and attention. Club participation and project group attendance is a challenge due to the multiple extracurricular activities youth are engaged in or opportunities for engagement. Grant procurement and funding has shifted; thus causing programmatic shifts.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation Results

4-H Science

The 4-H Science program is the largest educational initiative area; of 475,963 educational contacts made in FY15, 237,456 or 50% were part of the science projects. Listed are some highlights reported by our county and state staff:

- 9,338 youth participated in this year's 4-H science programs.
- Of the 9,338 youth, 1,179 were involved in robotics, electricity or GPS programs.
- 311 volunteers were trained to conduct science related educational programs.
- Of the 779 youth surveyed using the 4-H Science Common Measures:
 - 92% of the 4-7 grade participants indicating interest, engagement, and positive attitudes toward science.
 - 91% of the 4-7 grade participants were able to apply science skills and abilities.
 - 98% of the 8-12 grade participants indicating interest, engagement, and positive attitudes toward science.
 - 97% of the 8-12 grade participants were able to apply science skills and abilities.
 - 94% of the 8-12 grade participants used science to better their communities.

Animal project areas represent the largest enrollment participation in the Arkansas 4-H program. In FY15, 110,247 youth contacts of 237,456 in the Science area were reported to animal science projects in the Arkansas 4-H Online system.

Highlights of the FY15 animal/poultry projects reported in AIMS:

- 7,362 participants reported an increase in knowledge and skills in one of the nine

project areas related to livestock or poultry.

- 39% reported increased knowledge and understanding of care, health, nutrition, breeding, selection, and marketing of livestock and poultry at the county level.
- 1,971 youth participated in public speaking, demonstration, tours, judging, and/or exhibition through the animal and poultry project areas.
- 600 agriculture-related programs were conducted at the county level for 4,722 youth participants.
- 1,209 youth participated in agriculture related contests at the county, district, and state levels.

Health and Aging

Extension Exercise Programs

- 54,395 Contacts
- Unduplicated Contacts 1,409
- Fitness Assessments (n=517)
- 75% Increased lower body strength
- 77% increased upper body strength
- 69% increased aerobic endurance
- 76% increased lower body flexibility
- 70% increased upper body flexibility
- 73% increased balance

Extension Wellness Ambassador Program

- 1,750 Contacts
- 8 new Ambassadors
- 24 retained
- 620 programs conducted by Volunteer Ambassadors
- 5,885 contacts through Ambassadors
- 3,087 volunteer hours reported by Ambassadors
- \$32,421 Value of in-kind donation for Ambassador Program

Keys to Embracing Aging

- 1,480 Contacts
- 27 Unduplicated participants
- 23 Completed evaluation
- 100% of participants who have a better understanding of how the choices they make today affect their health and well-being in the future, as a result of this program
 - 100% of participants who have a better understanding of how various lifestyle choices affect each other and why it is important to practice healthy behaviors across all aspect of life (e.g., financial problems affect health status and vice versa), as a result of this program
 - 100% of participants who reduce one or more risk factors for chronic disease, as a result of this program

Marriage, Parenting, and Family Life

A key to happiness in family life is learning how to be an emotionally healthy individual, a good partner, and an effective parent. The University of Arkansas Cooperative Extension Service provides in-person and Web-based educational resources and training in the areas of personal well-being, couple relationships, and parenting.

In 2015:

- 1,568 participants in personal well-being programs. 1,321 indicated their knowledge of personal well-being increased and 1,225 committed to change at least one behavior or

practice to improve their well-being.

- 320 people participants in marriage and couple relationship programs. 292 indicated their knowledge of healthy marriage and couple relationships increased and 252 committed to change at least one behavior or practice to improve their relationships.
- 5,177 participants in parenting programs. 4,843 indicated their knowledge of effective parenting increased and 4,668 committed to change at least one behavior or practice to become more effective parents.

People are spending more time than ever before surfing the Web, checking emails, and using social media outlets, such as Facebook, Twitter, and Pinterest. To better reach this audience, we also focused much of our effort on providing Arkansans with quality, research-based family life education online.

- 18,804 webpage views and 14,955 unique visitors
- 76,812 in-direct contacts made through Facebook
- 2,135 subscribers to Navigating Life's Journey emails
- 145 subscribers to Navigating Life's Journey blog
- 100% of subscribers said the weekly emails are valuable to them
- 90% of subscribers said their lives and relationships are better as a result of the NLJ messages

Here is what some subscribers are saying about the impact of the NLJ emails:

"I like the short and to-the-point suggestions. These are timely, and manageable to put into immediate action. I feel validated in my efforts when I read and apply them!"

"Great quotes, inspiring and practical ideas to use in conversation and life with kids. Good ideas for activities and useful parenting advice. I look forward to reading every time I get it in my inbox."

"These emails give me 'big ideas' and topics that I can take home and talk about with my spouse and children. Thank you for helping to take big ideas from research and help us apply to everyday life."

Child Development

Provide training and resources to help Arkansas Child Care Providers better care for children. Each participant completed a Program Evaluation.

- 2797 Number of Participants in Best Care programs/classes
- 2797 Number of Best Care participants who completed program evaluation survey
- 2480 Number of Best Care participants surveyed who indicate their knowledge of child care issues has increased.
- 2291 Number of Best Care participants surveyed who will change at least one child care behavior or practice
 - 1367 Number of participants in Best Care Connected program/classes
 - 1288 Number of Best Care Connected participants surveyed who indicate their knowledge of child care issues has increased
 - 1222 Number of Best Care Connected participants surveyed who will change at least one child care behavior or practice
 - 1266 Number of participants in Guiding Children Successfully programs/classes
 - 1266 Number of Guiding Children Successfully participants who completed program evaluation survey
 - 1266 Number of Guiding Children Successfully participants who indicate their knowledge of child care issues has increased
 - 1266 Number of Guiding Children Successfully participants who will change at least one child care behavior or practice.

Key Items of Evaluation

Key Items of Evaluation

Special Issues in Health & Aging

- 7,052 Contacts
- 421 Unduplicated contacts
- 199 Surveyed
- 98% Increased Knowledge
- 81% Intend to adopt a new practice
- 67% Reported change of healthy lifestyle at 30 day follow-up

Marriage, Parenting, and Family Life

- For the education classes/workshops, the following items are evaluated:
- # of marriage, parenting and family life participants who indicate their knowledge has increased.
- # of program participants who indicated a (intent to behavior) change in behavior, based on lessons learned from Division of Agriculture sponsored Research and Extension programs
 - # of marriage, parenting, and family life participants who changed at least one behavior/practice
- For the Navigating Life's Journey articles, the following items are evaluated:
 - Are the NLJ emails valuable?
 - Is your life better as a result of the NLJ emails. If so, how?

Child Development

Participants receiving training in any of the Extension Early Care Education (Best Care, Best Care Connected, and Guiding Children Successfully) were evaluated based on:

- Participants who indicate their knowledge of child care issues has increased.
- Participants will change at least one child care behavior or practice.

Child Care Provider Education programs are delivered through Extension's statewide network so they are readily available to Arkansans in all 75 counties. Our programs are available in multiple formats (e.g. , face-to-face, online, and self-guided) to accommodate different learning styles and work schedules. The RAND Institute, in a review of benefits and savings of early childhood intervention programs, calculated that for every dollar invested in such programs, there is an estimated return of \$2.50 to \$4.00. That means that the return investment within the state of Arkansas for our child care professional training programs is between \$1.19 and \$1.90 million dollars. In 2015, with a budget of \$475,000 in external funding, 5,430 child care professionals successfully completed 51,886 hours of training.

As a result of the training, 96% of participants indicated their knowledge of effective child care practices increased and 94% of participants did something new to be a better child care professional.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Economic & Community Development

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	2%	0%	1%	0%
601	Economics of Agricultural Production and Farm Management	0%	0%	15%	0%
602	Business Management, Finance, and Taxation	47%	0%	1%	0%
603	Market Economics	0%	0%	2%	0%
604	Marketing and Distribution Practices	0%	0%	5%	0%
605	Natural Resource and Environmental Economics	12%	0%	1%	0%
606	International Trade and Development Economics	0%	0%	15%	0%
607	Consumer Economics	0%	0%	21%	0%
608	Community Resource Planning and Development	16%	0%	17%	0%
609	Economic Theory and Methods	0%	0%	1%	0%
610	Domestic Policy Analysis	4%	0%	12%	0%
702	Requirements and Function of Nutrients and Other Food Components	0%	0%	5%	0%
703	Nutrition Education and Behavior	0%	0%	2%	0%
724	Healthy Lifestyle	0%	0%	1%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	17%	0%	0%	0%
805	Community Institutions, Health, and Social Services	1%	0%	0%	0%
806	Youth Development	1%	0%	0%	0%
901	Program and Project Design, and Statistics	0%	0%	1%	0%
	Total	100%	0%	100%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	20.2	3.0	2.0	2.0
Actual Paid	20.8	0.0	14.1	0.0
Actual Volunteer	14.7	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
457929	0	213792	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
458616	0	1511175	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3396332	0	396547	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In the area of **Economic Viability and Sustainability:**

- Identify trends affecting Arkansas communities and regions.
- Help Arkansas communities and regions identify and implement innovative economic development strategies.
- Provide education and technical assistance to Arkansas businesses and entrepreneurs.
- Help local governments explore innovative solutions and optimize resources.

In the area of **Rural Infrastructure:**

- Provide tools for communities to assess infrastructure needs.
- Assist in identifying local, state and federal resources to address infrastructure challenges.
- Support communities' efforts to obtain and use information technologies, including broadband connectivity.

In the area of **Leadership and Community Involvement:**

- Provide leadership education for youth and adults.
- Assist local coalitions to develop and implement strategic plans.
- Work with communities and leaders to create environments that encourage innovation.
- Teach citizen involvement to enhance the vitality of Arkansas communities and regions.
- Engage diverse and under-served populations in civic involvement.
- Provide science-based information and education about public issues.

In the area of **Quality of Life:**

- Provide tools to help communities evaluate and enhance their quality of life assets and opportunities.
- Assist communities in quality of life marketing to targeted audiences.

In the area of **Population Composition and Change**:

- Inform policymakers and community leaders of pertinent population trends.
- Deliver programs that help leaders anticipate impacts of population changes.
- Develop and deliver programs for specific population groups based on demographic changes.
- Help Arkansans understand and address opportunities and challenges of the rural/urban interface.

2. Brief description of the target audience

Audiences vary by categories of activity (see above). For each activity we try to involve all stakeholders relevant to the topic at hand. The list below includes all audiences reached at some point during 2015; not all of the audiences are engaged during every activity.

- Attorneys
- Businesses/Industry - small, large, rural, urban, consultants, and other
- Producers - small, large, limited resource, retirement, and other
- Non-Farm private landowners
- Lenders
- Potential business owners (youth and adult)
- Elected officials - city, county, state, and federal
- Unelected community and business leaders
- Emerging and existing leaders
- Industry, trade and commodity organizations
- Civic, nonprofit, environmental, conservation, health and community organizations
- Organizational boards
- Federal, state and local policy makers - public agencies, administrators and other personnel
- Voters
- Research, extension and teaching professionals
- Educators
- General public
- Youth

3. How was eXtension used?

Use of eXtension varied depending on program and research needs of faculty and staff members. Several faculty members are members of one or more communities of practices (CoP). The portal was accessed periodically to see if information had been shared by others that could be used for a particular project. Faculty and staff also participated in webinars directly linked to or affiliated with eXtension, such as those offered on regional food systems. They have also promoted webinars that might of interest to internal or external clientele through social media and email.

The National Agricultural Law Center (NALC), which is housed at the University of Arkansas, and the Agricultural & Food Law Consortium continued to use eXtension extensively in FY15 as an information dissemination tool. The NALC serves as the lead institution for the Agricultural & Food Law Community of Practice, and the Agricultural & Food Law Consortium serves as the CoP Management Team. Consortium partners are members of other eXtension CoPs, which enhances collaboration between the Agricultural & Food Law CoP and other CoPs such as the Freshwater Aquaculture CoP and the Sustainable Energy CoP. Through the Agricultural & Food Law CoP, the NALC has developed and posted content, conducted several webinars on topics such as mandatory GM labeling, drones in agriculture, the Endangered Species Act, industrial hemp production, and animal welfare standards in aquaculture. These webinars have been well-attended and have reached a diverse audience of policymakers, Cooperative Extension

Service professionals, attorneys, and others throughout Arkansas and the nation.

In addition, nearly every grant application submitted by the National Agricultural Law Center contains an eXtension component. The NALC and its Consortium partners have developed a Call for Proposals that will provide priority funding to projects that support and incorporate eXtension. The Agricultural & Food Law CoP integrates with the NALC website on substantive areas, including but not limited to environmental law issues, direct marketing, landowner liability, and food law resources. The NALC continues to integrate its social media outreach activities to help draw new user-audiences to eXtension.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	123092	49718	4080	2218

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	99	0	99

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2015	56094

Output #2

Output Measure

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

Year	Actual
2015	45081

Output #3

Output Measure

- Number of grants and dollars received

Year	Actual
2015	1281574

Output #4

Output Measure

- Number of issue groups formed

Year	Actual
2015	1

Output #5

Output Measure

- Number of organized watershed groups
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of public meetings held for issue and watershed groups

Year	Actual
2015	10

Output #7

Output Measure

- Number of web hits on program-related web pages

Year	Actual
2015	83698

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants (youth and adult) who report conducting programs, community service projects, adopting new skills or accepting new leadership roles as a result of economic & community development programs
2	Estimated dollar value of program support volunteers (includes: EH; 4-H; Master Gardeners; leadership students; conferences; health fairs; spring cultural festival; etc.)
3	Total annual revenue generated as a result of government contracts received by APAC business clients
4	Number who indicate a change in behavior, based on lessons learned from economic & community development programs
5	Number who indicate new knowledge gained based on lessons learned from economic & community development programs
6	Number of Tax Preparers certified through Tax Schools
7	Number of floodplain managers certified
8	Number of voters who report being better educated about ballot initiatives as a result of public policy programs
9	Dollar value of grants and resources leveraged or generated by organizations, communities or regions as a result economic and community development programs
10	Number of organizational, community or regional plans adopted or implemented in conjunction with as a result economic and community development programs

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	685

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

To help resolve the social and economic problems in Arkansas communities, citizens must show initiative, responsibility, and exercise decision-making. Throughout our state there are some, but not enough, visionary yet pragmatic leaders: leaders bound by public needs and not political favors; leaders who serve their neighbors by serving their locality, state, and region.

What has been done

LeadAR is a two-year statewide leadership development programs. It consists of eleven three day seminars about issues that affect Arkansas, a ten day National Study Tour to another state and Washington, D.C., and an eleven day International Study Tour to another country. Leadership skills training is a part of every seminar agenda. Each participant also identifies a community service goal or project that they will take the leadership to accomplish during the two years of the program.

Results

There are currently five LeadAR alumni serving in the Arkansas State Legislature. Graduates have also gone on to become county judges, justices of the peace, mayors, and hold other local government positions. Examples of projects completed by the most recent class of graduates include creation of a high school leadership program; development of an online community resource directory; solicitation of funding to purchase city street signs; securing an agreement with a state agency to improve policies and procedures regarding foster youth; creation of an elementary school science center; creation of a temporary homeless shelter; establishment of a historical school restoration committee; and implementation of a "No Place for Hate" program in two schools.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #2

1. Outcome Measures

Estimated dollar value of program support volunteers (includes: EH; 4-H; Master Gardeners; leadership students; conferences; health fairs; spring cultural festival; etc.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	16581539

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
724	Healthy Lifestyle
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #3

1. Outcome Measures

Total annual revenue generated as a result of government contracts received by APAC business clients

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	44775341

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Changes in the economy, technology, and population continue to transform communities, the economic climate and the lives of Arkansans. While urban areas in Arkansas have mostly recovered from the Great Recession, rural areas have been slower to rebound. In a constantly changing economic environment, it is important for businesses to be able to identify and access new market opportunities.

What has been done

The Arkansas Procurement Assistance Center (APAC) is operated by the University of Arkansas System Division of Agriculture Cooperative Extension Service under a Cooperative Agreement from the Department of Defense (DOD) through a program administered by the Defense Logistics Agency (DLA). APAC provides statewide business consulting, counseling, contract assistance, and training services on how to participate with government contracting opportunities to both small and large businesses operating in all 75 Arkansas counties.

Results

in 2015, APAC assisted Arkansas companies in securing 688 local, state and federal contract awards as reported by our clientele. The value of these awards is over \$44.7 million, a significant economic contribution to Arkansas communities and the state. Using Department of Defense conversion rates (\$50,000 is equivalent to 1 job), this has resulted in nearly 900 jobs that have been created or retained as a result of the program this year. APAC currently has client base of nearly 900 businesses wanting to work in the government acquisition marketplace.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Number who indicate a change in behavior, based on lessons learned from economic & community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2625

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Water quality is an important issue that challenges all Arkansas communities. Impaired water quality is often a result of multiple potential sources of pollution with little information about the specific contributors.

What has been done

The University of Arkansas Division of Agriculture has worked closely with the Arkansas Natural Resources Commission (ANRC) over the last several years to engage stakeholders in the development of water quality policy and educate citizens about issues related to water quality. The 2015 Water Quality Stakeholder Engagement Forum program aimed to encourage local participation in watershed management planning for the ten Arkansas NPS priority watersheds.

Results

Forums attracted 219 attendees. Among those responded to evaluation questions, 76% said they planned to work on the priorities identified at the forum and 79% stated that they plan on collaborating in some way with people they interacted with at the forum. After leaving one forum, a participant came up with an idea to create a competition to educate young people and stop sediment from leaving farm fields and getting into local water ways. The resulting Arkansas Mud Drive was launched in the fall of 2015 through the Arkansas Association of Conservation Districts. It provides an opportunity to improve water quality and wildlife habitat in Arkansas by encouraging farmers and landowners to close their water control structures on cropland within 14 days post-

harvest.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number who indicate new knowledge gained based on lessons learned from economic & community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2858

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Despite growth in local and regional food system development, transactions costs and other barriers are limiting growth in many areas of the United States, including Arkansas. USDA's Agricultural Marketing Service (AMS) Farmers Market and Local Foods Promotion Program (FMLFPP) is designed to help fill the supply chain between producers and consumers. However, knowledge of these programs is limited and many potential applicants feel ill-equipped to successfully compete for these awards.

What has been done

Extension faculty from the University of Arkansas and University of Arkansas at Pine Bluff partnered together to offer grant writing workshops at six locations around the state to raise awareness about FMLFPP and help applicants develop high quality proposals. They also provided follow up technical assistance to organizations applying for the 2015 grant program. In Arkansas there were 93 workshop participants. Fifty-one percent of Arkansas attendees reported themselves as being minority.

Results

Participants were asked to respond to an online evaluation survey immediately after the workshops. Workshop participants in Arkansas included farmers; farmers' market or community supported agriculture (CSA) managers; university, government agency and nonprofit employees; K-12 school food service personnel, and economic development or farmers market volunteers. 37% of respondents indicated they had never before applied for grant funding of any type and 78% had never applied for funding from AMS. Respondents were asked to rank their level of understanding of training topics prior to and after attending, including technical requirements of the program, the submission process and grant writing best practices. Results indicate that most participants increased knowledge in nearly every topic area.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of Tax Preparers certified through Tax Schools

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
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3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
610	Domestic Policy Analysis

Outcome #7

1. Outcome Measures

Number of floodplain managers certified

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of voters who report being better educated about ballot initiatives as a result of public policy programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4098

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas is one of 18 states where residents can propose an amendment to the state constitution. Legislators are also able to refer up to three amendments to voters. Ballot issues are often overshadowed by candidate races and little information may be available about constitutional amendments and proposed acts put before voters. The Public Policy Center's ballot issue education program is offered as a nonpartisan solution to educate voters about the issues.

What has been done

The Public Policy Center helps Arkansans better understand the financial, social or policy implications of a proposed law. Education outreach efforts include distribution of fact sheets (available in printed and electronic formats), presentations to audiences across the state, local and stateside media releases, exhibits, web and social media posts, and public television broadcasts. County agents are trained by state specialists to deliver education programs at the local level.

Results

The Public Policy Center conducted an evaluation of its ballot issue education program in 2014. In addition to increasing their understanding of ballot issues, the majority of participants said they had a "great deal" of trust in the accuracy of ballot information published by the Cooperative Extension Service, and that the information would be unbiased. However, it appears Extension materials reach an older and more educated audience than the typical Arkansan as described by the U.S. Census. This information has spurred the Center to initiate a redesign of fact sheets and discussions about how to improve delivery methods to reach more people ahead of the November 2016 election.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	394740

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Number of organizational, community or regional plans adopted or implemented in conjunction with as a result economic and community development programs

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	19

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Born out of the tragedy of a tornado, the Delta Technology Education Center (DTEC) was created in a vacant bank building in Dumas to meet the training needs of area employers. Underutilized and lacking direction, the DTEC Board of Directors reached out the Cooperative Extension's Breakthrough Solutions program for help.

What has been done

Breakthrough Solutions is an award-winning, next-generation strategic planning and development program of the University of Arkansas Cooperative Extension Service with partners in the public, private and non-profit sectors. The partners began working with the DTEC leadership team to initiate an action planning process.

Results

A number of exciting outcomes have occurred. The DTEC has revamped its website with assistance from the UALR Small Business Technology and Development Center and is actively using social media. It has developed a new logo and tagline, funded by Entergy's Teamwork Arkansas. DTEC facilities have been used for multiple projects, including a health project, small business development, and creative economy training. An Entrepreneurial Resource Team was formed to support local businesses. The Center has partnered with Samaschool, a program that teaches high-demand, market-aligned skills and provides the soft skills and digital literacy training required for success in today's job market in areas with high poverty. DTEC internships have placed students at AT&T.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Funding concerns limited our ability to replace staff members who left the organization for retirement or other reasons. This is the only external factor with any significant impact on outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A variety of methods were used to evaluate programs including the use of advisory groups, participant questionnaires, pre-and post-tests, interviews with program participants, required reporting mechanisms and informal feedback. Examples of evaluation results in 2015 include:

- Over 2,600 program participants reported a change in behavior as a result of programs including implementing new strategies, tools, or technology.
- Over 2,800 program participants reported gaining knowledge, understanding, awareness, or skills as a result of our programs.
- APAC clientele reported receiving more than \$44.7 million in government contracts.
- The estimated value of Extension volunteer hours was over \$16.5 million.
- Organizations, communities and regions took the knowledge and skills learned through our programs to generate nearly \$350,000 in grants and other resources to support local community development initiatives.

Key Items of Evaluation

Arkansas Procurement Assistance Center clients are required to submit monthly online activity reports indicating whether they receive any government contracts. This information is used to track contract dollars received and jobs created or retained as reported above.

The Public Policy Center conducted a comprehensive evaluation of its ballot issue education program for the November 2014 Statewide General Election. The evaluation involved surveys of the public as well as county agents to get a better understanding of who used our materials and whether they informed users.

Four separate surveys of the general public were created and distributed to:

- Attendees of county agent ballot programs
- Recipients of Extension's ballot issue newsletter
- Viewers of the Public Policy Center's ballot issue website
- Readers of Extension's ballot issue fact sheets

The objective of these surveys was to describe ballot issue program participants, to describe perceived level of understanding of the ballot issues, and to measure trust in Extension for accurate and unbiased ballot information. Additionally, people who attended a county agent presentation on the ballot issues were surveyed about whether they made informed choices on ballot issues on Election Day.

In addition, all county agents were invited to complete a survey before and after the election. County agents who attended online Zoom training sessions on the ballot issue program were also surveyed before and after their session. After the November 2014 election, all county agents were invited to complete a survey.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
7032	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
1	Number of new crop varieties, animal breeds, and genotypes with climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
2598	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
1	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
1	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.