

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
2015	35

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
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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
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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
2015	52

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.