

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
101	Appraisal of Soil Resources	4%		1%	
102	Soil, Plant, Water, Nutrient Relationships	9%		4%	
111	Conservation and Efficient Use of Water	4%		1%	
112	Watershed Protection and Management	4%		4%	
201	Plant Genome, Genetics, and Genetic Mechanisms	4%		19%	
204	Plant Product Quality and Utility (Preharvest)	6%		4%	
205	Plant Management Systems	10%		2%	
206	Basic Plant Biology	10%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	1%		2%	
212	Diseases and Nematodes Affecting Plants	1%		14%	
213	Weeds Affecting Plants	7%		7%	
216	Integrated Pest Management Systems	20%		5%	
301	Reproductive Performance of Animals	2%		2%	
302	Nutrient Utilization in Animals	2%		6%	
303	Genetic Improvement of Animals	2%		6%	
306	Environmental Stress in Animals	4%		4%	
307	Animal Management Systems	2%		4%	
311	Animal Diseases	3%		9%	
601	Economics of Agricultural Production and Farm Management	4%		3%	
722	Zoonotic Diseases and Parasites Affecting Humans	1%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	119.3	0.0	266.0	0.0
Actual Paid	110.2	0.0	361.9	0.0
Actual Volunteer	16.1	0.0	16.0	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
2248161	0	1668734	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2287129	0	34978687	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
16568072	0	3498169	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In the area of **Efficient Production & Processing**, THE U OF A DIVISION OF AGRICULTURE HAS:

- Developed and delivered efficient, sustainable agricultural production and processing best management practices.
- Discovered and promoted adoption of breakthrough science--based technologies.
- Analyzed and explained the impact of issues affecting Arkansas agricultural production and processing.

In the area of **Competitive Marketing**, THE U OF A DIVISION OF AGRICULTURE HAS:

- Analyzed global and local commodity and product market opportunities and constraints.
- Identified and addressed the needs of diverse agricultural enterprises related to marketing supply chains.
- Analyzed and explained the impact of issues affecting Arkansas plant and animal product markets.
- Helped producers and processors take advantage of market opportunities.

In the area of **Public Appreciation and Understanding of Agriculture**, THE U OF A DIVISION OF AGRICULTURE HAS:

- Increased public awareness of Arkansas agriculture's economic and environmental benefits.
- Taught the science behind agriculture through youth and adult education programs.
- Recruited and retained agricultural and forestry professionals and leaders.
- Analyzed and communicated science--based information about sustainable agriculture issues to the public.

2. Brief description of the target audience

Target audiences for the Agricultural Production & Processing planned program include:

Agricultural food crop growers/producers
Livestock/poultry producers
Commercial poultry producers
Commercial poultry company personnel
Aquaculture producers
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 (US and international agricultural water resource managers),
Supply chain managers (consumer package good manufacturers and biotech companies)

3. How was eXtension used?

Multistate and integrated research and extension activities contributed by Arkansas scientists and educators to eXtension during 2014 featured feral hogs, bee management, fire ants, phosphorus management, grape cultivars, catfish budgets, pork production carbon footprint mitigation, cotton variety information, and Discovery Farms. Jon Zawislak had a feature article on eXtension Nov 5 2014 on managing small hive beetles in honeybee production <http://www.extension.org/pages/60425/managing-small-hive-beetles#.VQe2D9LF-VM> .

Division and UA engineers lead an effort to measure and mitigate the carbon footprint for US swine operations. Much of the information is distributed via eXtension. An example is a recent article on Life-Cycle Modeling for the Pork Industry by Dr. Matlock along with a video on integrated resource management (<http://www.extension.org/pages/64822/life-cycle-assessment-modeling-for-the-pork-industry#.VQe2dtLF-VM> .

In addition, water quality and irrigation programs use eXtension as an informational resource.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	553597	312335	246	3772

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

Patent Applications Submitted

Year: 2014

Actual: 13

Patents listed

Methods of Increasing Resistance of Crop Plants to Heat Stress and Selecting Crop Plants with Increased Resistance to Heat Stress. PCT/US2014/025923. Inventors: Pereira, Andy / Venkategowda, Ramegowda.

Nectarine Tree named 'BOWDEN'. US 13/998,198. Inventor:Clark, John

Nectarine tree named 'AMOORE SWEET? . US13/998,201 Inventor: Clark, John

Peach Tree Named 'SOUVENIRS'. US13/998,203 Inventor:Clark, John

Blackberry Plant named 'A-1960'. US13/998,724 Inventors: Clark, John / Moore, James

Blackberry named APF-122. US 13/999,390. Inventors: Clark, John / Thompson, Ellen / Aguas-Alvarado, Mario

Conjugated Linoleic Acid Rich Vegetable Oil Production from Linoleic Rich Oils by Heterogeneous Catalysis. Inventors: Proctor, Andrew / Shah, Utkarsh. EP 13195571.8.

Blackberry Plant named 'APF-153-T'US 14/120,553. Inventor: Clark, John

System and Process for Quantfying Potentially Mineralizable Nitrogen for Agricultural Crop Production. US 14/209,245. Inventors: Roberts, Trenton / Norman, Richard / Slaton, Nathan / Wilson, Charles.

Method, Vectors, Cells, Seeds and Kits for Stacking Genes into a Single Genomic Site. US 61/933,646. Inventor:Srivastava, Vibha

Process of Purifying Gamma-Tocols From Rice Bran Oil Deodorizer Distillate . US 61/935,065. Inventor: Howard, Luke

Antibody Guided Vaccines and Methods of Use for Generation of Rapid Mature Immune Responses. US 62/008,178. Inventors: Bielke, Lisa / Hargis, Billy / Berghman, Luc

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	76	239	315

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of agronomic production education meetings related to food production

Year	Actual
2014	406

Output #2

Output Measure

- # of demonstrations/on-farm research related to food crop production

Year	Actual
2014	660

Output #3

Output Measure

- # of farm visits related to food crop production

Year	Actual
2014	5158

Output #4

Output Measure

- # of row crop field days related to food production

Year	Actual
2014	28

Output #5

Output Measure

- # of educational meetings, demonstrations, field days, site visits, and other group events held to educate commercial and consumer clientele in fruit, nut, and vegetable production

Year	Actual
2014	101

Output #6

Output Measure

- # of clientele contacts from educational classes, workshops, group discussions, one-on-one, on farm demonstration interventions, demonstrations, and other educational methods related to food crop production.

Year	Actual
2014	20462

Output #7

Output Measure

- # of livestock or poultry related educational programs, workshops, educational meetings and/or field days.

Year	Actual
2014	479

Output #8

Output Measure

- # of clientele attending livestock or poultry related educational programs (field days, workshops, etc.)

Year	Actual
2014	10548

Output #9

Output Measure

- # of producers receiving livestock or poultry related educational materials (newsletters, fact sheets, etc.)

Year	Actual
2014	24227

Output #10

Output Measure

- # of livestock or poultry related farm visits or one-on-one consultations with producers.

Year	Actual
2014	7083

Output #11

Output Measure

- # of clientele trained on agricultural biosecurity.

Year	Actual
2014	7475

Output #12

Output Measure

- # of requested consultations related to exotic animal disease concerns.

Year	Actual
2014	350

Output #13

Output Measure

- # of hits to the CES Website regarding avian and livestock biosecurity.

Year	Actual
2014	352

Output #14

Output Measure

- # of farm visits or one-on-one consultations with clientele related to biosecurity.

Year	Actual
2014	964

Output #15

Output Measure

- # attending alternative agricultural systems related education classes, workshops, demonstrations, group discussions, and other educational events.

Year	Actual
2014	1846

Output #16

Output Measure

- # of alternative agricultural systems related demonstrations (e.g., demonstration study farm, food plots, etc.)

Year	Actual
2014	58

Output #17

Output Measure

- # of educational classes, tours, field days, and workshops related to pest management.

Year	Actual
2014	535

Output #18

Output Measure

- # of education meetings, demonstrations, and field days related to the production of non-food agronomic and horticulture crops.

Year	Actual
2014	31

Output #19

Output Measure

- # of clientele participating in educational events related to non-food agronomic and horticulture crop production.

Year	Actual
2014	3327

Output #20

Output Measure

- # of installations of mobile native ANR APPS by users

Year	Actual
2014	8306

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of clientele (non-duplicated) who use the DD50 program for improved rice production.
2	# of clientele that utilize SOYVA to assist with variety selection.
3	# of livestock producers who increased knowledge related to livestock production management practices.
4	# of livestock producers who initiated or improved their record keeping.
5	# of poultry producers who adopted new practices or technology.
6	# of livestock producers who changed an existing management practice or adopted a new practice.
7	# of growers/producers reporting knowledge gained about the need for biosecurity.
8	# of growers/producers reporting intent to adopt new biosecurity practices for animal production facilities.
9	# of diagnostic plant pest samples submitted.
10	# of diagnostic nematode samples submitted.
11	# of Asian Soybean Rust positive samples.
12	# of samples submitted for exotic animal diseases testing.
13	# of clientele who reported knowledge gained about speciality food related products.
14	# of clientele who initiated specialty food-related enterprises.
15	# of plant varieties developed.
16	# of pesticide applicator training participants certified or re-certified by passing commercial pesticide certification exams.
17	# of producers who gained knowledge in crop production and management.

18	# of Master Gardener participants trained, certified and re-certified.
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Outcome #1

1. Outcome Measures

of clientele (non-duplicated) who use the DD50 program for improved rice production.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	575

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas farmers produce more than 45 percent of the rice grown in the United States under dynamic production conditions that differ from those in other rice growing areas. Because of their prominence in this crop, Arkansas rice farmers depend on an Arkansas variety development program that provides a progression of improved varieties to meet the challenges of changing conditions in their fields and in the marketplace for rice.

What has been done

We conduct intensive conventional breeding methods supplemented by molecular marker detection to develop improved, adapted rice cultivars for Arkansas and Mid-South producers. Field development and testing of germplasm takes place on four experiment stations with different environments. The breeding program is heavily supported by all rice growers in the state thru funding from the check-off program.

Results

New cultivars from the Arkansas rice breeding program were grown on 19 percent of rice acreage during 2014. In 1980, the average rough rice yield in Arkansas was only 4,110 lbs/acre compared to 7515 lbs/acre in 2014. We estimate that 60 percent of this 3405 lbs/acre yield increase was due to newer Arkansas varieties developed during that period. The current value of this increase is about \$370.00 per acre, or about \$546 million in extra dollars for the Arkansas rice crop in

2014. Current new varieties contributed an estimated \$103 million of that extra value in 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems

Outcome #2

1. Outcome Measures

of clientele that utilize SOYVA to assist with variety selection.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Herbicide-resistant weeds are a growing problem in the world production of agriculture. These problematic weeds must be contained so that we can continue to be profitable. Managing these weeds and decreasing the soil seedbank is crucial to lessening the selection intensity placed on herbicides that are currently in use. In Australia where herbicide resistance in ryegrass exist to all known herbicide modes of action, growers are having to turn to nonchemical means of increasing weed management diversity and assisting with the battle against herbicide resistance. Some of the strategies used in Australian wheat production may have a benefit to Arkansas soybean growers if proven effective in our current production systems.

What has been done

The retention of Palmer amaranth and waterhemp seeds on these weeds at soybean harvest was measured over the last two years in Arkansas as well as many of the major producing soybean

states in the U.S. Additionally, an experiment was setup in an Arkansas soybean production field to test whether narrow-windrow burning of soybean chaff could be a viable management tool in decreasing the return of weed seed to the soil seedbank. A narrow-windrow plate was attached to the back of a combine to concentrate all chaff into rows for burning. Average soybean biomass amounts for each burn were obtained so that they could be correlated with the amount of heat seen within the narrow windrows. Weed seed were placed within these burning windrows so that the effect of the heat could be tested in a field setting.

Results

Our recent research has demonstrated that more than 99% of Palmer amaranth and tall waterhemp seeds are retained on the weeds at soybean harvest, meaning that these seed enter the combine and are mostly likely returned to the soil seedbank. This practice allows for the spread of resistant seed, a phenomenon that is non-logical and one in which we need to prevent. When narrow windrows are used to concentrate soybean chaff and weed seed, our findings indicate that there is sufficient heat during the burn to kill all weed seed present in the chaff, including Palmer amaranth, barnyardgrass, johnsongrass, and pitted morningglory. By eliminating the return of these seed to the soil seedbank, weed populations will be lessened in future years which should improve herbicide performance and decrease the presence of resistant weeds infesting these fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #3

1. Outcome Measures

of livestock producers who increased knowledge related to livestock production management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2014

15494

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Native warm-season grasses (NWSG) are tall-growing bunch grasses grown for livestock forage and wildlife cover. Typical native grasses grown in Arkansas include big bluestem, little bluestem, switchgrass, and indiagrass. These grasses were grazed by bison and elk in pre-settlement days and were later grazed by free-ranging livestock. Over time, they were mostly grazed out in Arkansas and replaced by more grazing tolerant species like fescue and bermudagrass. Native grasses have several advantages as low-cost forages that provide good summer forage. However, current establishment recommendations are not adequate to produce grazeable stands within an economically viable time frame for producers.

What has been done

Three sites were chosen, (in cooperation with the University of Tennessee and USDA/NRCS Conservation Innovation Grant), to establish native warm season grass demonstrations using the best-available methods and recommendations. The sites were planted in May and June 2014 at the University of Arkansas Livestock and Forestry Research Station at Batesville, on a farm near Drasco in Cleburne County, and on a farm near Conway in Faulkner County.

Results

By using the best available recommendations and methods, stands of 90% or greater were established at all locations by October (one growing season). The resulting set of recommendations developed through this demonstration will serve as a standard for producers with interest in planting native grasses for use as forage and for wildlife. By following improved establishment recommendations producers can reduce establishment time from 3 years to one year and, based on research results, would gain an extra \$600 to \$1000 per acre in forage production value from these forages.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

of livestock producers who initiated or improved their record keeping.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

of poultry producers who adopted new practices or technology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As use of antibiotics becomes less acceptable in poultry production, optimizing input variables such as drinking water quality has become a crucial component for reducing disease stressors that significantly impact bird performance, particularly for high yielding strains that have little tolerance for stressors. Since each farm can have unique challenges, it is crucial to provide information and tools that allows water systems to be thoroughly and properly analyzed to pinpoint problem areas. Our water quality lab provides technical expertise as well as tools for identifying water quality challenges that can cost commercial poultry production tens of millions in Arkansas, the USA and the world.

What has been done

We created a water diagnostic kit utilized by farmers and company personnel to quickly and properly gather appropriate samples. Samples are analyzed, and specific information is provided on what challenges are present and how they can be economically addressed. Identification of different stressor-sitations allowed us to conduct targeted research and field demonstrations, as

well as evaluate new technologies for effectiveness under different field situations.

Results

Results were shared with specific industries and their personnel in order to correct the many different problems associated with water quality issues. Methods included publications, presentations and direct contact. Over 2600 poultry operations were assisted in 2014. Estimates from industry of performance averaged \$250/flock resulting in more than \$1,000,000 in direct performance value to poultry producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #6

1. Outcome Measures

of livestock producers who changed an existing management practice or adopted a new practice.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4718

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Livestock producers face many challenges, but escalating costs of feed, fertilizer, and fuel caused serious problems for producers in Arkansas and throughout the country. Feeding expenses, both hay and supplements, are the biggest single cost of livestock production. With strategic planning based on the 300 Days Grazing approach, that feeding period was reduced significantly.

What has been done

Educational programs were combined with on-farm demonstrations of eight key management practices. The management practices were 1) stockpiling fescue, 2) stockpiling bermudagrass, 3) growing legumes, 4) growing summer annual forage, 5) growing winter annual forage, 6)

improving grazing management, 7) reducing hay losses in storage, and 8) reducing hay losses during feeding. On the Livestock and Forestry Research Station, a cow herd was managed using the same practices to verify program recommendations and strategies. This combined approach using the same forage and livestock management practices on a production scale simultaneously across multiple environments, producer farms, and a research station is unlike any other in the country.

Results

In 2014, 37 demonstrations were conducted on farms in 18 counties in Arkansas. Farms that incorporated forage brassicas (turnips, rape, and hybrid brassica) saved \$2.50 to \$3.60 per day on feed costs over a 75-80 day feeding period and cut feed costs by 50% and 67% respectively by using brassica forage compared to their traditional fall feeding program. Producers that used single strand electric fence wire to "strip-feed" hay saved over \$200 in hay value during the feeding period.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management

Outcome #7

1. Outcome Measures

of growers/producers reporting knowledge gained about the need for biosecurity.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2014

6816

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Poultry is the leading industry of Arkansas animal agriculture providing over 40,000 jobs and 40% of the total cash receipts. Arkansas broilers are the largest segment of the poultry industry with the state ranked 2nd in production nationally. 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. In 2014, an outbreak of H5N8 High Pathogenic Avian Influenza was noted in British Columbia, Canada; and later found in small flocks in Idaho, Oregon, Washington and California Areas in these states are currently either under quarantine or recently released from quarantine and surveillance. Several countries have embargoed poultry and/or poultry products from the USA until the AI is under control. This costs the poultry industry tens of millions in lost revenue. The increase in keeping of hobby and small flock poultry is a tremendous concern to the poultry industry of Arkansas and other states. This concern drives the need for more biosecurity education.

What has been done

We teach biosecurity and poultry health to commercial growers as well as hobbyists. Efforts included farm visits, workshops, short courses, DVDs, and publications. A new grant from USDA/APHIS allowed us to conduct a targeted education effort at backyard poultry producers as well as survey for diseases and biosecurity knowledge of growers in the state. It also initiated a new web-based course for small growers to complete online at their convenience. Growers earn a certificate of completion after taking the course and it will be offered to other states as well.

Results

Results indicated that hobby growers vary greatly in knowledge of poultry health and biosecurity but clearly there is a great need for more education. The survey did not reveal any exotic diseases of concern in 2014. The online course was started and content and format were constructed with release planned for later in 2015. Feedback at events on the possibility of an online course was overwhelmingly positive.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
311	Animal Diseases
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #8

1. Outcome Measures

of growers/producers reporting intent to adopt new biosecurity practices for animal production facilities.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1541

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #9

1. Outcome Measures

of diagnostic plant pest samples submitted.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2779

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The sugarcane aphid, historically a minor pest of sugarcane, began infesting grain sorghum in Texas, Louisiana, Oklahoma, and Mississippi in 2013. While the reasons for this switch in host plants are not fully resolved, sugarcane aphid infestations in sorghum resulted in economic losses. Yield losses of up to 100% were possible when heavy infestations occurred early in plant development; for an 80 acre field that was expected to yield 88 bushels per acre at a hypothetical cash price of \$4.88 per bushel, this would have meant a loss in revenue of \$34,355. Grain losses of up to 50% were reported if the sticky excrement of the aphids was present in the grain head and interfered with mechanical harvest. In 2014 the range of the sugarcane aphid rapidly expanded to include eight additional states, including Arkansas. The 12 affected states represented approximately 90% of the total sorghum acreage in the U.S. (2014 Acreage Report, National Agricultural Statistics Service). In 2014, 165,000 acres of sorghum were harvested in Arkansas, with an average yield of 88 bushels per acre (2015 Arkansas Grain Sorghum Quick Facts, Dr. Jason Kelley and Kevin Lawson, U.A. Division of Agriculture).

What has been done

U.A. Division of Agriculture Extension specialists and county agents monitored grain sorghum fields to ensure early detection of sugarcane aphid upon its expected arrival in Arkansas. Because the insecticides labeled for use in sorghum were not effective at controlling sugarcane aphid, a Section 18 emergency label exemption was prepared for Transform® WG, one of the few insecticides that had effectively controlled sugarcane aphid in 2013. Field experiments were conducted at the Rohwer Research Station in southeastern AR to determine the efficacy of insecticides and application methods (e.g., tank mixes, spray adjuvants) for control of sugarcane aphid. Updates, management recommendations, and the conditions of the Section 18 exemption were disseminated to growers, consultants, and county Extension personnel through: the Arkansas Row Crops blog; two newsletter articles; statements in popular press articles that appeared in local and regional media outlets at least 19 times; presentations at six county IPM meetings; a field day at the Rohwer Research Station; and an in-service training session for county Extension agents.

Results

Extension specialists and county agents confirmed the presence of the sugarcane aphid in Arkansas on June 27, 2014. A Section 18 label exemption for Transform® was granted on July 2, 2014, giving producers a viable control option. Field experiments demonstrated that feeding by sugarcane aphids can reduce yields by up to 60% during grain filling. In addition, several insecticides that are not currently labeled in soybean were shown to provide effective control of sugarcane aphid. A section 18 emergency label exemption will be sought in 2015 for the insecticides Transform® and Centric® based on the results of field experiments conducted in Arkansas and surrounding states.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants

Outcome #10

1. Outcome Measures

of diagnostic nematode samples submitted.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	539

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cotton is an important agronomic crop in the southern U.S. with an estimated annual value of about \$6 billion. In Arkansas, as in most of the southern states, 3-5 percent of the total cotton crop is lost to root-knot and reniform nematodes annually. The root-knot nematode is found throughout the US Cotton Belt, and can also attack soybean, corn, and many vegetable crops. Reniform nematodes are confined to the eastern and mid-southern states. Nematode management is difficult in cotton because no highly resistant cultivars are available that are

adapted to the region. Additionally, in 2010 the most commonly-used and effective chemical nematicide, aldicarb, was voluntarily withdrawn from use by the manufacturer due to environmental and human safety concerns. Failure to manage either nematode can result in yield losses of 15-20% in some fields, and currently the only options for mitigating nematode losses are crop rotation which is minimally effective on root knot due to its wide host range, and preplant soil fumigation with the nematicide 1,3-dichloropropene, which is very expensive and environmentally unattractive if used on a field-wide basis.

What has been done

Since 2001 a team of researchers from Arkansas, South Carolina, and Louisiana have been exploring the application of precision farming technology to a more efficient strategy for nematode control in cotton. This approach, termed the Site-specific Nematicide Placement Strategy (SNP) utilizes soil texture maps of individual fields to target sampling efforts and site-specific delivery of 1,3-dichloropropene only in areas where a significant improvement in yield due to nematode control is expected. The efforts of this team have resulted in a total of \$2.25 million in extramural competitive grant funds, and the approach is nearly ready to be deployed widely at a grower level. Across the southern region, the SNP approach has resulted in a reduction of 30-50% of the amount of 1,3-dichloropropene needed to maintain cotton yields at a comparable rate with field-wide fumigation, resulting in considerable savings to the grower and a much more attractive environmental profile.

Results

This work will radically change the strategies that are now being used by cotton growers across the US Cotton Belt for managing nematodes with a resulting savings of 30-50% of the current expenditures for soil fumigation. Reducing the quantity of soil fumigant by the same level will also result in a considerably more environmentally attractive approach to root-knot and reniform nematode management in cotton. These economic and environmental benefits should improve the long term sustainability of cotton production in the United States.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants

Outcome #11

1. Outcome Measures

of Asian Soybean Rust positive samples.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Two rust diseases, southern rust of corn and soybean rust, were again observed in 2014 in Arkansas. Both can be devastating under the right conditions, causing up to 50% yield loss. Soybean rust arrived too late in the season to be problematic whereas southern rust of corn did occur early enough, but weather conditions did not favor disease development. One of the best practices to manage these diseases is an early warning system.

What has been done

Since 2012 we have alerted growers to these two rust diseases as they are first detected in the state through blog articles, text messages and our website. We conduct extensive scouting and field monitoring to assure early detection. Since other diseases can be mistaken for these, our monitoring assures correct identification and reduces false warnings, and we train growers and consultants at the same time to recognize symptoms and signs.

Results

The major result of this program has been to minimize unnecessary fungicide applications in corn and soybean. Without the early warning system, preventative treatment of corn and soybean acreage in the state would cost as much as \$96 million, and increase the risk of fungicide resistance. In 2014, we detected southern rust of corn in early July and alerted growers with corn acreage still at risk from yield loss, if the disease had developed. As a result, we sprayed 535,000 acres of corn in a timely manner. Control plots in different areas indicated a yield loss of 10% where not treated using the early warning recommendations, an average value of more than \$43.00 net savings per acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants

Outcome #12

1. Outcome Measures

of samples submitted for exotic animal diseases testing.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Animal control officers have long been tasked with determining health and well-being of animals. Many of these individuals do not possess the health and well-being knowledge of the various farm animal species. There is a need for expanded training sessions for Arkansas animal control officers.

What has been done

An animal handling and control workshop was designed to provide learning opportunities for animal control officers in Arkansas. The objective was to determine health and well-being knowledge gained for farm animals by animal control officers. There were 5 species of livestock presented: dairy and beef cattle, horse, goats, and sheep. All sessions included healthy behavior, unhealthy symptoms, proper movement, and handling of each species. To determine knowledge prior to the workshop, a pre-test was administered to each participant. An identical post-test was given to participants at the completion of the workshop.

Results

Following training, participants increased their dairy knowledge by 54%; beef knowledge was increased 25%; horse knowledge increased by 50%; and goats and sheep knowledge increased by 50% and 45%, respectively. Overall, participants showed a 54% increase in livestock knowledge. The hands on discussion allowed participants the opportunity to ask questions more freely. Given the verbal feedback from the participants, it seems the hands-on training was the

major factor contributing to the increase in knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #13

1. Outcome Measures

of clientele who reported knowledge gained about speciality food related products.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	183

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The increasing interest in local food and home agriculture has resulted in a natural interest in beekeeping statewide. Along with backyard poultry, beekeeping has become very commonplace in rural and urban Arkansas. While beekeeping can be relatively straightforward, there is a wealth of misinformation available to stakeholders in the state and inexperience can lead to some unpleasant episodes when working with bees. It is also true that many people have become more interested after hearing reports of honeybee decline and the potential impact on food crops nationwide. Regardless, beekeeping can be managed safely and is a very productive and enjoyable enterprise that can provide honey, extra income, and science education in a small space.

What has been done

Given the increasing number of Arkansans interested in local foods, gardening and outdoor activities, we developed a comprehensive beekeeping short course for public audiences with little experience and limited knowledge. The course provides education on honeybee biology, working

with bees, bee hive types and construction, hive management, honeybee and pollinator health, a beekeeping calendar, keeping bees in urban areas, feeding bees, harvesting honey, and how to organize or join a local beekeeping club. The course also explains the laws and regulations enforced by the State Plant Board that apply to beekeeping. Graduates of the course are expected to be able to begin limited beekeeping and manage simple hive systems as well as understand how to find information and continue their education about bees and pollinators. In 2014, we taught the course at 10 locations across the state including Fayetteville, Fort Smith, North Little Rock, Conway, Crossett, Lonoke, Nashville, Little Rock, Bentonville and Pinnacle Mountain State Park (youth course).

Results

We taught 929 beekeeping students in the 10 short courses during 2014 as follows: Fayetteville (January) 212 attendees; Fort Smith (February) 226 attendees; North Little Rock (February) 78 attendees; Conway (April) 156 attendees; Crossett (August) 35 attendees; Lonoke (September) 37 attendees; Nashville (October) 78 attendees; Little Rock (November) 81 attendees; Bentonville (December) 93 attendees; and Pinnacle Mountain State Park (semester course for youth) 6 children, 5 parents. All students left the course with enthusiasm for bees and several have established hives around the state for future honey production. A number have reported sharing their knowledge with neighbors and friends, who have contacted us about attending short courses during 2015. This effort has also helped reinforce and invigorate existing, or led to creation of new, beekeeping clubs numbering 20 in every area of the state at the end of 2014. We plan to continue this program in 2015 and subsequent years as demand for beekeeping knowledge and interest in apiculture increases.

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

of clientele who initiated specialty food-related enterprises.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	68

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Local Food Systems are increasingly being examined for their ability to effectively deliver locally grown products to consumers and as viable marketing channels to expand producers marketing opportunities. Additionally, advocates across the food value chain are interested in understanding the ability to use and/or leverage these systems to secure safe, dependable, regionally produced food products and expand business activity.

What has been done

In 2014 the University of Arkansas Division of Agriculture (UA) faculty, directly engaged in several related projects to enhance the use, operation and efficiency of local food systems. The allied activities are linked and leveraged through the MarketMaker Program and direct marketing resources/trainings. UA Faculty successfully developed a food safety self-assessment to help farmers evaluate their on farm food safety processes and record keeping. The self-assessment is being used by a number of direct marketing farmers to enhance the safety of their products. Additionally, the assessment tool is being used by school procurement specialist to guide food safety discussions to enhance farm to school efforts. The Activities included continued outreach on the development and use of farmers markets as well as promotion of the markets through the MarketMaker portal. The UA hosted the annual meeting of the Arkansas Farmers Market Association where state branding program, Arkansas Grown; farm to school; value added processing resources; and food safety protocols were highlighted. Additionally, efforts were undertaken to build a collaboration to explore the development of a food hub in the Central Arkansas area.

Results

The farm-to-school project identified enhanced food transactions and outreach interventions in three selected elementary schools. MarketMaker to identify the farmer that is currently featured by the program, Arkansas Grow Healthy Study, to promote farm to school efforts across the state. MarketMaker also promoted direct marketing farms and markets listing over 60 percent of the state's markets and 150 individual direct marketing growers. We hosted the 2015 Arkansas Farmers Market Association where 70 attendees were able to learn about regulatory updates and resources to enhance farmer markets. A session focused on the use and development of brands including the use of the states branding program to promote their products. We created a partnership to plan for the development of a Regional Food Innovation Center that will host a certified kitchen, processing facility, education programs, small business training, support for marketing products, and other services to build capacity for local food systems development in Central Arkansas. The collaborative was awarded (one of twenty-six awarded nationally) a Local Foods/Local Places Planning grant and will start planning strategically for the infrastructure

project in early 2015.

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
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #15

1. Outcome Measures

of plant varieties developed.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Improved varieties of crops are a key component of success for growers including those that produce fruit. Adapted fruit blackberry varieties insure dependable yields of high quality products for growers and provide consumers with an enjoyable product for a healthy diet. The University of Arkansas has been improving blackberries since the beginning of the breeding effort in 1964. Blackberry remains as a key crop in the expansion of options of healthy fruits and vegetables available to American consumers. Blackberry is one of the newer fruits found routinely now on retail market shelves. The supply of blackberries has increased to the point that this fruit can be found year-around in many markets. The primary reason that blackberries are a more common item of retail commerce is the development of improved varieties that can be shipped to distant markets. Additional breeding and genetic improvement is increasing grower options for varieties and is a key for this industry to continue to expand.

What has been done

Eighteen varieties have been released from this breeding effort, and have been planted throughout the US and in other countries.

Results

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. Of the plants reported sold from 2012-2014, the potential crop area 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.

4. Associated Knowledge Areas

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

Outcome #16

1. Outcome Measures

of pesticide applicator training participants certified or re-certified by passing commercial pesticide certification exams.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1081

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pest management is a very broad area encompassing agriculture, urban situations, 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 the proper use of pest control products. The pesticide safety education program in Arkansas is the primary way that pesticide

applicators are instructed on the proper and safe use of pesticides.

What has been done

We conducted 24 certification trainings during 2014 to reach the private, commercial, and non-commercial pesticide applicators. These trainings are held in conjunction with the Arkansas State Plant Board who awards certification. In addition we updated the many educational materials used to keep applicators up to date and proficient.

Results

We trained 1,081 Commercial and Non-Commercial applicators in 2014 while county extension agents trained an additional 4000 private applicators. We revised and launched our new webpages on the extension website, and was proved with those interested in training for certification. We helped coordinate the Arkansas Abandoned Pesticide Collection effort which has removed over 1.5 million pounds of pesticides in the past few years. This program has also provided about \$195,000 in educational equipment to counties for pesticide education since 2010. Previous grower pesticide use surveys have indicated that approximately 50% of the respondents have changed their pesticide practices as a result of attending a PAT session. The most common changes listed were increased use of protective gear, reading the label more closely, and more attention paid to calibration. Approximately 85% of survey respondents rated the re-certification sessions as good to excellent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #17

1. Outcome Measures

of producers who gained knowledge in crop production and management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	8163

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Arkansas agricultural sector continues to experience serious economic, production, and marketing challenges, due to ongoing global financial instability and damaging weather events. Additional uncertainty surrounds U.S. fiscal and monetary policy and regulations. The implementation of the 2014 farm bill, considered by some to have the most complex farm bill program provisions ever written, will take time and a sustained research and educational effort to implement. Farmers who choose wrong within the new farm bill may suffer considerable loss of opportunity over time.

What has been done

In 2014, we partnered with USDA's Farm Service Agency and an array of farm organizations to provide practical education on base reallocation; Price Loss Coverage (PLC); Agricultural Risk Coverage (ARC); supplemental coverage; (SCO) and Stacked Income Protection Plan for Producers of Upland Cotton (STAX); the Dairy Margin Protection Program (MPP-Dairy); Livestock Gross Margin (LGM-Dairy) insurance; and buy-up decisions under NAP. We conducted 22 major farm bill/outlook meetings and helped coordinate 15 other farm bill/outlook meetings.

Results

We hosted 2,022 growers and related farm personnel at our primary education meetings, and over 1,000 at other meetings we assisted or coordinated. There were 75 educational farm bill presentations and feedback from attendees was overwhelmingly positive. Most growers concerns were on base reallocation, PLC and ARC and all growers surveyed asked for additional information and training. This farm bill is very complex and growers are extremely concerned about making the right choices over the next five years, it may literally mean the difference between staying in business for some producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #18

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1867

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Master Gardener program continues to be a strong and vital program in Arkansas with continued interest in becoming a MG volunteer. A strong, viable program is about more than just horticulture education, but managing people, projects and impact. As the program continues to grow, (65 county based programs and 3600 volunteers) we need continual management training and strong leadership.

What has been done

We used our state advisory board (County 76) and funds raised at the state convention to initiate more leadership training and improve participation. We offered discounted registration fees as well. We hosted a two-day training event for leaders on topics including money management, mentoring, project partnerships, social media and recruitment. We asked attendees to take what they learned back to their counties and implement it. We also conducted five advanced master gardener trainings, hosted the state conference in Texarkana, and sponsored a MG day at Garvan Gardens.

Results

We noted 160 Master Gardeners and agents at the leader training, 500 attendees at the state conference and 450 at the MG day at Garvan Gardens. Evaluations indicated very high regard for the usefulness of the material presented at all of the events. The state MG Conference in Texarkana showed an estimated economic impact of \$125,000 to the local economy. From the leadership training, several counties have implemented changes in their programs and developed

tools to use in recruiting new Master Gardeners as well as growing new leaders. We have also seen a rise in membership in our state advisory board. With the on-line reporting system, we are now able to track hours by county, by project and have excellent data. Master Gardeners reported 181,371 volunteer hours and 102,850 education hours for a total volunteer commitment of 284,221 hours. The garden blog has also had a strong following with over 737 people signed up as followers receiving each blog post through their email plus 642 via facebook, and 56,560 views in 2014.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations
- Other (New insect pest outbreak)

Brief Explanation

The year started with extensive flooding and cool weather, affecting crop production and hampering attendance at meetings and events. The new Farm Bill and lower commodity prices greatly affected educational and certain research directions. Potential policy and regulations aimed at banning neonicotinoid insecticides created new challenges to our pest management research and education outcomes and direction of effort. A new insect, the sugarcane aphid, heavily influenced research and education emphasis during 2014 as this pest damaged grain sorghum in the state for the first time.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Eighteen blackberry varieties have been released to date, with success best evidenced by worldwide acceptance planting more than 3 million plants. Feedback has been very positive on performance of novel thornless and fruiting primocane varieties.

We conducted a livestock handling and control workshop for animal control officers. A pre-test and post-test showed increased dairy knowledge of 54%; beef 25%; horse 50%; goats 50%; and sheep 45%. The hands-on training method was highly rated by all participants.

New cultivars from the Arkansas rice breeding program were grown on 19 percent of rice acreage during 2014. Since 1980, rice yield has increased by 3405 lbs/acre, at least 60% of that due to newer Arkansas varieties. The annual value of this increase was \$546 million in 2014. This program continues to garner strong annual funding support from the rice

check-off, good evidence of success.

High feed costs in previous years resulted in intense interest and demand for hands-on help with extended grazing systems. In 2014, 37 demonstrations were conducted in 18 counties, showing feed cost savings of 50-67%. Informal surveys of producers indicated strong interest in increased adoption.

A new grant-funded effort to provide targeted biosecurity and poultry health education to commercial and hobby poultry growers was initiated in 2014. Results of the initial survey of hobby growers showed a great variation in science-based knowledge of poultry health and biosecurity principles. Feedback on the possibility of online instruction was overwhelmingly positive.

A new aphid pest in grain sorghum during 2014 demonstrated success of Extension response to an emergency. Division recommendations were adopted on over 90% of the acreage during July and August with a net result of saving much of the crop, as untreated fields lost up to 100% of yield. Growers requested more work on this problem and a new grant from the corn and sorghum check-off was awarded.

Hobby beekeeping grew rapidly in 2014, with 929 new students taught in 10 short courses across the state. Beekeeping clubs increased to 20 and feedback from was for more and more training. Adoption of beekeeping principles has led to an upsurge in urban beekeepers. This effort was highlighted in media articles and on television during the year.

Specialists trained 1,081 commercial pesticide applicators in 2014 while county extension agents trained another 4000 private applicators. Previous surveys indicated 50% of respondents changed their pesticide practices as a result of these sessions, including increased use of protective gear, reading the label more closely, and more attention to calibration. Approximately 85% of survey respondents rated the re-certification sessions as good to excellent.

We hosted 2,022 growers and related farm personnel at primary Farm Bill education meetings, with another 1,000 at secondary meetings. Survey feedback on the quality and usefulness of these meetings was overwhelmingly positive. Most respondents expressed concerns about base reallocation, PLC and ARC and all growers surveyed asked for additional information and training.

Key Items of Evaluation

Success in the current local foods arena were evidenced by worldwide recognition of our small fruit breeding program, as well as state efforts to address rapidly increasing interests in hobby poultry and beekeeping. Evidence of effective response programming was exemplified by knowledge gains in animal well-being by animal control officers, intense interest in extended grazing systems, remarkable success in managing a new insect pest of grain sorghum, and a massive effort to educate growers on the most complex farm bill in history. Finally, sustained success was noted for our long term rice breeding and pesticide education programs, both enjoying widespread annual support from producers and applicators.