V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger

☑ 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
201	Plant Genome, Genetics, and Genetic Mechanisms		5%		13%
202	Plant Genetic Resources		5%		13%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants		14%		10%
205	Plant Management Systems		15%		7%
211	Insects, Mites, and Other Arthropods Affecting Plants		6%		0%
213	Weeds Affecting Plants		10%		0%
301	Reproductive Performance of Animals		5%		5%
302	Nutrient Utilization in Animals		6%		5%
307	Animal Management Systems		0%		10%
311	Animal Diseases		12%		7%
601	Economics of Agricultural Production and Farm Management		5%		13%
602	Business Management, Finance, and Taxation		12%		0%
603	Market Economics		0%		10%
610	Domestic Policy Analysis		5%		7%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	5.0	0.0	6.5
Actual Paid Professional	0.0	12.8	0.0	10.8
Actual Volunteer	0.0	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**
0	1223640	0	2067051
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	1260304	0	1340229
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The activity for the policy part of the program consisted of surveying a representative sample of the 250-300 farmers that are served by the UAPB 2501 Small Farm Project; conducting workshops and training sessions to educate farmers and others who attend. Pamphlets, fact sheets etc. were distributed during one-on-one conferences as well as during informational meetings. Small farm management assistance was provided by Extension Associates through direct one-on-one assistance, group training on record keeping and financial planning. Personnel also apprised farmers about programs offered through the Natural Resources Conservation Service, Farm Service Agency, Risk Management Agency and Heifer International. Training was provided to county extension staff, master gardeners, small-scale and limited-resource farmers, and youth. Research wasdone on alternative low cost feed sources that may be used to formulate rations for swine, goats and beef cattle.Farmers were taught how to use FAMACHA scoring and proper use of chemical dewormers to reduce the cost of treating animals for gastrointestinal parasites. Research was conducted on vegetables crop rotations that are suitable for the Arkansas Delta and Southwestern Arkansas; also, screening of alternative insecticides and ornamental plant trials were conducted. A protocol for successful production of virus-free sweet potato plants through shoot meristem culture was developed to aid the sweet potato industry in Arkansas.Gladiolus corms were evaluated for morphological and physiological characteristics that influence cut flower production. Pre-test and post-test were developed for students to determine their knowledge of biomaterial sustainability.

Assisted with the development of a mobile nursery system to feed hybrid striped bass and crappie

Methods to produce hybrid and triploid hybrid crappie were tested. Triploid crappie were produced using pressure shocks of 6000 psi for 7 min applied 3 minutes post-fertilization. Hybrid crosses using black females and white males were also successfully produced.

Moringaand Leucaena leaf meals (native to Africa) were tested in Nile tilapia diets as alternative protein sources relative to a diet with soybean meal as the main protein source. General effects were reported previously (there were few diet differences). Whole-body proximate composition and fatty acid data were generated this period. A feeding trial with sunshine bass using diets with fish oil or flaxseed oil with or without a dairy-yeast prebiotic was completed. Production and health data were reported previously. Proximate and fatty acid analysis are currently in progress, and remaining live fish are being conditioned to undergo a bacterial challenge to reveal additional health effects of the diets. Nutrigenomics work on lipid metabolism in largemouth bass was completed.

We receive requests for information and have updated the cooperative extension fact sheet

Alterative Aquaculture Species for Arkansas. I have worked with the Arkansas turtle farmers on trying to address their needs.

Aquaculture in Arkansas provides a local source of healthy, high protein, low fat food, and creates economic activity and jobs. To support family fish farmers, potential producers, and the general public, integrated research and extension programs were conducted. Activities consisted of research studies in the laboratory and on the experiment station, on-farm research trials, extension farm visits, calls, e-mails, newsletters, workshops, and presentations. Water quality and fish health services were provided to support educational programs. Program planning was conducted through discussions with individual farmers and with farmer associations (e.g., Catfish Farmers of Arkansas, Arkansas Bait and Ornamental Fish growers Association). Results of research studies and extension programs were also shared with peers across the country at national meetings and in journals and other publications.

Monitoring water quality and fish production in different catfish production systems in Arkansas

Determined market trends for southern aquaculture products using retail-level scanner databases.

Analyzed demand for frozen and chilled seafood in the United States using retail-level scanner data.

Analyzed regional and seasonal variations in demand for catfish and its substitutes in the United State.

Analyzed the price transmission relationship and asymmetry in price transmission along the catfish value chain in the US.

Conducted survey of crawfish retailers and restaurant managers, and identified determinants for development of live Market grading standards for crawfish. We identified number of grades desired and potential size or weight limits (or other factors) for each grade.

Analyzed the feasibility of using internet search query trends (Google trends) in forecasting the demand for seafood products in the United States.

Made projection for fish production, consumption, trade, and market prices by product categories and countries. The projections were made for the period up to 2030.

There are three major areas for activity here.

(1). Provide producers and lenders with inventory maintenance assistance. This involves fish crop inventory appraisals, projections, and development of enterprise budgets.

(2). Water quality maintenance -toxic algae screening program, a proactive means to prevent devastating fish losses due to toxic algae.

(3). Educational opportunities for county Extension agents and vocational agri instructors through workshops offered. Two workshops concerning water quality were offered at UAPB last summer.

Three activities were conducted:

1. Pond production study of stockers 5-inch and 7-inch hybrid catfish in single or multiple-size
2. Assistance to develop long-term business plans
3. 2-year model to evaluate feeding strategies on catfish farms under a variety of economic conditions

I have visited channel and hybrid catfish farms and strived to gather information and facts related to catfish culturestatusand issued problems, in order to develop possible research topics helping the catfish production improved

New diet ingredients or novel combinations of ingredients were tested in feeding trials with stocker catfish in large tanks. One study was conducted to determine whether diets enriched with higher levels (4 or 6%) of CLA-enriched soybean oil can improve the fatty acid composition of farmed channel catfish for human health relative to a diet with traditional soybean oil, while maintaining or improving gcatfish growth, health, and product quality. A second study was conducted to determine growth, survival, feed conversion, processing traits, and proximate composition of the fillet in catfish fed diets with 28 or 32% protein and 20% corn gluten feed (CGF) or solvent-extracted distillers dried grains with soluble (SE-DDGS). Nutrigenomics work on lipid metabolism in channel catfish was completed.

Verification study on alternative production techniques including split-pond and intensive aeration systems for catfish culture.

To sell channel catfish for stocking as part of some states fishing programs, the state agencies sometimes require health inspections of individual lots of fish prior to live hauling. These inspections are to ensure that the fish are in good general health. These are conducted as requested by the farmer.

Research was conducted to develop a standard sampling plan in Aquaculture and guide research design and to estimate the number of samples necessary to achieve a high probability of detecting biologically significant effects.

Activity involves maintaining the fish disease and water quality diagnostic laboratory services. Annually 800 to 2,000 diagnostic samples are submitted to the laboratory. The breakdown is 200 fish disease cases, 1,000 water samples for general analysis, and 800 algal samples from ponds with histories of toxic algal episodes. In one on one visits with producers, bio-security is an issue that is constantly stressed and how important it is to contain the spread of the virulent Aeromanas strain that is now in Southeast and Southwest Arkansas.

Research will be conducted to develop better methods for the detection, control, and eradication of aquatic animal diseases. Diagnostic laboratories will assist in the diagnosis and management of aquatic animal diseases. Regulatory testing and biosecurity management will be provided to facilitate the interstate and international movement of aquaculture products.

I have communicated with research and extension scientists at UAPB,and strived to gather information and facts related to baitfish culture status and issued problems, in order to develop possible research topics helping the baitfish productionand disease preventionimproved.

The baitfish production cycle involves stocking fish fry into freshly filled ponds. The ponds are fertilized to stimulate phytoplankton and zooplankton populations that the fry feed upon. Unfortunately, submersed aquatic weeds can growth up from the bottom. This prevents zooplankton growth and makes pond harvest difficult. This leads to reduced fish growth and poor health, or sometimes complete crop failure. Current herbicides are often more expensive to use than the crop that might be produced. Methods to economically reduce or limit this nuisance plant growth have been explored.

This program identifies specific areas of hatchery inefficiency (e.g. broodstock selection, artificial spawning procedures, low fecundity, impact of stress on performance, and fry-fingerling survival) and creates viable alternatives to existing practices by integrating fish physiology with hatchery management and fish production.

Developed oxygen saturation and heat exchanging technologies for hybrid catfish and largemouth bass hatcheries.

We evaluated effects of abrupt changes of pH on survival of major baitfish species

Golden shiners were stocked in outdoor tanks (3.3 m^2) at either 100,000 fish/acre or 300,000 fish/acre and fed pelleted diets with 22 or 28% protein for 9 weeks. One diet was also offered in a meal form to fish at the two densities in two additional treatments. Non-traditional ingredients (corn DDGS and corn gluten feed) were used in two of the lower-protein diets, while soybean meal was the main protein source in the 28% diet (control) and one of the 22% diets.At harvest, performance variables were measured. After harvest, a subset of shiners was subjected to swimming speed trials to assess fish stamina.

Identification of compounds that will destick goldfish eggs from spawning substrate

Aquaculture in Arkansas creates economic activity and jobs. To support family fish farmers, potential producers, and the general public, integrated research and extension programs were conducted. Activities consisted of research studies in the laboratory and on the experiment station, on-farm research trials, extension farm visits, calls, e-mails, newsletters, workshops, and presentations. Water quality and fish health services were provided to support educational programs. Program planning was conducted through discussions with individual farmers and with the Arkansas Bait and Ornamental Fish growers Association. Results of research studies and extension programs were also shared with peers across the country at national meetings and in journals and other publications.

2. Brief description of the target audience

The primary audience for this program consists of Small and Socially Disadvantaged Farmers (SSDFs). Small Farms as defined by the National Commission on Small Farms are those farms with $250,000 in gross sales or less while Socially Disadvantaged Farmers are those who have been subjected to racial or ethnic prejudices because of their identity as a member of a group without regard to their individual qualities. Identified groups include: African Americans, Hispanics, Asians, American Indians or Alaska Natives, and Native Hawaiians or other Pacific Islanders. However, UAPB does not discriminate against any individual and services are provided to all who request it.

County Extension faculty, existing fish farmers and potential farmers.
Youth
The target audience will be catfish and baitfish farmers and researchers of these production systems and associated water quality. Extension personnel will be also targeted to provide suggestions on analyses and presentation/dissemination of results to farmers.
Aquaculture producers

Commercial producers of aquatic animals in Arkansas, private pond owners, county Extension agents, state agencies.

Fish producers, feed manufacturers, researchers, seafood consumers

Fish farmers looking for alternative crops , people interested in getting into fish farming

Program activities were targeted towards aquaculture producers, potential producers, and farm pond owners. Aquaculture production primarily occurs on family farms; most are small businesses without resources to conduct internal research, and many find it increasingly difficult to keep informed of changing rules and regulations without assistance from extension.
Catfish farmers in Arkansas
Catfish/aquaculture producers
Catfish/aquaculture processors
Catfish/seafood markets
State and Federal-level policy makers
Other seafood researchers
The audience is aquaculture producers and those interested in aquaculture such as county Extension agents or vocational agriculture instructors.
catfish farmers and producers
Primary target audiences are local channeland hybrid catfish farmers who need to improve the catfish production with alternative culture systems (split pond systems) and management regimes in the culture systems.
Fish producers, feed manufacturers, researchers, seafood consumers
Target audience is catfish farmers in the southeast United States.
Catfish farmers, farm managers, state agencies
The target audience are researchers in Aquaculture and Fisheries department as well as the catfish farmers in Arkansas.
The audience is fish producers, pond owners, county Extension agents, and consulting service individuals.

Commercial producers of aquatic animals in Arkansas, private pond owners, county Extension agents, state agencies involved in the regulation or control of aquatic animal diseases.

Primary target audiences are local baitfish farmers who need improved baitfish culture regime and

systems in terms of productivity and disease prevention. Local baitfish and live fish market shops requiring an efficient and cost-effective indoor system for holding fish for sale are also important target audiences. The addressed problem with existinglive fishholding systems is that they use expensive city water in flow through systems or experienceunstable water quality in recirculating systems due to variable fish loading rates, which often result in afinancial burden and achronic disease problem.

Baitfish farmers

The direct target audience for this program includes commercial hatcheries and fish producers and public entities involved with the production and transportation of fish.

Aquaculture producers

baitfish farmers of Arkansas
Fish producers, feed manufacturers, researchers, recreational fishers
Commercial baitfish and ornamental fish producers in Arkansas, county Extension agents, state agencies
Program activities were targeted towards baitfish producers, forage fish producers, and potential producers. Aquaculture production primarily occurs on family farms; most are small businesses without resources to conduct internal research, and many find it increasingly difficult to keep informed of changing rules and regulations without assistance from extension.

3. How was eXtension used?

eXtension allows access to fact sheets for alternative species and contact of extension specialist for more detailed answers

General information on aquaculture alternatives is available through the eXtension Freshwater Community of Practice. However, this program stresses alternatives that are specifically suited to the resources, climate, and regulatory environment in Arkansas. As such, our clientele requires state-specific assistance, rather than general information.
We worked with the local extension specialists to connect with the farmers
I have communicated with research and extension scientists at UAPB and developed a basic engineering model of water circulators for catfish split pond systems. The model is used for extension specialists and farmers to optimize the performance of their water circulators.
Some baitfish farmers are currently planning to adopt the split pond systems (SPS)commercially. However, one of the major obstacles to the SPS on a commercial scale is to develop an efficient method of screening a sluiceway for retaining small baitfish within the fishunit, and allowing for appropriate water flowrateat the same time. A basic concept ofsluiceway screensfortheSPS hasbeen developed. Theconcept may be used forthecommercialSPSthrough a proof-concept study in research ponds units.
eXtension was used to research herbicide labels and identify unknown plants
General information on baitfish culture submitted by UAPB personnel is available through the eXtension Freshwater Aquaculture Community of Practice. However, established commercial baitfish farmers, the target audience for this program, obtain information directly from baitfish experts at the university, through personal contacts, a newsletter, meetings, and a field day.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	21544	25000	1009	0

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

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	9	17	26

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The number of research studies and demonstrations conducted

Year	Actual
2012	25

Output #2

Output Measure

- The number of farmers provided assistance in applying for USDA programs

Year	Actual
2012	362

Output #3

Output Measure

- The number of newsletters, fact sheets, etc. distributed

Year	Actual
2012	4276

Output #4

Output Measure

- The number of newspaper articles published

Year	Actual
2012	35

Output #5

Output Measure

- The number of field days held

Year	Actual
2012	1

Output #6

Output Measure

- Number of presentations made

Year	Actual
2012	37

Output #7

Output Measure

- The number of workshops and training sessions conducted

Year	Actual
2012	39

Output #8

Output Measure

- Number of refereed journal articles

Year	Actual
2012	10

Output #9

Output Measure

- Number of abstracts

Year	Actual
2012	9

Output #10

Output Measure

- Number of presentations

Year	Actual
2012	55

Output #11

Output Measure

- Number of trade magazine articles

Year	Actual
2012	0

Output #12

Output Measure

- Number of factsheets and newsletters

Year	Actual
2012	0

Output #13

Output Measure

- Number of peer reviewed journal articles

Year	Actual
2012	0

Output #14

Output Measure

- Number of publications

Year	Actual
2012	19

Output #15

Output Measure

- Number of research reports submitted to stakeholders

Year	Actual
2012	58

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased economic opportunity and profitability for SSDF
2	An increase in the number of SSDF that adopt one or more Best Management Practices for crop production
3	Increase the number of farmers that develop an estate plan to reduce land loss by Socially Disadvantaged Farmers
4	Number of Arkansans gaining access to catfish management information
5	Number of producers responding to research results
6	Number of producers willing to test successful ingredients of feeding strategies on a commercial scale
7	Number of fingerling producers that learned what we know
8	Number of scientists that learned what we know
9	Number of fingerling producers that use what we know
10	Number of Arkansans gaining access to hybrid catfish information
11	Number of Arkansans adopting hybrid catfish production
12	Number of producers who learn project results
13	Number of researchers that will cite results
14	Number of producers that will modify feeding and management
15	Percent cool weather plankton-related problems that will decrease
16	Percent warm weather plankton-related problems that will decrease
17	Enhanced crop diversity on SSDF to increase profitability

18	Increase the number of SSDF that adopt one or more Best Management Practices for livestock production
19	Information on species other than baitfish and channel catfish is available to current or potential fish farmers
20	Properly managed biosecurity programs prevent the spread of virulent diseases on fish farms.
21	Number of stakeholders gaining new knowledge about diets and feeding strategies for baitfish
22	Improving pasture and livestock efficiency

Outcome #1

1. Outcome Measures

Increased economic opportunity and profitability for SSDF

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small, limited-resource, and socially disadvantaged farmers often rely on small ruminant production to supplement or completely provide farm income, especially on marginal lands. In the southern US, small ruminants face high exposure to Haemonchus contortus, a blood-sucking gastrointestinal parasite that frequently kills its host. Young kids and pregnant and lactating females are particularly susceptible to Haemonchus infection. Chemical dewormers are becoming less effective in controlling Haemonchus infections. Small ruminant producers need more effective methods of controlling Haemonchus on their farms to reduce economic losses.

What has been done
Four gastrointestinal parasite management workshops were conducted in different areas of the state. These workshops were designed to educate producers about the use of FAMACHA scoring and proper use of chemical dewormers to reduce the development of resistance, reduce the cost

of medicine and reduce death losses due to gastrointestinal parasites.

Results
As a result of the program, one goat producer in Arkansas County reduced death losses due to parasite infection in his herd from over 18% to less than 2%, an estimated savings of $3,780. Ten goat producers reduced the frequency with which they deworm their goats, reducing their costs by an estimated $230 and slowing the rate of development of parasite resistance to anthelminthics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #2

1. Outcome Measures

An increase in the number of SSDF that adopt one or more Best Management Practices for crop production

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the data from Extension Associates, SSDPs have yields that are lower than the county averages. These lower yields make it difficult for these producers to be profitable. Using Best Management Practices could help these producers become more profitable.

What has been done
Extension Associates provided one-on-one production information and educational materials to SSDPs while encouraging them to attend local county extension service production meetings.

Results
Thirty SSDPs adopted soil testing, extension variety selection and weed control recommendations on their crops. As a result of adopting these practices, producers have

increased their yields significantly and reduced their herbicide cost. Income on these farms increased by approximately 20 percent as a result of using best management practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Increase the number of farmers that develop an estate plan to reduce land loss by Socially Disadvantaged Farmers

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Most small and socially disadvantaged producers do not have estate plans. Therefore, when these producers die, their land becomes heir property. The heir property is difficult to operate because it is owned by multiple individuals thus making it difficult to operate.

What has been done
Four estate planning workshops were conducted. Approximately 200 individuals attended the workshops. The workshops were conducted in areas with high populations of socially disadvantaged individuals. An attorney from the National Law Center in Fayetteville conducted the workshops.

Results

Approximately 200 individuals received knowledge on estate planning and succession planning. Thirty individuals began contacting heirs and family members to develop an estate plan. Ten individuals developed estate plans.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of Arkansans gaining access to catfish management information

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of producers responding to research results

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Aquaculture producers need to improve survival of fry at pond stocking

Although hybrid and triploid hybrid crappie are raised for stocking as fingerlings in small impoundments, little research has been done to examine the growth, survival and triploid induction in crappie. Due to high feed cost for channel catfish, the production of alternative species for commercial food fish production would benefit current producers. Faster growth rates are generally observed in hybrid and triploid individuals. Triploid induction in hybrids has resulted in increased survival rates in many species of animals. This may be observed along with improved feed efficiency in hybrid and triploid crappie.

Commercial production techniques for alternative species vary considerably relative to those for major aquaculture species. Often, lack of standardized production procedures stems from lack of specific scientific knowledge on alternative species. Producers want species-specific diets to improve the profitability of their industries. Human consumers are interested in products that taste good and are beneficial for health. Tilapia are omnivores that can be sustained on all-plant diets without reduced performance during growout. However, the cost of soybean meal has become cost-prohibitive recently. Therefore, plant ingredients that can replace soybean meal, at least partially, might facilitate the sustainability and profitability of tilapia cultured in different regions. Carnivorous fish such as hybrid striped bass (HSB) and largemouth bass have additional diet constraints. Marine fish oil (source of essential fatty acids) should be reduced to lower diet cost, but performance must be maintained. The partial substitution of plant oils rich in n-3 fatty acids, in combination with other feed additives such as prebiotics, may support good production and product quality with minimal use of fish oil.

Many people are looking at various aquaculture enterprises as a way to start a new business or

provide food for their families. Arkansas is a prime location for the development of aquaculture farms. Objective, research-based information enables clientele to make wise decisions about investing in aquaculture, reducing economic losses and increasing the chances for a successful outcome.

Disease issues in aquaculture and natural fisheries settings can create catastrophic losses. Additionally other states and countries want to prevent the introduction of unwanted diseases or organisms. As a result, UAPB provides a service to inspect and conduct disease testing on fish destined for export to other states or countries. These disease tests enable the producer to market their fish and provides evidence to the receiver that the fish are free of diseases and pathogens.
Baitfish farmers need answers to this problem. It has a huge negative impact on the farm?s economic viability and consistently ranks among the top five problems when farmers are surveyed.

Catfish producers in the state of Arkansas are interested in producing hybrid catfish. This practice requires a novel approach to spawning catfish and the integration of experimental data into practical approaches for the farmer.

Aquaculture producers

What has been done
Developed a mobile nursery system that concentrates live prey organisms from a pond and feeds the fry in a controlled environment

Hybrid crappie have been produced by crossing the white crappie female with the black crappie male. Triploid induction was conducted on eggs by subjecting them to pressure shocks at 6,000, 7,000 and 8,000 psi for 1, 2, 3, or 4 minutes duration at 5, 6, 7, and 8 minutes post-fertilization. Triploid verification was conducted using a flow cytometer.

Moringa and Leucaena leaf meals (native to Africa) were tested in Nile tilapia diets as alternative protein sources relative to a diet with soybean meal as the main protein source. General effects were reported previously (there were few diet differences). Whole-body proximate composition and fatty acid data were generated this period. A feeding trial with sunshine bass using diets with fish oil or flaxseed oil with or without a dairy-yeast prebiotic was completed. Production and health data were reported previously. Proximate and fatty acid analysis are currently in progress, and remaining live fish are being conditioned to undergo a bacterial challenge to reveal additional health effects of the diets. Nutrigenomics work on lipid metabolism in largemouth bass was completed.

A fact sheet on aquaculture alternatives was revised to update the information. Presentations were made on a new pond bank culture system for hybrid striped bass fry, and on rearing largemouth bass for the fillet market. Impediments to the competitiveness of U.S. aquaculture were identified and presented.

UAPB operates four regional Fish Disease Diagnostic Laboratories that provide water quality analysis, pathogen testing, and disease prevention and management advice. These services are supported by a research program that emphasizes the development of diagnostic assays, the detection of emerging diseases, and methods to control or eradicate disease organisms. Demonstration projects have been conducted for the past three summers into using low rates of an aquatic herbicide added at the time of first filling and applying pre-emergent herbicides to dried

pond bottoms prior to filling.

On going collaborations with Baxter Land Company have tested various forms of spawning aides Catfish pituitary, Carp pituitary, and two forms of LHRHa to induce artificial spawning to produce hybrid catfish. Examinations of a system of passive grading of female catfish broodstock have led to efficient means to sample fish artificial spawning in a research settings. UAPB researchers act as a conduit for reporting of data describing the use of spawning aids to the INAD permit holder, the USFWS.

Equipment designed to reduce liquid oxygen consumption and propane gas usage was demonstrated at two aquaculture operations.

Results

Fry survival early in the season and late in the season was improved, with no improvement seen during the normal fry production season

Triploid induction rates were highest at 6000 psi for 3 minutes when pressure was initiated 7 minutes post-fertilization. Survival rates for triploid hybrids were significantly higher than survival of hybrids.

Whole-body protein, dry matter and ash were similar in tilapia among diets. Whole-body lipid was higher in fish fed the soy control diet than those fed diets with 30% of the soy protein replaced by leaf meals. Tilapia fed diets with the highest level of leaf meals in place of soy had significantly higher amounts of n-3 fatty acids, including highly unsaturated fatty acids (20:5n-3 and 22:6n-3). This could increase their value to health-conscious consumers. Soy meal costs at least 25% more than the leaf meals, and the potential to increase the profitability of tilapia production by partially replacing soybean meal with the leaf meals seems high. Sunshine bass grew well on diets with fish oil, and the effect was enhanced by a prebiotic. Nutrigenomics studies revealed comparative information on a key lipid enzyme in largemouth bass that can help guide diet development. The results of these studies were presented at the World Aquaculture Society meeting in Nashville (2013), The Striped Bass Growers Association meeting in Nashville (2013), and the UAPB Research Forum (2013). Written publications are in preparation.

Producers and potential producers were supplied with research-based information to support wise decisions regarding culture of new and alternative aquaculture species and systems.

About $1million of disease losses were prevented by our services.
Low rates of fluridone have proven effective, but resistant plant strains becoming dominant are a fear for the future. The initial use of pre-emergent herbicides has had promising results but work needs to be continued before anything definitive can be concluded.

Baxter Land Company has developed into a self sustaining producer of hybrid fingerlings. UAPB scientists still act in support of this operation through oversight of the use of spawning aides to induce ovulation in female catfish.

Technologies were adopted and installed on these hatchery operations resulting in more efficient production of hybrid catfish and largemouth bass fingerlings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
311	Animal Diseases

Outcome #6

1. Outcome Measures

Number of producers willing to test successful ingredients of feeding strategies on a commercial scale

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #7

1. Outcome Measures

Number of fingerling producers that learned what we know

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #8

1. Outcome Measures

Number of scientists that learned what we know

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #9

1. Outcome Measures

Number of fingerling producers that use what we know

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #10

1. Outcome Measures

Number of Arkansans gaining access to hybrid catfish information

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #11

1. Outcome Measures

Number of Arkansans adopting hybrid catfish production

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area

307	Animal Management Systems

Outcome #12

1. Outcome Measures

Number of producers who learn project results

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #13

1. Outcome Measures

Number of researchers that will cite results

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Number of producers that will modify feeding and management

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #15

1. **Outcome Measures**

Percent cool weather plankton-related problems that will decrease

Not Reporting on this Outcome Measure

Outcome #16

1. **Outcome Measures**

Percent warm weather plankton-related problems that will decrease

Not Reporting on this Outcome Measure

Outcome #17

1. **Outcome Measures**

Enhanced crop diversity on SSDF to increase profitability

2. **Associated Institution Types**

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	45

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The small acreage of most small and socially disadvantaged farms (SSDFs) makes them suitable for crops with high profit margins such as fruits and vegetables. However, many of these producers in Eastern Arkansas are row crop (soybeans, wheat corn, etc.) producers. Row crops farmers generally operate many acres (average size of 1000 acres) due to the smaller profit margins of their crops.

What has been done

Extension associates visited with many SSDPs and explained the economic suitability of fruit and vegetables for small farms. The importance of identifying markets and dependable labor was highly stressed. Three potential markets were discussed with participants: the Wal-Mart Southern Pea Market, several different direct markets, and East Arkansas Enterprise Community (EAEC).

Results

Twelve producers increased their profitability approximately 25 percent by growing and selling southern peas through the new Wal-Mart Buy Local Initiative. Five producers grew and marketed sweet potatoes to increase their income by approximately 20 percent. Twenty producers grew mixed vegetables and marketed them directly to consumers to increase their incomes by 20 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
601	Economics of Agricultural Production and Farm Management
603	Market Economics

Outcome #18

1. Outcome Measures

Increase the number of SSDF that adopt one or more Best Management Practices for livestock production

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small and limited-resource livestock farmers are faced with rising feed costs and are seeking long term solutions to solve this and other management problems in order to stay and be competitive in the livestock business. Livestock farmers have to deal with rising feed costs by either downscaling their livestock operations or getting out of business altogether.

What has been done
During the year under review (2012), two research trials on the suitability of brewers rice replacing all corn or milo in diets for pigs were completed on the University of Arkansas Pine Bluff Farm. Brewer rice is a product of rice milling that is abundantly available in southeast Arkansas and is cheaper than corn or milo. Research-based recommendations were disseminated to the target audience via producer workshop (8 participants were reached), farm visits (20 were made) and phone (15 were reached).

Results
Six swine producers and four goat producers are putting into use some of the feed mixing and feeding techniques recommended. The swine and goat producers adopting our recommendations have had a substantial reduction (20%) in feed costs and overall production efficiency i.e. pigs finished on brewers rice diets used less feed to gain a pound of body weight compared to corn diets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #19

1. Outcome Measures

Information on species other than baitfish and channel catfish is available to current or potential fish farmers

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Arkansas fish farmers, land owners interested in alternative species

What has been done
A cooperative extension fact sheet has been update and published on alternative aquaculture species. Requests for information are answered.

Results
I have had 37 request for information on alternative species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #20

1. Outcome Measures

Properly managed biosecurity programs prevent the spread of virulent diseases on fish farms.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fish producers and natural resource managers care. Fish farmers have a financial stake in this matter. Resource managers are obligated to protect the fish and wildlife resources of this country.

What has been done
On farm biosecurity programs have been established. Producers in Southwest Arkansas normally share equipment, facilities, and labor and it is easy to spread diseases from farm to farm. Now there is dedicated equipment that is used solely on the farm originally had the Aeromonas, no equipment on the farm is used on any other farm.

Results

The disease spread has been stopped.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #21

1. Outcome Measures

Number of stakeholders gaining new knowledge about diets and feeding strategies for baitfish

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Commercial production of baitfish is relatively inefficient. Feed comprises a major part of production costs. Baitfish production using lower-cost supplemental diets with alternative ingredients might be profitable due to their reliance on natural foods. However, density also has a major effect on growth of baitfish, so it is useful to compare diets under low- and high-density scenarios. Baitfish are marketed as live products, so hardiness and resilience must be considered in designing diets and feeding strategies for them.

What has been done
Golden shiners were stocked in outdoor tanks (3.3 m2) at either 100,000 fish/acre or 300,000 fish/acre and fed pelleted diets with 22 or 28% protein for 9 weeks. One diet was also offered in a meal form to fish at the two densities in two additional treatments. Non-traditional ingredients (corn DDGS and corn gluten feed) were used in two of the lower-protein diets, while soybean meal was the main protein source in the 28% diet (control) and one of the 22% diets. Fish were fed to satiation twice daily on weekdays and once daily on weekends. Subsamples of fish in each tank were weighed every 3 weeks to track growth and adjust feed weights. Chlorophyll a was measured twice during the study, and zooplankton was identified and enumerated on a similar schedule to estimate the abundance of natural foods. After harvest, a subset of shiners was subjected to swimming speed trials to determine u-crits (a measure of stamina).

Results
Weight gain was higher in fish at the low density regardless of diet. Weight gain was also higher in fish fed the diet with 28% protein than other diets at either density. Survival was better at the high density (but was >90% in all treatments), and there were no diet effects on survival. Net yield was higher at the high density and in fish fed the 28% soy diet. A partial budget analysis will be conducted to enable economic comparisons among diets and stocking densities. The results of this study were presented at the Arkansas Bait and Ornamental Fish Growers Association meeting (2013), World Aquaculture Society meeting in Nashville (2013), and the UAPB Research Forum (2013). Written publications are in preparation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #22

1. Outcome Measures

Improving pasture and livestock efficiency

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small, limited-resource, and socially disadvantaged farmers often rely on small ruminant production to supplement or completely provide farm income, especially on marginal lands. In the southern US, small ruminants face high exposure to Haemonchus contortus, a blood-sucking gastrointestinal parasite that frequently kills its host. Young kids and pregnant and lactating females are particularly susceptible to Haemonchus infection. Chemical dewormers are becoming less effective in controlling Haemonchus infections. Small ruminant producers need more effective methods of controlling Haemonchus on their farms to reduce economic losses.

What has been done
Four gastrointestinal parasite management workshops were conducted in different areas of the state. These workshops were designed to educate producers about the use of FAMACHA scoring

and proper use of chemical dewormers to reduce the development of resistance, reduce the cost of medicine and reduce death losses due to gastrointestinal parasites.

Results
As a result of the program, one goat producer in Arkansas County reduced death losses due to parasite infection in his herd from over 18% to less than 2%, an estimated savings of $3,780. Ten goat producers reduced the frequency with which they deworm their goats, reducing their costs by an estimated $230 and slowing the rate of development of parasite resistance to anthelminthics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Changes in the economic conditions in the state lead some farmers to look for alternative species and may prevent some farmers from exploring new opportunities.

Calcium is important for the development and survival of many freshwater species. The water in hatcheries throughout the state vary widely in alkalinity and hardness values. Studies conducted at UAPB in low calcium water had high mortality rates. When calcium was supplemented survival rates significantly increased.

Animal feed ingredients are very costly, forcing some fish producers to use ingredients that are not as nutritious as standard ingredients used previously in large amounts (fish meal and oil, soybean meal). The weak economy has also reduced the available funding (especially federal funds) for research on nutrition/diet development for food animals.

Regulations and government oversight are necessary and desired by U.S. citizens. However, an overly cumbersome and restrictive regulatory environment can stifle and constrain economic activity.

The stringency of the regulatory environment in the U.S. has increased in recent years in terms of both the number and complexity of regulations that affect U.S. aquaculture. The overall cumulative effect has been continued increases in the regulatory

costs and risk faced by aquaculture growers in the U.S. Given the regulatory burden, fish farmers are reluctant to invest in production of alternative species. In addition, the economy has had a negative impact on aquaculture production given the dramatic increase in the price of fish feed ingredients.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

This work demonstrated to aquaculture producers a method for improving fry survival early in the season before pond conditions are optimal.

Significance was determined statistically at an alpha level of 0.05

Producers and researchers were interested in the results of our studies, based on feedback received in response to written reports and presentations at meetings.

Program evaluation was conducted through informal conversations with producers regarding new species and culture systems. Two producers indicated that they were planning to test split-pond production systems on their farm.

Key Items of Evaluation

Obtaining fish populations that were 90% triploid

Relevance, novelty, and potential economic feasibility of implementing the results.

Evaluation of this program will require a long-term and informal approach. Information provided to farmers may not impact their decision-making until some years in the future, when they are ready to invest in alternative species and/or culture systems.