V(A). Planned Program (Summary)

Program # 1

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
102	Soil, Plant, Water, Nutrient Relationships		5%		8%
111	Conservation and Efficient Use of Water		5%		5%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants		2%		2%
204	Plant Product Quality and Utility (Preharvest)		5%		5%
205	Plant Management Systems		5%		7%
212	Pathogens and Nematodes Affecting Plants		2%		2%
216	Integrated Pest Management Systems		5%		5%
301	Reproductive Performance of Animals		5%		5%
302	Nutrient Utilization in Animals		5%		5%
303	Genetic Improvement of Animals		10%		10%
307	Animal Management Systems		15%		15%
311	Animal Diseases		6%		6%
313	Internal Parasites in Animals		5%		5%
405	Drainage and Irrigation Systems and Facilities		2%		2%
503	Quality Maintenance in Storing and Marketing Food Products		5%		0%
601	Economics of Agricultural Production and Farm Management		8%		8%
604	Marketing and Distribution Practices		5%		5%
721	Insects and Other Pests Affecting Humans		5%		5%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Extension	Research

Year: 2012	1862	1890	1862	1890
Plan	0.0	6.0	0.0	20.0
Actual Paid Professional	0.0	6.0	0.0	31.0
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	875112	0	1477573
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	1694368	0	1326637
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

a. Conduct research to control internal parasites and prevent diseases in small ruminants.
b. Practice the use of artificial insemination in large and small ruminants to improve the genetics of herds and flocks.
c. Determine embryonic and fetal loss in goats throughout gestation, using real-time ultrasound.
d. Research biosensors to facilitate artificial insemination.
e. Develop sunfish cultigens for distribution to the industry.
f. Determine nutritional requirements of sunfishes.
g. Develop optimal production dynamics for sunfishes.
h. Provide aquaculture fish health services for stakeholders.
i. Develop technology to reduce mosquito populations responsible for transmitting the causative agents of some of the most widespread and prevalent infections of humans.
j. Conferences, meetings, workshops, and training and educational opportunities for small farmers.
k. Introduction and evaluation of new crops (especially native crops) and improved cultural practices.
l. Abstracts, publicatons, grant proposals, and guide sheets.
m. Promotion of backyard and community gardening.

2. Brief description of the target audience

Lincoln University's Cooperative Research and Extension programs focus on enhancing the quality of life for diverse, limited resources audiences. Low-income, limited resource farmers and ranchers, and underserved population in rural and urban communities.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5778	6371	2649	2861

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	4	6	10

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Projects completed, presentations and manuscripts. Enhanced profitability of small farms. Enhanced vitality and strengthening of rural communities.

Year	Actual
2012	103

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-Develop better understanding of environmental factors which contribute to the mosquito's ability to transmit disease to humans and animals. To develop mosquito population management strategies focused on manipulation of environmental factors to influence the mosquito's ability to transmit disease.
2	Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.
3	Farmers adopt new technologies for increased and sustainable production.
4	Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.
5	Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.
6	Enhanced profitability of small farms. Increase farm growth income by $5,000. Enhanced vitality and viability of rural communities. Increase farm retention rates.

Outcome #1

1. Outcome Measures

Livestock-Develop improved approaches to internal parasite control and disease prevention. Develop improved production management systems through enhancing reproduction, genetics, and nutrition. Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultigen. Identify viable production systems for sunfishes. Make available a fish health protocol. Insects and Pests-Develop better understanding of environmental factors which contribute to the mosquito's ability to transmit disease to humans and animals. To develop mosquito population management strategies focused on manipulation of environmental factors to influence the mosquito's ability to transmit disease.

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)
Small limited resource farmers to improve production and increase profits. Commercial fish farmers.

What has been done
Aquaculture-Application of research diets, verification of cage studies for food sized sunfish.
Small Ruminant-Apply the use of herb cultivars on three farms for the control of internal parasites, using native
plant cultivars for grazing sheep and goats.
Conversion of empty swine facilities to aquaculture farming, raising food fish. Transfer new technologies for sunfish, small and large ruminant production for farmers. Refining re-cycle aquaculture systems to be sustainable on small farms. Workshops have reached approximately 1,000 potential fish farmers.

Results
Several novel bluegill crosses have been created with considerable variation in terms of their performance. Data indicates that higher protein and lipid feeds resulted in greater growth and fillet yields in bluegill sunfish. Even though the data is not completely analyzed the higher cost (Higher protein, higher lipid) feeds appear to produce a lower cost of fish produced per pound of feed.

Survival of hybrid sunfish in the laboratory was excellent. Survival of cold shocked fish was higher than expected.
These fish are currently being grown to a stage were ploidy can be determined with the Coulter Counter.
Success was attained in reducing the larval brine shrimp feeding time to 7 days. Survival of the fish tested on the new larval feed was near 99%.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals
721	Insects and Other Pests Affecting Humans

Outcome #2

1. Outcome Measures

Transfer new technologies for sunfish, small and large ruminant production to farmers. Farmers will use learned technologies.

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)
Commercial fish farmers.
Small farmers interested in ruminant and fish farming.

What has been done

Taught 4H youth quality assurance and proper techniques used in livestock care.
Educated producers about disease transmission and control.
Programs delivered included Goat and Sheep disease update, goat meat updates, Animal Agriculture Emergency Response and Emergency Preparedness for Livestock Specialists.
Current LU Small Ruminant research was presented. Workshops and presentations have reached approximately 1,000 potential fish farmers.

Results
Awareness of disease transmission between animals and between humans and animals, how easily it can happen and what producers can do to control transmission. Producers learned how to recognize specific diseases and are now better able to detect and prevent economic losses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #3

1. Outcome Measures

Farmers adopt new technologies for increased and sustainable production.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increased and sustainable production. Farmers should adopt new technologies.

What has been done
Through clinics and workshops, introduced new philosophies and methods in controlling internal parasitism in small ruminants such as non-chemical control, sustainable management and control measures that small ruminant producers would be able to utilize. Over 930 farmers participated in workshops and presentations.

Marketing workshops to eventually increase small farmer income. This included the Value-added Fiber Program.

Results
A large percentage of the producers who participated stated they would be willing to change management practices and try new ideas, including different marketing strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals

Outcome #4

1. Outcome Measures

Create conditions for the minority, underserved farmers to be able to earn a reasonable income, continue to live on farms, and develop educational programs and opportunities that will encourage minority youth to get involved in farming. Increase or at least maintain the number of minority farms in the state. More farmers are adopting sustainable farming practices (profitable, environmentally friendly, and socially responsible). Increase the income level of the collaborating small farmers and ranchers on an average of $5,000 per family.

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)
Farmers need additional income.
Because of the increasing number of older farmers, the state of Missouri is losing minority small farmers and ranchers at an alarming rate due to retirement and death.
Horticultural crops are most attractive to the small-scale producer because they produce high returns per unit land area.

What has been done
Pre- and Post-activity surveys showed the knowledge or techniques were well received by participants. On-farm visits for questions and answers to some commercial vegetable growers;
Pre- and Post-activity surveys showed the knowledge or techniques were well received by participants. On-farm visits for questions and answers to some commercial vegetable growers;

Results
More small farmers have learned seasonal extension techniques with high-tunnels. More educators have learned how to organize and manage community gardens. Positions for the ISFOP were advertised.
Individuals redirected their production and marketing practices. Businesses and government adjusted their policies as a result of publications, journals and abstracts. More than 1,800 people were contacted through publications. Twenty younger farmers have joined the cooperative. The name of the cooperative has been selected. Market contracts have been signed with large chain stores.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
503	Quality Maintenance in Storing and Marketing Food Products
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #5

1. Outcome Measures

Enhanced profitability of small farmers and ranchers, and enhanced viability of rural communities. Increase the average small farm gross income of the collaborating farmers by $5,000. Increase retention rates of the collaborating farmers and ranchers through providing appropriate education and information.

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)
Small farmers need new technologies to increase farm income.
Alarming poverty rates among farmers, ranchers and residents in Southeast Missouri.

What has been done
More high-tunnel greenhouses were built by small farmers. More community gardens were planned by community leaders for next year.
Conducted meeting and conferences to discuss marketing opportunities for minority farmers and ranchers.
Presented the development of business and market plans to the audiences identified above.
Organized computer literacy training to assist the audience in good farm record keeping.
Buyers have been set up to purchase from Farmer's Cooperative.
Marketing Cooperative has been developed to facilitate collective production and marketing.

Results
Increased/extended supply of freshly produced vegetables and small fruits.
Farmers' income increased by approximately $3,000, less than expected because of the flood and drought that caught farmers by surprise.
Farmers gained invaluable knowledge of computers for purposes other than record keeping.
Younger farmers are still being recruited to begin farming (target is 20).
Hispanic producers and workers were recruited for the first time. The workers assisted in harvesting the produce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
503	Quality Maintenance in Storing and Marketing Food Products
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Enhanced profitability of small farms. Increase farm growth income by $5,000. Enhanced vitality and viability of rural communities. Increase farm retention rates.

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)
Small Farmers/growers who do not stay on the farm because of lack of quality of life from farming. There is no change in their economic well being as a result of continued farming participation. Need to improve nutrient level in soil.

What has been done
The two fertilizer treatments consisted of 1) optimum N (200 mg N/liter), and 2) low N (100 mg

N/liter). While the pH of the re-circulating nutrient solution for both treatments was maintained at about 6.0, mean electrical conductivity (EC) was 2.29 mS/cm at optimum N compared with 1.23mS/cm at low N. Average day/night
ambient temperature was 39.1 oC and 32.8 oC, with a mean of 30.5 oC, and day/night relative humidity (RH) was 81.3 % and 55.0 %, respectively. Two-week old lettuce seedlings transferred into NFT troughs at the first true-leaf stage were harvested 30 days later.
Recruited more, younger farmers and provided education about the process of production and marketing.

Results
Marketable yield (mean fresh weight [g/head of lettuce]) decreased by 30.5 % at low N compared with optimum N, consistent with 43.5 % and 17.5 % decrease in dry weight and dry weight ratio (dry weight/fresh weight),respectively. These findings improve grower knowledge about hydroponic nutrient solution composition and use, which represents the greatest challenge to all hydroponic/soilless growers. A soundly based understanding of nutrient solution management, on which literature information is most limited, is as important to successful hydroponic
culture as the lists of nutrient formulas, preferred reagent sources and the weights and measures often published in textbooks. Better plant nutrient management through the supply of optimum rather than excess or suboptimum levels in NFT systems can improve profitability through 1) increased lettuce yield and quality 2) reduction of plant
nutrient costs, and 3) reduction in losses by enhancing root nutrient uptake, which can also minimize environmental pollution.
Improved marketing of produce and specialty crops. Improved farm income for small and limited resource farmers.
Missouri Agricultural Products Cooperative was established.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
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601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Extreme weather conditions had an effect on some of the outcomes. There was flooding in the Southeast portion of Missouri, where a majority of our Extension efforts are concentrated. The biggest challenges were financial and attributed to funding costs. The downturn in the economy affected most of these poor areas. Joblessness became worse and funds for other assistance dried up.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

We found that if the program is maintained and enhanced, profitability of farmers will increase. The quality of life of farm families will improve. Rural communities will become vibrant and attractive to live in.

Key Items of Evaluation

Evaluation was based on current and previous performances of farmers in the region.

- It was also based on market discovery for farmers to profitably sell their produce.
- Recruitment of young farmers played a role in the evaluation.
- The willingness of older farmers to educate the young on the process of farming plays a significant role in the evaluation.
- Last, and not least was on the farming participation rate.