

**V(A). Planned Program (Summary)**

**Program # 1**

**1. Name of the Planned Program**

Global Food Security and Hunger

**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%
	<b>Total</b>		100%		100%

**V(C). Planned Program (Inputs)**

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890

Plan	0.0	1.5	0.0	4.0
Actual	0.0	4.6	0.0	12.4

**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	1151705	0	2202518
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	640500	0	1218283
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**

- An evaluation of potential for the production of Sweet Potato and Watermelon, using alternative management practices.
- Use of scented geraniums as a potential source for insect control.
- Small scale hydroponic cropping of specialty vegetable and herbs.
- Develop bluegill for aquaculture as a food-fish.
- Explore embryonic and fetal losses in goats.
- Using herbs to control internal parasites in small ruminants.
- Non-traditional methods for improving ruminant production on small farms.
- Develop sunfish cultigens for distribution to the industry.
- Reduce mosquito population responsible for transmitting the causative agents for cattle and humans.
- Artificial insemination in large and small ruminants to improve the genetics of the herds.
- Workshops to develop marketing and production cooperatives for small farmers.
- A value-added Fiber program helped producers market fibers from sheep, goats, rabbits, llamas, and alpacas.
- Various other workshops, conferences, and other educational and informative programs.

**2. Brief description of the target audience**

Disadvantaged, low-income, limited resource farmers and ranchers, small farmers, farmers with unsuitable land for row-crop farming, gardeners, greenhouse growers, and horticultural and agricultural crop producers, Missouri aquaculture fish farmers.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	2300	80000	400	2000
<b>Actual</b>	5879	4595	866	610

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

**Patent Applications Submitted**

Year: 2010  
 Plan: 0  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2010	Extension	Research	Total
<b>Plan</b>	0	2	
<b>Actual</b>	0	5	5

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Projects completed, presentations and manuscripts

Year	Target	Actual
2010	14	23

**Output #2**

**Output Measure**

- • Research Projects Completed\* Year Aquaculture Small Ruminant Large Ruminant 2008 0 1 0 2009 4 1 0 2010 0 1 0 2011 2 1 1 2012 2 1 1 \*Projects reported only in year of completion Presentations Year Aquaculture Small Ruminant Large Ruminant 2008 6 2 0 2009 6 2 0 2010 6 2 0 2011 6 2 0 2012 6 2 0 Manuscripts Year Aquaculture Small Ruminant Large Ruminant 2008 4 1 0 2009 4 1 0 2010 4 1 0 2011 5 2 0 2012 5 2 0 Not reporting on this Output for this annual report

Year	Target	Actual
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2010	{No Data Entered}	2
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**Output #3**

**Output Measure**

- Short term output measures are: Abstracts, Presentations, Training students, and Workshops. Intermediate output measures are publications. Long-term: Will be felt after five years

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	105

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultivar. Identify viable production systems for sunfishes. Make available a fish health protocol. Small Ruminants- Assess the use of herb cultivars for control of internal parasites. Investigate new cultivars of grasses and legumes for potential improvement of weight gains in lambs and kids. Develop optical or biosensor to determine optimum breeding time. Large Ruminants- Develop optical sensor or biosensor for determining optimum breeding time.
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	Develop educational programs to encourage minority youth to get involved in farming. : Increase the number of minority farmers by 200. Adoption of environmental sustainable crop production practices: Increase the number of farms adopting production practices by 150.
5	Improve small and minority farms income: Increase the average small farm gross income by \$5,000
6	Enhanced viability of rural communities. Enhanced profitability of Small Farms. 2010: Increase Farm growth income by \$5, 000 2011: Increase Farm retention rate by 4, 250

## **Outcome #1**

### **1. Outcome Measures**

Aquaculture- Define sunfish nutritional requirements. Develop a fast growing sunfish cultivar. Identify viable production systems for sunfishes. Make available a fish health protocol. Small Ruminants- Assess the use of herb cultivars for control of internal parasites. Investigate new cultivars of grasses and legumes for potential improvement of weight gains in lambs and kids. Develop optical or biosensor to determine optimum breeding time. Large Ruminants- Develop optical sensor or biosensor for determining optimum breeding time.

### **2. Associated Institution Types**

- 1890 Extension
- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	3575	1000

### **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 where 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

<b>KA Code</b>	<b>Knowledge Area</b>
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 #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

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	1530	400

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Commercial fish farmers.  
Small farmers interested in 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**

<b>KA Code</b>	<b>Knowledge Area</b>
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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	1530	930

**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.

**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**

<b>KA Code</b>	<b>Knowledge Area</b>
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**

Develop educational programs to encourage minority youth to get involved in farming. : Increase the number of minority farmers by 200. Adoption of environmental sustainable crop production practices: Increase the number of farms adopting production practices by 150.

**2. Associated Institution Types**

- 1890 Extension
- 1890 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	360

**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; community gardening and high-tunnel greenhouse vegetable production trainings; and launching of the Innovative Small Farms' Outreach Program(ISFOP). Brochures, publications and handouts. Meetings and conferences were held, online journal publications, abstracts and articles were published in a referred hard bound journal. Starting a local farmers cooperative. Development of cultural and management systems to improve the adaptation of sweet potato and watermelon in central Missouri, and assessing the economic implications of these practices. The value-added fiber program helped producers market fiber and hopefully increase overall small farm income.

### **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**

<b>KA Code</b>	<b>Knowledge Area</b>
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
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**

Improve small and minority farms income: Increase the average small farm gross income by \$5,000

### **2. Associated Institution Types**

- 1890 Extension
- 1890 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	4000

### **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 brought in to discuss bulk purchases.

#### **Results**

Increased/extended supply of freshly produced vegetables and small fruits.

Farmers' income increased by approximately \$4,000 to 6,000 annual rate.

Farmers gained invaluable knowledge of computers for purposes other than record keeping.

About 30 younger farmers were recruited to begin farming.

Hispanic producers and workers were recruited for the first time. The workers assisted in harvesting the produce.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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
721	Insects and Other Pests Affecting Humans

**Outcome #6**

**1. Outcome Measures**

Enhanced viability of rural communities. Enhanced profitability of Small Farms. 2010: Increase Farm growth income by \$5, 000 2011: Increase Farm retention rate by 4, 250

**2. Associated Institution Types**

- 1890 Extension
- 1890 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	50

**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 recirculating 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 (Table 2). 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 (Figs. 1a and 1b) 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**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
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604	Marketing and Distribution Practices
721	Insects and Other Pests Affecting Humans

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

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

### **Brief Explanation**

Extreme weather conditions had an affect 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 and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- During (during program)
- Case Study

### **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.
- the last, and not least was on farming participation rate.