

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger - enhancing sustainability of agricultural plant production

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				20%
111	Conservation and Efficient Use of Water				5%
131	Alternative Uses of Land				30%
133	Pollution Prevention and Mitigation				5%
204	Plant Product Quality and Utility (Preharvest)				10%
212	Pathogens and Nematodes Affecting Plants				5%
601	Economics of Agricultural Production and Farm Management				25%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	10.5
Actual Paid Professional	0.0	0.0	0.0	13.5
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	0	0	613272
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	613272
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	655614

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct workshops and stakeholder meetings.
 Provide training.
 Conduct research experiments.
 Set up a soil carbon laboratory.
 Develop a course description and course material pertinent to the program.
 Conduct research experiments on nutrient uptake, translocation, accumulation and partitioning in plants using various elements using organic and mineral fertilizers.
 Explore the potentials of plug transplanting and grafting technology for organic transplants.
 Conduct hands-on training and workshops on visual nutrient deficiency symptoms of food crops and ornamentals.
 Train and educate students and extension agents in plant mineral nutrition management.
 Develop alley cropping agroforestry systems for carbon storage.

2. Brief description of the target audience

Organic and conventional growers of food crops and ornamentals
 Professional design practitioners
 Community stakeholders
 Farmers, forest landowners, environmental and conservation conscious individuals
 Undergraduate and graduate students
 Scientific community, extension agents

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	440	640	51	70

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

Patent Applications Submitted

Year: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	3	2	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of venues to inform stakeholders about characteristics, trends, and significant changes in farm distribution and supply of produce commodities.

Year	Actual
2013	3

Output #2

Output Measure

- Number of workshops held on use of specialized fertilizer formulations to reduce environmental nutrient contamination.

Year	Actual
2013	13

Output #3

Output Measure

- Number of workshops held to educate landowners on carbon sequestration strategies.

Year	Actual
2013	1

Output #4

Output Measure

- Number of exotic species/cultivars introduced as alternative crops.
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of workshops held addressing agricultural sustainability.

Year	Actual
2013	1

Output #6

Output Measure

- Number of venues to inform stakeholders about current issues on fruit and vegetable consumption/demand and its impact on overweight/obesity.

Year	Actual
2013	3

Output #7

Output Measure

- Research presentations relating to enhancing sustainability of agricultural plant production.

Year	Actual
2013	11

Output #8

Output Measure

- Research publications related to enhancing sustainability of agricultural plant production.

Year	Actual
2013	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Producers will adopt use of specialized fertilizer formulations to reduce environmental nutrient contamination (Enhanced capacity of a sustainable global food system including new/improved plans, animals, technologies and management systems).
2	Producers will realize reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.
3	Producers will realize increases in crop yield and income as a result of the use of specialized fertilizer formulations.
4	Producers will be informed about online tools to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).
5	Producers will use an online tool to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).
6	Producers will achieve improved water, air quality, and agricultural management as a result of using the online tool (Improve climate mitigation strategies and their adoption).
7	Producers will have increased knowledge of characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states (More sustainable, diverse, and resilient food systems across scales).
8	Students with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states in the U.S. (More sustainable, diverse, and resilient food systems across scales).
9	Farm/forest landowners will have an increased knowledge of multi-function land management techniques(Improve climate mitigation strategies and their adoption).
10	Farm/forest landowners will adopt multi-function land management techniques(Improve climate mitigation strategies and their adoption).
11	Farm/forest landowners will realize increased income as a result of multi-function land management techniques (Improve climate mitigation strategies and their adoption).
12	Educators (i.e. Extension agents, state forestry officials) will have increased knowledge of multi-function land management techniques
13	Number of breeders incorporating low-level pathogen inducer genes in to germplasm
14	Number of people with increased knowledge about current issues on fruit and vegetable consumption/demand and its relationship with overweight/obesity in the U.S.
15	Number of students with increased knowledge of current issues on fruit and vegetable consumption/demand and its impact on nutrition and overweight/obesity in the U.S.

Outcome #1

1. Outcome Measures

Producers will adopt use of specialized fertilizer formulations to reduce environmental nutrient contamination (Enhanced capacity of a sustainable global food system including new/improved plans, animals, technologies and management systems).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Challenges of cultural practices including water management for healthy seedling production. Utilization of alternative nutrient sources such as banana peels, potatoes, and greensand as a source of potassium in organic seedling establishment will be beneficial.

What has been done

Presentation of papers at scientific conferences.

One presentation at the American Society for Horticultural Science Annual Conference 2013 entitled "Organic seedlings production using organic amendments and substrate".

Two presentations at the International Plant Nutrition Colloquium

1) Impact of Macro and Micronutrient Deprivation on Iron Uptake in Bedding Plants

2) Bell Pepper (*Capsicum annum* L.) Fruit Mineral Nutrients as Affected by Shade Level

Results

Research outcomes were communicated to the scientific community, extension specialists, extension agents, graduate students, undergraduate students and growers. This information will improve nutrient management in seedling establishment of food crops, and hydroponic production system and optimal nutrient management for blueberry. Alternative nutrient sources may also represent a cost savings factor in sustainable production of food crops. In addition, we expect additional research interest in tropical and sub-tropical fruits, water management and enhancing the nutritional value of food crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #2

1. Outcome Measures

Producers will realize reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a lack of information on the precise fertilizer requirements and techniques of management for production for specialized crops, i.e. blueberry production.

What has been done

Three studies were conducted to investigate optimal nitrogen forms and pH levels for blueberry production and established high resolution images of macro and micronutrient deficiency symptoms.

Results

Research results were communicated to Master gardeners, blueberry producers and scientists to inform them of new fertilizer application practices for nitrogen in blueberry production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

Outcome #3

1. Outcome Measures

Producers will realize increases in crop yield and income as a result of the use of specialized fertilizer formulations.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Producers will be informed about online tools to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Producers will use an online tool to optimize evapotranspiration, biomass, and air quality in row crops (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Producers will achieve improved water, air quality, and agricultural management as a result of using the online tool (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Producers will have increased knowledge of characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

An evaluation of trends and significant changes in farm and supply distribution of produce commodities will provide empirical evidence and perspectives for policy makers, producers and businesses to evaluate needs and opportunities, and to effectively design and implement policies and programs that create market access and opportunities for fresh produce farmers and businesses. Research on these issues, though invaluable to various stakeholders, is very limited or not up to date. This study provides the most up-to-date empirical evaluation of the recent developments in the fresh produce market.

What has been done

We selected four states for study, collected data on farms, especially small farms and produce farms in these states from NASS and reports from respective states' departments of agriculture, collected and assembled data on market environment including data on farmer's markets and food hubs and data on food deserts and demographics and consumer information. We are compiling data on farm distribution and characteristics with data on market environment and analyzing farm distribution in conjunction with analysis of market environment in selected states.

Results

Findings in this period suggest high obesity rates, low consumption of fruits and vegetables, and clusters of food deserts are associated with each other in many states in the south. The growth of direct-to-consumer sales paralleled that of the agriculture value from 2002 to 2007. The south has a larger share of small farms but accounted much less in direct-to-consumer sales compared with the rest of the nation. The above may suggest that direct-to-consumer sales have potential for growth for small farms and in the south, as well as that potential barriers exist that prevented direct-to-consumer sales in the south.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Students with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states in the U.S. (More sustainable, diverse, and resilient food systems across scales).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Skilled personnel are vital to sustainable growth in the produce industry and increasing supply of healthy foods for consumers. It is important to inform and educate students of critical issues, recent developments, current situation, and future perspectives and opportunities in the produce industry.

The knowledge gained will help students make informed decisions on their careers and beyond and encourage them to make contributions in their own ways.

What has been done

Activities of the project include teaching, training, professional development activities for students at TSU. Many students reached by the project are minority students such as African American, African, Asian, and Middle-eastern students.

Three graduate students have worked on this project through graduate research assistantships. All these three graduate students received one-on-one mentoring, training, and hands-on experiential learning.

Results

Fifty students enrolled in these two courses in 2013 were introduced to background, literature, needs, critical and emerging issues, data sources, methodologies, and findings and implications. These students also practiced a pedagogical student project developed from the data and analysis of this study. The study has directly increased the knowledge of at least 50 students about characteristics, trends, and changes in the U.S. fresh produce industry, and is estimated to impact even more people as the students spread the knowledge. This will have a spillover and long-term impact on the labor force in the fresh produce industry.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Farm/forest landowners will have an increased knowledge of multi-function land management techniques(Improve climate mitigation strategies and their adoption).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	110

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small producers generally lack the knowledge and skill-sets needed to properly manage their natural resources, are frequently underserved by existing education programs, or are simply unaware of the many opportunities available to them at the state and federal level. High investment costs, combined with the long rotation periods until forest products are ready for market deter many from investing more substantively in traditional forestry operations. Training in multi-function land management techniques will offer limited-resource landowners opportunity to successfully attain their goals with forest land management practices and flexibility of establishing a mixed-use system.

What has been done

Various outreach activities were held to communicate research findings to small acreage land holders.

Results

A total of 110 small-holding farmers, forest landowners, and ranchers increased their knowledge of research-based multi-function land management techniques.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #10

1. Outcome Measures

Farm/forest landowners will adopt multi-function land management techniques(Improve climate mitigation strategies and their adoption).

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small producers generally lack the knowledge and skill-sets needed to properly manage their natural resources, are frequently underserved by existing education programs, or are simply unaware of the many opportunities available to them at the state and federal level. High investment costs, combined with the long rotation periods until forest products are ready for market deter many from investing more substantively in traditional forestry operations. Training in multi-function land management techniques will offer limited-resource landowners opportunity to successfully attain their goals with forest land management practices and flexibility of establishing a mixed-use system.

What has been done

Research was conducted to on strategies to enhance the multi-use income capacity of property. Limited resource landowners were then trained in the strategies.

Results

It is too early in the project cycle to determine the level of change in land management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #11

1. Outcome Measures

Farm/forest landowners will realize increased income as a result of multi-function land management techniques (Improve climate mitigation strategies and their adoption).

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Educators (i.e. Extension agents, state forestry officials) will have increased knowledge of multi-function land management techniques

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Number of breeders incorporating low-level pathogen inducer genes in to germplasm

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Number of people with increased knowledge about current issues on fruit and vegetable consumption/demand and its relationship with overweight/obesity in the U.S.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The analysis of demand for fruits and vegetables and related issues is critical to study the future development of the produce industry. This study examines the relationship between fruit and vegetable consumption and adult obesity prevalence. The study also investigates whether and how obesity rates differ among various demographic and socioeconomic groups and factors that affect the propensity for consuming more fruits and vegetables.

What has been done

The project is assessing the needs and demand for fresh produce. We added an analysis of trends and across-state distribution of fruit and vegetable consumption rates and overweight/obesity rates and conducted further hypothesis tests.

Results

Many states in the northeast have the highest or higher-than-average consumption rates, and many in the south have the lowest or lower-than-average consumption rates among all; the highest consumption rates changed very little over time, whereas all the lowest consumption rates have decreased even lower over time; obesity rates increased across all states during the study period, however, obesity prevalence gets worse much faster for those states that already have very high obesity rates in the south; fruit and vegetable consumption appears to have higher and statistically significant effect on obesity compared with other two health-rated behavior/choices, physical activities and smoking.

A master-degree thesis was defended and filed in June 2013 as a result of the updated and revised study. The thesis is entitled 'An Empirical study of Fruits and Vegetable Consumption and Adult Overweight and Obesity in the U.S.'

4. Associated Knowledge Areas

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

Outcome #15

1. Outcome Measures

Number of students with increased knowledge of current issues on fruit and vegetable consumption/demand and its impact on nutrition and overweight/obesity in the U.S.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2013

50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

It is important to inform and educate our students about the current and critical issues on food, agriculture, health and nutrition so that they can make informed decisions on their consumptions and career choices, and make contributions to and have positive influence on communities.

What has been done

The study and its findings were incorporated into the curricula of two graduate-level courses in three ways in spring and fall semesters in 2013. Students were introduced to background and critical issues, literature, and findings of this study. The students in a statistics class all completed a student pedagogical project developed from the project, including data analysis, regression estimation, and a write-up. The pedagogical student project was published on the class website and can be assessed worldwide.

Results

Fifty students were enrolled in these two graduate-level courses in 2013. These students were introduced to background and critical issues, literature, and findings of this study. Over forty students were introduced to the pedagogical case study. They have conducted the designed data and statistical analyses and analyzed results. The teaching module has also been posted on the statistics teaching website. During this reporting period, people from 27 countries and 32 states in the US. visited the sties; and the site had 3060 visits, 811 unique visitors, and 12,177 page views. We estimate a direct contact of 53 students at TSU and at least another indirect contact of 50 people through the website worldwide.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Twin-track measuring impact approach were used to evaluate the success of the project. During the training session at conference, questionnaires were filled by participants to get feedbacks. These feedbacks were used to guide for future planning. In addition, a systematic client consultation was used to elicit feedback from the intended beneficiaries on the effectiveness of the design of project subcomponents and adoption of best multifunction land management practices.

Key Items of Evaluation