

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				25%
111	Conservation and Efficient Use of Water				10%
131	Alternative Uses of Land				20%
133	Pollution Prevention and Mitigation				10%
204	Plant Product Quality and Utility (Preharvest)				10%
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: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	10.1
Actual Paid Professional	0.0	0.0	0.0	6.0
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	0	0	305772
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	305772
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	255272

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

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	392	600	0	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	0	3	3

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
2012	3

Output #2

Output Measure

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

Year	Actual
2012	0

Output #3

Output Measure

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

Year	Actual
2012	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
2012	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
2012	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of producers adopting the use of specialized fertilizer formulations to reduce environmental nutrient contamination.
2	Number of producers realizing reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.
3	Number of producers realizing increases in crop yield and income as a result of the use of specialized fertilizer formulations.
4	Number of people informed about online tool to optimize evapotranspiration, biomass, and air quality in row crops.
5	Number of people using an online tool to optimize evapotranspiration, biomass, and air quality in row crops.
6	Number of people achieving improved water, air quality, and agricultural management as a result of using the online tool.
7	The number of people with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states.
8	The number of 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.
9	Number of people with increased knowledge about current issues on fruit and vegetable consumption/demand and its relationship with overweight/obesity rates in the U.S.
10	Number of students with increased knowledge of current issues on fruit and vegetable consumption/demand and its impact on nutrition and overweight/obesity rates in the U.S.
11	Producers informed about greenhouse gas emission as a result of fertilizer application in corn production systems.
12	Producers informed about optimizing fertilizer inputs and water use efficiency to mitigating greenhouse gases emission in row crop production.
13	Students trained in greenhouse gas monitoring

Outcome #1

1. Outcome Measures

Number of producers adopting the use of specialized fertilizer formulations to reduce environmental nutrient contamination.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of producers realizing reduction in crop loss through the use of specialized fertilizer formulations to reduce environmental nutrient contamination.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of producers realizing 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

Number of people informed about online tool to optimize evapotranspiration, biomass, and air quality in row crops.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of people using an online tool to optimize evapotranspiration, biomass, and air quality in row crops.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of people achieving improved water, air quality, and agricultural management as a result of using the online tool.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

The number of people with increased knowledge about characteristics, trends, and significant changes in farm distribution and supply of produce commodities in selected states.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	50

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

Data on production and prices were collected from Agricultural Marketing Services, NASS, and Economic Research Services of USDA. A unique panel dataset on fresh-market vegetables was generated for 36 producing states during 2003-2011. The empirical analyses were conducted utilizing descriptive and inferential statistical methods, trend regressions, and panel econometric models. The study analyzes supply distribution in across section and trends over time in different regions.

Results

The findings suggest that during 2003-2011: (1) seven out of 36 producing states produced 82% of fresh vegetables in the U.S. with California accounting for 51% of the total production; (2) fresh vegetable production experienced a statistically significant decline in these seven states due to decrease in harvested acres with yield remaining unchanged; (3) the minor producing states as a whole showed no evident or no statistically significant decrease in production, implying potential for expansion; (4) inflation-adjusted producer price fluctuated, but on average, had no statistically significant change in the past 10 years, which may have contributed to the decline in production. Data were presented at various regional and national venues.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

The number of 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.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	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 the 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

The program findings to date have been incorporated into multiple lectures in two graduate-level courses.

Results

Fifty students who enrolled in the two courses in 2012 were directly introduced to the study and its findings as examples and case studies in several lectures. 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

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

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	180

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 project examines the relationship between fruit and vegetable consumption and adult obesity prevalence. The project 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 study uses a panel dataset from the Behavioral Risk factor Surveillance System (BRFSS) by the Center for Diseases and Controls and Prevention from 1996 to 2009. An econometric model was developed and tested. The study employs a series of nonlinear fractional response econometric models for estimation and robustness tests. A working paper was developed from the first set of findings, presented at two conferences and published online at the conference site.

Results

The findings offer valuable insights on promoting healthy dietary choices with more fruits and vegetables in designated groups. Analysis suggests the effect of fruit and vegetable consumption on obesity rates is negative, statistically significant, and robust to various estimation specifications. Also revealed was middle-aged people, African-Americans, and people undergoing a marriage separation have the highest obesity prevalence and the lowest rate of fruit and vegetable consumption compared with all other age, ethnic, and marital-status groups. Education attainments, income levels, and employment status have either no significant effect or have expected effects on dietary choice and obesity outcome, but generally they have no counter intuitive effect on either dietary choice or obesity outcome.

4. Associated Knowledge Areas

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

Outcome #10

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 rates in the U.S.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	100

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.

What has been done

The study and its findings were incorporated into the curricula of two courses in three ways in spring and fall semesters in 2012: the study and its findings were presented and discussed with students in several lectures of both courses, a study project and dataset were developed for pedagogical purposes from the original research in fall 2011 and revised in 2012. The students in a statistics class all completed the project, including data analysis, regression estimation, and a

write-up. Third, the study project was published on the class website and can be assessed worldwide.

Results

Fifty students who enrolled in the two courses in 2012 were directly introduced to the study and its findings in several lectures as examples and case studies. Forty students completed a study project, which is a simplified pedagogical project developed from the original research. People from over ten countries and over 20 states in the U.S. visited the statistics class website in 2012, which posted the study project developed from this research. There were 2,200 sites visits and 10,000 page views in 2012. The study project is estimated to reach 50 people and increased their knowledge of current issues on fruits and vegetable consumption and its relationship with nutrition and overweight/obesity in the U.S.

One graduate student is completing the MS on this topic that has a focus on distributions of fruit and vegetable consumption and obesity rates.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Producers informed about greenhouse gas emission as a result of fertilizer application in corn production systems.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increases in the atmospheric concentration of greenhouse gases contribute to global warming and destruction of atmospheric ozone layer. Nitrous oxide is the principal non-carbon dioxide greenhouse gas emitted from soils, primarily as a result of nitrification and denitrification processes. Nitrogen fertilizer inputs, coupled with irrigation, generally increase nitrous oxide emissions. If nitrogen and water use efficiency in row crop such as corn are improved,

greenhouse gas production can be reduced. Large quantities of nitrogen fertilizers are applied to corn fields.

What has been done

A field-scale study of corn production evaluated the effects of a denitrification inhibitor, no-till, and conventional tillage systems on nitrous oxide emission from soils. Seasonal dynamics of nitrous oxide (N₂O) emissions from a large scale farm (40 acres) were also evaluated, using Eddy Covariance technique. Rainfall, average wind speed/direction, relative humidity, and solar radiation were measured.

Results

Preliminary data indicate N₂O fluxes were significantly influenced by the agricultural practices such as no-till, especially after rainfall events. As expected, the UAN fertilizer plus denitrification inhibitor plots exhibited lower nitrous oxide emissions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #12

1. Outcome Measures

Producers informed about optimizing fertilizer inputs and water use efficiency to mitigating greenhouse gases emission in row crop production.

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nitrogen fertilizer inputs, coupled with irrigation or rainfall generally increase nitrous oxide emissions. Nitrous oxide is the principal non-carbon dioxide greenhouse gas emitted from soils, primarily as a result of nitrification and denitrification processes. Large quantities of nitrogen fertilizers are applied to corn fields.

What has been done

A field scale study of corn production both at a small scale (1 acre) and a large scale (40 acres) was evaluated. Both fields were fertilized with nitrogen fertilizer, UAN. Nitrous oxide emission was measured with closed chambers technique at the small field and with an eddy covariance technique at the larger field.

Results

Preliminary data indicate that N₂O fluxes were significantly influenced by the agricultural practices such as no-till especially after rainfall events. As expected the UAN fertilizer plus denitrification inhibitor plots exhibited lower nitrous oxide emissions. Results are being prepared for communication to producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation

Outcome #13

1. Outcome Measures

Students trained in greenhouse gas monitoring

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is the need for a college-based training in global climate change, especially in greenhouse gases emission. Employers are seeking a future workforce to meet the need of air quality issues especially in the area of global warming.

What has been done

Students are learning data entry techniques and becoming proficient in instrument calibration and the measurement of nitrous oxide flux using the closed chamber technique.

Results

Two students (one graduate student and an undergraduate student) are gaining both research and extension experiential training. The graduate student is developing an MS thesis from one of the primary objective of the project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

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

Most objectives in this project are on schedule for being met, notable results include:

Two graduate students were trained in greenhouse gas monitoring techniques

100 students with increased knowledge of implication of fruit and vegetable consumption habits on commodity production economics.

180 producers with improved understanding of demand for fruits and vegetables and related issues as they relate to the future development of the produce industry.

Producers have increased knowledge of greenhouse gases emission as a result of fertilizer application in corn production systems.

Farm/forest landowners increased their knowledge of multi-function land management techniques

Some goals have not been met. Many of the unmet goals are the result of project maturity- the project has not progressed to the point of being able to measure some goals, i.e. the project has not advanced enough yet to measure the number of farm/forest landowners realizing increased income as a result of multi-function land management techniques, or to produce tangible changes in landowner behavior.

Key Items of Evaluation