V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Food and Non-Food Products: Development, Processing, Quality, and Delivery

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	31%		31%	
502	New and Improved Food Products	22%		22%	
503	Quality Maintenance in Storing and Marketing Food Products	18%		18%	
504	Home and Commercial Food Service	2%		2%	
511	New and Improved Non-Food Products and Processes	25%		25%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	2%		2%	
	Total	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	3.5	0.0	14.5	0.0
Actual	0.9	0.0	7.2	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
332297	0	286607	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
867782	0	865412	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
119136	0	300423	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• conduct research • develop programs and conduct workshops • develop extension curricula • provide outreach training programs • establish distance education programs and web-based programs •coordinate meetings with important stakeholders (researchers, industry, farmers, regulatory, etc.) • work with media

2. Brief description of the target audience

•Farmers •Animal production personnel •Plant production personnel •Biofuels processing industry personnel •Food manufacturing and processing plant personnel •Non-food manufacturing plant personnel •Professional engineers •State and county health departments •Federal regulatory officials •State industry associations

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	1000	10000	100	1000
Actual	650	0	200	0

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

Patent Applications Submitted

Year: 2010
Plan: 1
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	5	10	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of programs offered to farmers or production agriculture specialists
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of programs offered to the food industry
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of programs offered to the non-food industry
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of research projects on bioprocessing
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of research projects on air quality
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Number of research projects on grain storage and processing
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of research projects related to dairy products
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Number of research projects related to aquaculture products
  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Number of research projects related to enology and viticulture
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Number of research project related to food processing
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Number of research projects related to food quality
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Number of workshops offered to the general public

Year	Target	Actual
2010	1	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of persons gaining knowledge in bioprocessing
2	Number of products produced using new bioprocessing technologies
3	Nnumber of new products produced by new bioprocessing, bioenergy, and biotechnology
4	Number of new bioprocessing techniques used to increase efficiency
5	Number of persons gaining knowledge in food processing and food processing automation
6	Numbers of persons or companies adopting new food automation technologies
7	Number of food and non-food automation technologies used
8	Number of persons gaining knowledge in air quality control systems
9	Numbers of animal production facilities adopting better air quality practices
10	Number of production facilities with improved air quality
11	Number of persons gaining knowledge in grain processing
12	Numbers of persons and companies adopting better grain processing practices
13	Number of persons gaining knowledge in enology and viticulture
14	Number of persons gaining knowledge of government programs
15	Number of persons gaining knowledge of marketing trends
16	Number of persons gaining knowledge of food packaging applications
17	Number of persons adopting one or more best management practices related to viticulture and enology

Outcome #1

1. **Outcome Measures**

Number of persons gaining knowledge in bioprocessing

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of products produced using new bioprocessing technologies

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Nnumber of new products produced by new bioprocessing, bioenergy, and biotechnology

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Number of new bioprocessing techniques used to increase efficiency

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	3	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Commercial sterilization of aseptic bulk storage tanks and transport containers is typically performed using Iodophor (iodine and phospohoric acid) solutions. This sterilization method requires flooding the containers with the iodophor. Since the current bulk storage tanks for citrus juices are now approaching over 2 million gallons each, this requires millions of gallons of iodophor that must be discharged to water treatment facilities after the sterilization.

What has been done
An alternative to iodophor flood sterilization of aseptic, bulk juice storage vessels is to use chlorine dioxide gas. The chlorine dioxide gas technology was successfully developed and commercialized in collaboration with Enerfab, Inc. In addition, a gas sterilization procedure was developed for aseptic tranfer vessels, ISO tankers.

Results
In the past year, three facilities have used the new sterilization method. Over 250 ISO tankers, were sterilized with chlorine dioxide gas for aseptic transfer of orange juice. Each bulk tank sterilized with chlorine dioxide gas saves over 1 million gallons of water which was required previously for flood sterilization with iodophor. Each ISO tanker sterilized with chlorine dioxide saves energy in the form of heat required to re-pasturize the juice to prevent spoilage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
512	Quality Maintenance in Storing and Marketing Non-Food Products

Outcome #5

1. Outcome Measures

Number of persons gaining knowledge in food processing and food processing automation

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Foods, food ingredients and dietary supplements must be safe, nutritious, stable and acceptable throughout the intended shelf-life. However, some common storage conditions and practices may contribute to faster-than-expected degradation of key nutrients, such as vitamin C. It is important to identify conditions in which nutrients degrade, how fast the degradation occurs, and devise strategies to avoid the degradation.

What has been done
Researchers have studied the effects of processing and storage conditions on the structure-function relationships of food ingredients and ultimate food shelf-life, with an increasing focus on the effects and control of water-solid interactions.

Results
This research has significantly increased the understanding of the detrimental effects of moisture on crystalline solids and the synergistic interaction of water with multi-component blends of food and bioactive ingredients. The studies showed for the first time that powdered blends of highly water-soluble food ingredients (including sugars, salts, organic acids, and vitamins) undergo deliquescence, which can lead to enhanced chemical reactivity and physical changes. Vitamin C is commonly added to many food products, and labeling laws often result in overages being added to meet label claims throughout shelf-life, which increases product cost and may exacerbate deliquescence-related instabilities. Improving the stability of vitamin C in complex environments is important for product quality, labeling, nutrient delivery, and cost. This research has produced industry and consumer guidelines for formulation, packaging, and storage conditions of ingredient blends, including wide-reaching press coverage of consumer advice for where to store vitamins to enhance their stability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

Outcome #6

1. Outcome Measures

Numbers of persons or companies adopting new food automation technologies

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of food and non-food automation technologies used

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

   Number of persons gaining knowledge in air quality control systems

   Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

   Numbers of animal production facilities adopting better air quality practices

   Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

   Number of production facilities with improved air quality

   Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

   Number of persons gaining knowledge in grain processing

   Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

   Numbers of persons and companies adopting better grain processing practices

   Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

   Number of persons gaining knowledge in enology and viticulture

   Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

   Number of persons gaining knowledge of government programs

   Not Reporting on this Outcome Measure

Outcome #15

1. **Outcome Measures**

   Number of persons gaining knowledge of marketing trends

   Not Reporting on this Outcome Measure

Outcome #16

1. **Outcome Measures**

   Number of persons gaining knowledge of food packaging applications

   Not Reporting on this Outcome Measure

Outcome #17

1. **Outcome Measures**

   Number of persons adopting one or more best management practices related to viticulture and enology

2. **Associated Institution Types**

   - 1862 Extension
   - 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Indiana has a vibrant and growing wine industry that contributes significantly to the economic wealth of the state and enhances the livelihood of its residents. Growers and vintners demand up-to-date information on new grape cultivars, sustainability and pest management, winemaking techniques, and marketing strategies.

What has been done
The Purdue Wine Grape Team conducts discovery and engagement in viticulture and enology. Research has led to the discovery of grape cultivars that have improved fruit quality and produce better wines. Regular winery consultaions, analytical services and wine sensory evaluations have been done. Professional workshops and seminars engage the industry several times each year to deliver the latest scientific information. The team continued a successful campaign to create and promote an inaugural Indiana signature wine style. The annual Vintage Indiana wine festival in Indianapolis attracting more than 10,000 people and the Indy International wine competition with 2,700 entries from around the world were held to promote Indiana agriculture.

Results
Wine quality has improved. The Indiana wine industry now contributes more than $72 million to the Indiana economy. Grape and wine production are the fastest growing segments of Indiana value-added agriculture and agritourism. Indiana's wine acreage has increased over the past ten years. Wine production surpassed one million gallons in 2010, a 2,100% increase since 1991. Wine has emerged as a prime example of a high-valued agricultural commodity made in Indiana.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

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.)
- Other (State & National Priorities)

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}