

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety And Food Security

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
101	Appraisal of Soil Resources	2%		0%	
111	Conservation and Efficient Use of Water	10%		10%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		5%	
205	Plant Management Systems	10%		0%	
216	Integrated Pest Management Systems	5%		0%	
501	New and Improved Food Processing Technologies	0%		10%	
502	New and Improved Food Products	0%		10%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		10%	
603	Market Economics	3%		0%	
701	Nutrient Composition of Food	0%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		10%	
703	Nutrition Education and Behavior	0%		10%	
704	Nutrition and Hunger in the Population	10%		15%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	20%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		10%	
806	Youth Development	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890

Plan	12.0	0.0	15.0	0.0
Actual Paid Professional	0.0	0.0	6.0	0.0
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
811658	0	638285	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
811658	0	638285	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
10074929	0	1692301	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Activities included research with the objective of defining the oligosaccharide fermentation patterns produced by ileal and colonic contents of sow-reared and formula-fed piglets [this knowledge will allow for the development of nutritional ingredients to improve the quality of infant formulas for babies who are not breast fed], the determination of bacterial populations within the insect vectors of *E. tracheiphila* [with the ultimate goal of controlling bacterial wilt disease of cucurbits], an investigation into the effects of sonication, sanitizers and sodium dodecyl sulfate [SDS] on the quality of fresh-cut Iceberg and Romaine lettuce, the development of standardized protocols for iron fortification using extrusion and for mixing and grinding fortified pellets and nixtamalized corn for the development and characterization of an in situ fortification technology for tortillas, work focusing on the measurement of critical odorants and their interactions in foods, food ingredients and other complex materials where odor is of concern, the dissemination of up-to-date information that allowed growers and buyers to more efficiently meet market demands associated with organic production, food safety regulations, Farm to School, and extended seasons for production and marketing, the design and fabrication of a pilot-scale continuous-flow washing system used to investigate the efficacy of ultrasound treatment for produce sanitization, an investigation into the potential of zein to microencapsulate bioactive, health-enhancing food components, and work to improve our understanding of the bacterial population within insect vectors [this will provide information for the potential source of microbial contamination for fresh produce].

Conference presentations included Experimental Biology 2013, 10th International Congress of Plant Pathology, Illinois Specialty Crops, Agritourism, and Organics Conference, Institute of Food Technologists, and the National Science Foundation Industry and University Cooperative Research Program.

Food safety training for employees of establishments and volunteers that prepare or serve food to the public was again delivered. Approximately 100 individuals were trained primarily through the first of the following three programs: [1] the Illinois Department of Public Health five-hour **Refresher Course for Food Handlers** designed for food service sanitation managers who must maintain their certification every three years; [2] **Serve it Safely**, a food class for volunteers who serve food for fundraisers, community

organizations and family events; and [3] A new two-hour workshop titled **From Garden Gates to Dinner Plates** was developed this past year and attended by 22 individuals who were interested in information about the **Illinois Cottage Food Operation Law** regarding low-risk foods that can be prepared in the home and sold at Illinois farmers markets. A new online and supplemental program entitled **Yes, You Can--Preserve Food Safety** was reviewed and piloted. The **Supplemental Nutrition Assistance Program-Education** [SNAP-Ed] curriculum for both youth and adults included an emphasis on proper hand-washing and cleanliness habits when preparing food.

During this past year, seven **Enhancing Specialty Food Safety** programs were offered to specialty growers in Illinois and addressed safe food production and handling in order to ensure that fresh produce is free from contamination by microorganisms that cause foodborne illnesses. Information on good agricultural practices to ensure food safety was also included as a topic for a statewide webinar and commercial fruit and vegetable production schools were held at various locations throughout the state. In addition, several Extension educators assigned to provide programs in small farms and local food systems shared updates of rules and regulations regarding farmers' markets, pesticide spraying, and open water systems.

State and regional Extension conferences/clinics and field days reached large numbers of corn and soybean producers with information on fertility and pest management. **Corn and Soybean Classics** [six regional-based meetings that featured eight faculty presentations on the latest research concerning crop production, pest management, economics, and the interactions among them] were attended by 938 producers and agricultural consultants. The multi-state **AGMasters Conference**, a two-day multidisciplinary conference, was attended by 155 who participated in one general session and 12 specialized sessions. **Regional Crop Management Conferences** were held in four locations in 2013. The primary audience was certified crop advisers. Extension of research to the public also included the **Varietal Information Program for Soybeans**, a website and publication that provided information on yield, protein and oil, and disease and pest susceptibility. Annual research farm field days were held on campus and throughout the state to showcase the results of research plots to producers.

The electronic **Pest Management and Crop Development Bulletin** series was issued weekly throughout the crop-growing season [20 issues from early April to mid-August] and five additional times in the off-season to report on current agricultural conditions based on pest management information provided by entomologists, agronomists, and plant pathologists. Of the 4,657 plant samples diagnosed by the **University of Illinois Plant Clinic**, the significant field crop disease issues evaluated were soybean cyst nematode and soybean vein necrosis virus. The clinic tested client-submitted samples, phytosanitary inspection samples, soybean cyst nematode egg extraction samples, and nematode samples for University researchers and private industry. Pesticide safety education was conducted using presentations at numerous locations that resulted in 9,203 commercial pesticide applicator certifications and 2,793 private pesticide applicator certifications. Information was also disseminated electronically via a quarterly multi-state newsletter focused on integrated pest management successes and activities.

Statewide Extension conferences related to produce production included several multi-state conferences: **Illiana Vegetable Growers Symposium**, **the Southern and Southwestern Tree Fruit School**, **Western Illinois Vegetable School**, **Stateline Fruit & Vegetable Conference**, and the **Southern Illinois Commercial Vegetable School**. Additional Illinois state or regional conferences focused specifically on growing horseradish, small fruits, and strawberries. Extension also provided leadership for the **Specialty, Agritourism and Organic Conference** and distributed issues of **Fruit and Vegetable News** approximately bi-weekly. More than 100 aspiring farmers and new growers and agriculture teachers participated in **Preparing a New Generation of Illinois Fruit and Vegetable Farmers**, a year-long program which features classroom, hand-on, and in-field instruction.

Several interdisciplinary efforts among Extension Educators with responsibility for local foods,

horticulture, foods and nutrition, community economic development, and/or 4-H development were targeted at supporting community gardens that raised produce to feed the hungry. Extension staff also facilitated community groups, forums, expositions, and tours to bring together those interested in identifying opportunities to support local foods systems including the potential conversion of an abandoned prison into a food hub, small farm incubator, or a Farm to School learning laboratory.

Extension activities that addressed hunger within Illinois are delivered by **Expanded Food and Nutrition Education Program** [EFNEP] staff and **Supplemental Nutrition Assistance Program Education** [SNAP-Ed] staff members who conduct hands-on activities with children and their parents with limited incomes. These activities include using food stamps, meal planning, wise shopping, and use of food pantries. The **SNAP-Ed** and **EFNEP** staff used the **CATCH** and **SPARK** curricula to educate elementary and preschool students in after-school and summer programs about healthy snacks, good nutrition, and the importance of physical activity. **OrganWise Guys** materials were also used by **SNAP-Ed** and **EFNEP** staff in elementary school classrooms. Curricula used to teach adults included **Eating Smart Being Active** and **Loving Your Family Feeding Your Future** that emphasized feeding your family on a budget and preparing meals safely. More than 569,000 teaching contacts were made through the **SNAP-Ed** program and 19,279 family members including 3,300 new families were reached through **EFNEP** this past year.

2. Brief description of the target audience

Members of the target audience included practitioners interested in improving child health and scientists interested in how early nutrition influences gut development, researchers in the fields of economics, public health, and nutrition, policymakers charged with improving the well-being of low-income Americans, program administrators overseeing food assistance programs, food producers, processors, ingredient manufacturers and flavor companies, food industry professionals who work with extruded snack and cereal products, farmers' market managers, produce packers, scientists from the fields of nutrition, bioengineering and immunology, industry and academic food science researchers and professionals engaged in the development of methods and processes to improve the safety and quality of foods, graduate and undergraduate students in food science and human nutrition, product development professionals in the food industry, food ingredients manufacturers, commodity groups, and the fruit and vegetable industries.

Extension targeted youth, certified food handlers, and volunteers who serve food to the public, producers of food distributed through local systems, producers of commercial fruit and vegetable crops, producers of feedstuffs for livestock, certified crop advisors, and limited resource audiences that are food stamp eligible.

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	171796	295935	470871	0

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

Patent Applications Submitted

Year: 2013

Actual: 1

Patents listed

TF 13036 PRO [Stabilization Compositions and Methods of Manufacture].

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	20	20

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2013	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Increasing Knowledge Of New Corn And Soybean Crop Management Techniques
2	Number Of Plant Variety Releases
3	Number Of Networks Prepared To Mitigate Biological And Abiotic Disruptions
4	Number Of Pounds Of Fresh Produce Donated For Consumption By Vulnerable Populations
5	Development Of Effective Methods For The Investigation Of Potent Odorants In Foods
6	Exploring The Use Of Power Ultrasound To Enhance The Microbial Safety Of Fresh Produce
7	Development Of The Proof-Of-Concept Of A Robust, Sensitive And Specific Diagnostic Platform To Test Micronutrient Status
8	Investigating The Potential Of Zein To Microencapsulate Bioactive, Health-Enhancing Food Components
9	Identification Of Methods That Extend The Shelf Life, Improve The Nutritional Quality, And Enhance The Safety Of Fresh Cut Produce
10	Number Of Fresh Food Producers Adopting Practices That Prevent Foodborne Illness Contamination
11	Number Monitoring Proper Temperatures Of Food Served/Sold To The Public To Prevent Food-Borne Illness
12	Increased Knowledge Of Fresh Fruit And Vegetable Production Practices
13	Increased Knowledge Of Small Farm Production Options

Outcome #1

1. Outcome Measures

Number Increasing Knowledge Of New Corn And Soybean Crop Management Techniques

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number Of Plant Variety Releases

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number Of Networks Prepared To Mitigate Biological And Abiotic Disruptions

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number Of Pounds Of Fresh Produce Donated For Consumption By Vulnerable Populations

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	4300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Over 1.9 million Illinois residents are considered food insecure, which means they do not have regular access to nutritious food. Thirty-eight percent of food insecure households and 34 percent of children in Illinois exceed federal poverty guidelines that would qualify them for food assistance. Those individuals must rely on charities to feed themselves and their families.

What has been done

University of Illinois Extension's 4-H staff applied for and received a state grant through the National 4-H Council's administration of funds for Invest an Acre, a private foundation supported program. Vegetable Garden Challenge Grants were then offered and awarded to individual 4-H members, 4-H clubs, schools, churches, and community organizations who agreed to grow and donate extra produce to local food pantries/soup kitchens/organization. These groups received the 4-H: Empowering Youth to End Hunger in Their Communities Toolkit to guide them in carrying out various activities. Extension Master Gardeners and 4-H Teen Ambassadors were recruited to help youth conduct activities that included: [1] Planning, planting, maintaining, and harvesting products grown in community gardens; [2] Partnering with Illini Fighting Hunger in conducting four meal packaging events with meals consisting of a soy-fortified rice casserole mix; [3] Volunteering at food pantries; [4] Establishing a meal site and serving an evening meal for families receiving food from a newly organized pantry; [5] Providing a Harvest Lunch for farmers delivering grain that resulted in cash donations to support their local 4-H Club Food Pantry; and [6] Staffing booths at county fairs and the Farm Progress Show and distributing fliers explaining the process for farmer participation in fighting hunger through the Invest An Acre donation of grain.

Results

The 4-H Feeding and Growing Our Communities program engaged 1,118 youth and 384 adults who collectively contributed 12,252 hours of volunteer service and secured in-kind donations of \$18,150 to address community-based, culturally-relevant food security and hunger relief projects in twenty-four counties. Specific outcomes encompassed: [1] The establishment of 11 community gardens; [2] Harvesting over 4,000 pounds and then donating 2,000 pounds of fresh produce to local food pantries, senior centers, soup kitchens, and community housing sites serving families in need; [3] Collecting and donating over 2,300 pounds of canned and non-perishable food to local food pantries; [4] Purchasing and bagging 420 'snack packs' for elementary school children; [5] Partnering with Illini Fight Hunger in preparing 63,054 meals of a soy-fortified rice casserole mix through four meal packaging events which were distributed to food pantries and through direct outreach to families.

Illinois 4-H members and volunteers now have a better understanding of hunger in their communities and have developed strategic plans to improve the lives of residents in need through community gardens, food collection and distribution sites, food packaging events, and feeding the hungry meal programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
704	Nutrition and Hunger in the Population
806	Youth Development

Outcome #5

1. Outcome Measures

Development Of Effective Methods For The Investigation Of Potent Odorants In Foods

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The project will develop and employ effective methods for the investigation of potent odorants [aroma-active compounds] in foods, food ingredients and various other complex materials. Key to the success of the project is the development of efficient procedures for the isolation, separation and identification of trace volatile constituents [specifically odorants] from complex [nonvolatile] matrices. Modern analytical techniques, including high resolution gas chromatography-olfactometry [GCO] and GC-mass spectrometry [GC-MS] will be used for the analysis of the isolated components. A critical component of this project will be the development of accurate and precise GC-MS quantification methods based on the use of stable isotopes as internal standards, so called stable isotope dilution assays [SIDA]. The validation of the analytical data will be accomplished by sensory analysis of model 'aroma' systems based on the analytical results.

What has been done

The project has focused on the measurement of critical odorants and their interactions in foods, food ingredients and other complex materials where odor is of concern. It has also evaluated the interaction of flavors with food matrix components such as protein. Other studies relate to the development of accurate and precise methods for quantification of trace odorants by stable isotope dilution assays.

Results

Results of this project will allow for the development of higher quality food products and associated materials [ingredients and packaging materials] by evaluation of important flavor-related quality indices for product development/improvement and shelf-life estimation. These techniques may also lead to the identification of sources of off-flavors, taints or other odor-based issues.

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
702	Requirements and Function of Nutrients and Other Food Components

Outcome #6

1. Outcome Measures

Exploring The Use Of Power Ultrasound To Enhance The Microbial Safety Of Fresh Produce

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The long-term goal of the proposed research is to explore the use of power ultrasound to enhance the microbial safety and minimize the food safety risk of fresh produce. The project objectives are: [1] To test ultrasound and sanitizer combined treatments with selected produce in a small wash tank in batch mode and in a pilot scale continuous ultrasonic washing system to examine the effect of sanitizer, washing time, and produce-to-sanitizer solution ratio on microbial reduction; [2] To conduct experiments to examine the effect of ultrasound on the quality of produce; [3] To conduct experiments on the combination of surfactants with sanitizer and ultrasound on the microbial count reduction, which will be based on surfactant screening and HLB values [also, emphasis will be given to the effect of sanitizer + surfactant + ultrasound on produce quality]; and [4] To investigate the distribution of acoustic energy in the washing tank and find means to improve the uniformity.

What has been done

A pilot-scale continuous-flow washing system with three pairs of ultrasonic transducers operating at 25, 40, and 75 kHz was designed and fabricated and used to investigate the efficacy of ultrasound treatment for produce sanitization. A uniform ultrasound distribution in the channel was achieved, as shown by pitting on aluminum foil and log reduction of *Escherichia coli* O157:H7 population on spinach held at different locations in the channel. The inactivation normalized by acoustic power density for one-minute treatments at 25, 40, and 75 kHz was 0.056, 0.061, and

0.057 Log CFU/[W/L], respectively. Blockage reduces the exposure of screened leaves to ultrasound, and results in significantly lower microbial count reduction. Compared to treatment with chlorine alone, combined treatment with chlorine and ultrasound in the continuous-flow system achieved additional log reductions of 1.0 and 0.5 CFU/g for *E. coli* cells inoculated on spinach, for washing in single-leaf and batch-leaf modes, respectively.

Results

In addition, we examined the individual and combined effects of sonication, two sanitizers [chlorine and Tsunami 100] and a surfactant [sodium dodecyl sulfate [SDS]] on the quality of fresh-cut Iceberg and Romaine lettuce. Lettuce samples were treated for 1 minute with and without ultrasound in a custom-designed ultrasonic tank containing one of the following treatment solutions: tap water; chlorine [100 mg L⁻¹ free chlorine]; Tsunami 100 [80 mg L⁻¹ peroxyacetic acid]; and a combination of Tsunami 100 with 0.1% [w/v] SDS. Washed samples were packed under modified atmosphere conditions and stored at 4° C for up to 14 days. Changes in headspace gases, texture, color, tissue damage, visual quality, populations of aerobic mesophile bacteria, and yeasts and molds were determined. The O₂ concentrations and CO₂ accumulation in Romaine lettuce were not significantly different among the treatments. In Iceberg lettuce, a lower O₂ and high CO₂ content in the headspace of samples treated with Tsunami 100 and Tsunami 100 + SDS were recorded. After 14 days of storage, the tissue damage expressed by electrolyte leakage rate [ECR], total color difference, firmness, and total aerobic plate counts were not significantly different for all the treatments in two types of lettuce samples [P>0.05]. Treatment of Iceberg lettuce with sonication in combination with Tsunami 100 or Tsunami 100 + SDS did not degrade quality compared to samples treated with chlorine alone, whereas for Romaine lettuce, chlorine-treated samples had a significantly higher overall quality score than that from the other treatments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #7

1. Outcome Measures

Development Of The Proof-Of-Concept Of A Robust, Sensitive And Specific Diagnostic Platform To Test Micronutrient Status

2. Associated Institution Types

- 1862 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)

Micronutrient undernutrition is a serious public health concern. It is associated with reduced childhood growth and social and mental development, increased risk and duration of illness and diminished work capabilities of an individual's lifetime. A major challenge to improving health in at-risk populations is the lack of current and reliable health and nutrition information. The high cost and inconvenience of current laboratory diagnostic technologies make this a very challenging problem. To address this challenge, we propose to apply photonic crystal [PC] technology to build a low-cost, easy-to-use, rough diagnostic device to assess real-time micronutrient status. Our overall goal is to develop the proof-of-concept of a robust, sensitive and specific diagnostic platform that will allow us to test micronutrient status.

What has been done

Photonic crystals [PC] are structures that reflect a narrow band of wavelength when illuminated by a broadband light source [such as LEDs and sunlight]. When biomolecules, such as antibodies and antigen complexes, absorb to the biosensor surface, it will cause a wavelength shift that is specific to the complexes bound, making a simple mechanism for biomarker detection. Also, PC biosensors are inexpensively manufactured from plastic materials and easily incorporated into simple test formats for disposable applications. In addition, our collaborator has developed a new optical attachment to convert a smartphone into a sensitive readout instrument, reducing the cost of reading PC platforms and maximizing its flexibility to any smartphone user in any household, clinic or region of the world.

Results

In this project our work was aimed at conducting proof-of-concept studies to establish a new application for the use of PC biosensors to micronutrient status biomarkers. The rationale for this research is that once populations suffering from micronutrient malnutrition are identified using low-cost diagnostic technologies, health- and nutrition-related problems can be better addressed through tailored nutrition strategies. In these studies, we designed, constructed and evaluated a PC biosensor application for detection of ferritin and soluble transferrin receptor, both biomarkers of iron deficiency anemia.

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

701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #8

1. Outcome Measures

Investigating The Potential Of Zein To Microencapsulate Bioactive, Health-Enhancing Food Components

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The potential of zein to microencapsulate bioactive, health-enhancing food components will be investigated in this work. [1] Zein micro and nano scale encasing structures will be formed by manipulating experimental conditions including solvent composition, zein mass fraction, concentration of bioactive compounds, temperature, and the presence of additional surfactants. [2] Zein structures will be characterized by dynamic light scattering, scanning electron microscopy, focused ion beam electron microscopy, and atomic force microscopy. The long-term goal of this project is the production of stable food ingredients containing health enhancing/maintaining compounds.

What has been done

Zein, a corn protein, is a mixture of the polypeptides alpha-, gamma-, beta-, and delta-zein. Alpha-zein and gamma-zein comprise 70-85% and 10-20% of total zein mass, respectively. Both peptides have similar amino acid composition, except gamma-zein is rich in cysteine. The presence of cysteine has been associated with gelation of zein solutions. A common solvent for zein is aqueous ethanol. Preliminary results suggested that pH and ethanol content affect the rheology of zein solutions. Our objective was to investigate the effect of ethanol content [65-90%] and pH of the solvent [2, 6, and 12] on the rheological properties of zein solutions [20% w/w] containing gamma-zein. Steady shear tests and oscillatory time sweeps were performed to determine flow behavior and gelation time of zein solutions.

Results

Results indicated that alpha-zein solutions were nearly Newtonian while those containing gamma-zein showed shear thinning behavior. At high pH, gamma-zein increased the consistency index [K] and shortened gelation time. Results were attributed to the cysteine in gamma-zein. High pH promoted formation of disulfide bonds leading to higher K values and shorter gelation times. Results of this work are expected to be useful in the design of zein extraction processes and the development of new zein applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components

Outcome #9

1. Outcome Measures

Identification Of Methods That Extend The Shelf Life, Improve The Nutritional Quality, And Enhance The Safety Of Fresh Cut Produce

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fresh-cut fruits and vegetables have become increasingly popular among consumers during the last two decades, because they are ready to consume and/or require minimal preparation for consumption. The challenge to producers is that fresh fruits and vegetables are living tissue with high water and sugar content. Damage during cutting often results in rapid loss in quality, storage life, and makes the products vulnerable to plant and human pathogen attacks. Identification of methods that extend the shelf life, improve the nutritional quality, and enhance safety of fresh cut produce will have a significant positive impact on consumers' acceptance of these products and improve the financial return to producers.

What has been done

We identified a new sanitizer composition that can achieve 5-log reductions in the survival count of *E. coli* on the produce surface. We tested a ultrasound and chlorine combined wash in a pilot scale continuous flow to significantly enhance the efficacy of sanitation. Draft genome sequences for two strains of *Erwinia tracheiphila*, the causal agent of bacterial wilt of cucurbits, were obtained with both shotgun and pair-end libraries. A total of 620 million bases were obtained, which represents about 60 fold coverage of the genome at approximately 4.8 mbps. Initial assembly yielded about 42 scaffolds with about 400 contigs. We have determined the number of plasmid in the two strains of *E. tracheiphila*, generated an OpMap for both genomes based on restriction enzyme digestion, and aligned all the contigs and scaffolds to the map. We have also compared and aligned two genomes to define the difference, and closed 37 and 40 gaps, respectively. Bacterial populations within the insect vectors of *E. tracheiphila* were also determined.

Results

The outcomes of this project not only will provide new and long-due knowledge to the research community, but also benefits cucurbit growers and the fresh produce industry. Understanding the bacterial population within insect vectors will provide information for the potential source of microbial contamination for fresh produce, which is of great concern to the fresh produce industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #10

1. Outcome Measures

Number Of Fresh Food Producers Adopting Practices That Prevent Foodborne Illness Contamination

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In recent times, the safety of fresh produce has become a growing concern to consumers and the horticultural industry. Contamination of produce by microorganisms that cause foodborne illness outbreaks result in significant associated health costs. In addition, these outbreaks have financial consequences for a given producer as well as other producers in the same industry who incur losses when the public refuses to buy any product associated with a given foodborne illness outbreak.

Since the Food and Drug Administration introduced new rules to regulate production and handling practices for fresh produce, it is imperative that stakeholders in the food industry become proactive regarding both Good Agricultural Practices [GAPs] and Good Handling Practices [GHPs].

What has been done

In response, six one-day and one online multi-session Extension educational programs were conducted in Illinois in the winter and early spring of 2013 to address safe food production and handling in order to ensure that fresh produce is free from contamination by microorganisms that cause foodborne illnesses. Specific topics addressed in these programs included water usage and water testing, worker health and hygiene, facilities and equipment sanitation, manure handling and field application, and recordkeeping. More than one hundred individuals participated in the training sessions representing specialty crop producers and others interested in food safety practices.

Results

An end-of-meeting evaluation form was distributed and collected from 69 of the participants. A second evaluation was also mailed in November of 2013 to all attendees in the seven programs who provided an address [104] to identify any of 34 different practice changes resulting from their participation that were implemented during the growing season. Forty-eight evaluations were returned [46.1%]. Thirty-five of the 48 respondents [73%] identified practice changes implemented. Twenty-one [44%] of the respondents indicated implementing practice changes related to worker health and hygiene, e.g., training their workers about hand washing, posting hand washing signs, and stocking hand washing supplies. Twenty-one of the respondents [44%] also indicated implementing practice changes related to facilities and equipment sanitation such as cleaning harvesting bins/aids each day and sanitizing trucks and other transportation vehicles before loading. Nineteen [40%] of the respondents indicated implementing practice changes related to water usage for washing and cooling fresh produce and testing water quality. Sixteen [33%] implemented changes in their record-keeping and eleven [23%] made changes in manure handling and field application. Ten [21%] initiated a safety audit and twelve [25%] created a written food safety plan for their food production enterprise. In addition, 36 of 48 respondents [75%] indicated that they planned to implement at least one additional practice change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and

Naturally Occurring Toxins

Outcome #11

1. Outcome Measures

Number Monitoring Proper Temperatures Of Food Served/Sold To The Public To Prevent Food-Borne Illness

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	66

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Periodic outbreaks of foodborne illnesses have generated public concern about the safety of the food they consume and have serious health consequences for those who eat contaminated foods and economic consequences for individuals who serve fresh or prepared food. As of 1999, the Food Service Sanitation Code required Illinois-certified food service sanitation managers to attend a minimum of five hours of safety training or to complete a recertification exam to be eligible for re-certification to serve food every five years.

What has been done

Eight workshops on food safety [5-hour Refresher Course] have been conducted statewide by Extension Educators with nutrition and wellness assigned responsibility. Eight-eight [88] individuals involved in serving food to the public participated in the programs as a requirement to maintain their foodservice certification by the Illinois Department of Public Health. In addition, 33 food bank managers and staff members who are involved in distributing food to those in need participated in the program that was adjusted to address their unique food handling safety challenges.

A pre- and post-test consisting of eight multiple choice items focused on 2008 changes to the Illinois Food Sanitation Service code was distributed and collected from those in the certification course to measure knowledge change. Additional information and pre-test/post-test items were shared with food bank staff.

Results

Impact on knowledge of food safety measured by pre- and post-tests scores from participants in the 5-Hour Refresher Course revealed increases in one of more of the eight food safety practices by 84 of the 88 participants [94%]. All but two of the food bank staff members were able to

answer at least one post-test question correctly that they were unable to answer correctly on the pre-test. Specific to maintaining proper temperatures of food, 66 [75%] learned the temperature range [danger zone] when food is most susceptible to the growth of bacteria that cause foodborne illnesses, and 65 [74%] indicated learning that ready-to-eat potentially hazardous foods can be stored in the refrigerator for no more than seven days. In addition, 11 of the 33 food bank staff members were able to identify the temperature zone when food is most susceptible to the growth of bacteria that causes foodborne illnesses. Based on results from a random follow-up study conducted in 2011, 33 of the 5-hour Refresher Course participants are likely to have changed food temperature monitoring practices. Study results revealed that one-half of the respondents changed practices related to food temperature monitoring.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #12

1. Outcome Measures

Increased Knowledge Of Fresh Fruit And Vegetable Production Practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	123

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fruit and vegetable producers are seeking ways to improve their efficiency of production leading to enhanced profitability of their enterprise. Ultimately, consumers benefit in accessing quality produce that enhances their health and is safe for consumption.

What has been done

A number of annual one-day Extension schools for commercial fruit and vegetable producers are held during the winter months throughout the state, as well as in conjunction with neighboring

states. These include vegetable schools, fruit schools, and small fruit schools. Extension educators and specialists assist in organizing, promoting and teaching the latest research findings related to production, pest management, marketing, and safe food handling. Attendees are also able to visit with vendors and exhibitors. This past year a formal evaluation was designed, distributed and collected from participants at the end of the Southern Illinois Vegetable School, the two Southern Illinois Tree Fruit Schools, and the Stateline Fruit and Vegetable Growers Conference, a joint Extension program between Illinois and Wisconsin.

Results

The approximately 350 attendees at these schools were offered an option to rate the knowledge they gained for each of the individual topic sessions using a 1-5 scale with 1 = None/already knew and 5 = Learned a great deal. In addition, those attending the Stateline school were asked to comment on their overall knowledge gains regarding managing pest problems, produce safety, growing produce, and managing environmental/climate impacts. A total of 118 growers [34% of the attendees] completed the evaluation.

All of the 17 vegetable producers [14% of the attendees] who responded checked at least one topic as a 4 or 5, while 13 checked a 5 rating for at least one session topic. All of the 63 fruit producers [45% of the attendees] who responded checked at least one topic as a 4 or 5, while 54 checked a 5 rating for at least one session topic. For those attending the Stateline joint conference, all but two of the 38 respondents rated at least one session topic as a 4 or 5 and 26 checked a 5 rating for at least one topic session. Topics rated highest by vegetable school respondents were The Perfect Tomato Variety and How to Feed It [rated 4 or 5 by 82%] and Updates on Cucurbit Diseases and Insect Control in Vegetables [rated 4 or 5 by 47%]. Topics rated highest by fruit school respondents were Update in Insect Management in Peaches and Apples [rated 4 or 5 by 90%] and Impact of Drought on Fruit Trees [rated 4 or 5 by 79%]. When asked to share comments about their plans for using the information they gained, 74 attendees at the three programs listed specific planned actions. In addition, 31 respondents who attended the previous year's Southern Illinois schools indicated taking actions to control a pest based on recommendations shared by a presenter. Additional findings can be found in the Evaluation section of this planned program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

Outcome #13

1. Outcome Measures

Increased Knowledge Of Small Farm Production Options

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	188

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Owners of small acreages need assistance in determining how they can best put them to use.

What has been done

Extension Educators with assigned responsibility for small farms and local foods education developed Putting Small Acres to Work, a one-day program that addressed a variety of topics that were offered to help people who have a few acres learn ways that they can put them to use. Two hundred ninety [290] individuals attended one of six workshops held at various locations in the state. As planned, an end-of-workshop evaluation form was distributed and collected from 166 of the participants. In addition a series of 13 weekly one-hour webinars directed at small farm owners or operators was offered in the winter of 2013. Over 500 individuals representing 31 states and three countries registered for one or more of the sessions. A follow-up online evaluation was developed to collect information on the impact of this series [91 responded]. The survey questions were designed to gather information about participants' access to the series and knowledge gained and applied related to emerging topics in advancing local food production, management and marketing.

Results

Respondents to the Putting Small Acres to Work end-of-program evaluation were asked to identify the degree to which their knowledge, confidence and abilities were changed regarding putting their small acres to work. Using a scale from one to five [1 = No change and 5 = Greatly improved], the average score for 160 respondents was above a 3.4 for all the items. Responses to specific evaluation items addressed participants: [1] Ability to effectively find and access resources to support their small acreage systems [3.98 average group score with 116 of 158 [73.4%] choosing a rating of 4 or 5]; [2] Ability to develop goals for their property [3.84 average group score with 103 of 147 [70.1%] choosing a rating of 4 or 5]; and [3] Knowledge of concepts and principles of managing small acreage [3.78 average group score with 101 of 158 [63.9%] choosing a rating of 4 or 5].

More than half of the 91 Small Farms Webinar participants who responded to the follow-up survey indicated that they applied information they received through one or more of the 13 sessions. Three-fifths of the respondents indicated that they gained both answers to questions they had before attending the sessions and resource materials they can use to make more informed decisions. Nearly half reported gaining ideas they can try on their farm immediately.

Approximately one-fourth [25] began production of vegetables, fruits, herbs, or flowers and more

than half added new varieties to their production of these commodities. Additional information is provided in the Evaluation section of this planned program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Good Agricultural Practices [GAPS] Training

An end-of-meeting evaluation form consisting of seven questions was distributed and collected from 69 of the participants in six one-day and one online multi-session **Enhancing Specialty Food Safety** programs. An evaluation was also mailed in November of 2013 to all attendees in the seven programs who provided an address [104] to identify any of 34 practice changes resulting from their participation that were implemented during the growing season. Respondents to the follow-up survey included a total of 48 of 104 attendees that included specialty crop producers and other individuals interested in food safety practices.

Knowledge Changes

A key question asked respondents to assess the knowledge level gained on specific topics that were covered in the conference using a scale from one to five [1 = None/already knew and 5 = A great deal]. The average score for the 69 respondents was above a score of three for all topics. The areas of greatest learning were: [1] Preparing for a GAPs audit

[4.75 average group score with 56 of 69 [82%] checking 'a great deal']; [2] Keeping records [4.30 average group score with 36 of 69 [52%] checking 'a great deal']; [3] Minimizing risks during food production [4.13 average group score with 29 of 69 [42%] checking 'a great deal']; and [4] Minimizing risks during post-harvest handling [4.12 average score with 26 of 69 [38%] rating this a '5'].

Practice Changes Implemented

Five questions encompassed 34 potential practice changes that were addressed in the programs. The focus areas of the five questions included: [1] Water usage and water quality testing; [2] Worker hygiene and health; [3] Facilities and equipment sanitation; [4] Manure handling and application; and [5] Recordkeeping. Respondents were presented with five options for each practice that included 'Did Prior', 'Done as a Result', 'Plan to Do', 'Don't Plan to Do', and 'Does Not Apply'.

A large number of the practices were checked 'Does Not Apply'. Most [60-80%] of the respondents checked this response in relation to manure handling and application practices. Approximately one-half of the respondents do not have employees, and thus, have no need to implement changes related to worker health and hygiene. However, 35 of the 48 respondents [73%] identified at least one practice change implemented: [1] Nineteen [40%] of the respondents indicated implementing practice changes related to water usage and water quality; [2] Twenty-one [44%] of the respondents indicated implementing practice changes related to worker health and hygiene; [3] Twenty-one [44%] of the respondents indicated implementing practice changes related to facilities and equipment sanitation; [4] Eleven [23%] of the respondents reported making changes in manure handling and field application; and [5] Sixteen [33%] of the respondents indicated implementing practice changes related to recordkeeping.

Specific practices most frequently marked as changes by the respondents included [followed by the number of individuals making the change]: [1] Providing training to help workers understand the importance of personal hygiene = 14; [2] Clean harvesting bins/aids daily = 14; [3] Clean and sanitize trucks and other transportation vehicles before loading = 13; [4] Post hand-washing signs emphasizing the importance of washing hands before work, after using the toilet facilities, and after lunch or smoking = 12; [5] Cover clean storage bins when not in use = 11; [6] Remove field soil from the outside of harvesting containers/bins prior to moving them into packing areas = 11; [7] Record worker training dates and content of training = 11; and [8] Regularly stock hand washing stations with liquid soap in dispensers, potable water [safe for drinking] and paper towels = 10.

In addition, 36 of 48 [75%] of the respondents indicated that they planned to implement at least one additional practice change. However, all of the 34 practices were checked as 'Plan to Do' by at least two and as many as twenty-one respondents.

With respect to their involvement in an audit of their operation regarding risk management practices, ten indicated they conducted a self-audit and three engaged a third party in conducting the audit. Twelve respondents [25%] also indicated that they had created a written food safety plan for their food production enterprise.

Food Service Safety Evaluation

University of Illinois Extension Nutrition and Wellness Educators conducted **Food Service Sanitation Management Certification Courses** in eight locations in 2012-2013. Eighty-eight individuals involved in serving food to the public participated in the programs as a requirement to maintain their food service certification by the Illinois Department of Public Health. In order to identify changes in their knowledge of food safety, participants were asked multiple-choice questions at the beginning and at the end of the five-hour course. The questions were designed to address critical practices and recent regulation updates to reduce the risk of bacterial contamination that can cause foodborne illnesses. In addition, 33 food bank managers and staff members who are involved in distributing food to those in need participated in the program that was adjusted to address their unique food handling safety challenges and completed a multi-choice pre- and post-test set of questions that addressed the content of that training.

All but two of the participants in the certification courses demonstrated an increase in knowledge to prevent food contamination by answering at least one question correctly at the end of the course that they had incorrectly answered before the course began. Approximately half of the participants who had answered each question incorrectly before the program answered it correctly at the end for the following items: [1] 66 [75%] learned that ready-to-eat potentially hazardous foods can be stored in the refrigerator for no more than seven days. In addition, all 88 participants were able to correctly answer this question at the end of the program; [2] 65 [74%] gained knowledge about how to correctly label prepared foods that are stored in the refrigerator or coolers; and [3] 62 [70%] learned the temperature range [danger zone] when food is most susceptible to the growth of bacteria that cause food borne illnesses.

With respect to five additional food handling requirements, participants were already knowledgeable as evidenced by their ability to answer the questions correctly at the beginning of the course. Nearly one half or more of the participants correctly answered the following questions correctly at the beginning of the course: [1] 71 [81%] could already distinguish between potentially hazardous and non-hazardous food. However, five of these individuals incorrectly answered this question at the end of the program; [2] 64 [73%] already knew the temperature and time needed to reheat potentially hazardous foods; [3] 60 [68%] already knew what jewelry is acceptable to wear when serving food to the public. An additional 27 were able to correctly answer the question after the program; [4] 49 [56%] learned only to drink from covered containers when involved in serving food. An additional 34 were able to correctly answer the question after the program; and [5] 43 [49%] already recognized the relationship of refrigerator shelf location with respect to variability of foodborne illness risk for various foods.

With respect to food bank staff responses to nineteen pre-post-test questions, 21 increasing their knowledge of temperatures for serving and storing foods: [1] 11 of 33 [34%] gained knowledge about the temperature zone [41 degrees Fahrenheit to 135 degrees Fahrenheit] when food is most susceptible to the growth of bacteria that cause foodborne illnesses; [2] 11 of 33 [34%] learned to always pack cold foods last when transporting food in a vehicle; [3] 8 of 33 [25%] learned that food and food contact equipment should be stored at least six inches off the floor; [4] 7 [22%] learned that when evaluating perishable food for safety, the most important characteristic is appearance; and [5] 6 [19%] learned to keep food frozen solid and freezers set at zero degrees Fahrenheit or below.

The attendees [350] at the two **Southern Illinois Commercial Tree Fruit Schools**, the

Southern Illinois Commercial Vegetable School and the **Stateline Fruit and Vegetable Conference** were offered an option to rate the knowledge they gained for each of the individual topic sessions using a 1-5 scale with 1 = None/already knew and 5 = Learned a great deal. One hundred twenty-three responded.

Fruit and Vegetable School Evaluation

All of the 63 who responded checked at least one topic as a 4 or 5, while 54 checked a 5 rating for at least one session topic at the **Southern Illinois Fruit School**. All topics were rated 4 or 5 by over 65% of those who responded. The list of topics that follows are those that were rated a 4 or 5 in order of percentage of those who circled that rating regarding knowledge gained: [1] Update in Insect Management in Peaches and Apples was rated a 4 or 5 by 54 of 60 individuals who responded [90%]; [2] International: New Zealand Fruit Industry was rated a 4 or 5 by 39 of 44 individuals who responded [88%]; [3] Trends in the Nursery Industry was rated a 4 or 5 by 54 of 61 individuals [88%]; [4] New and Current Peach Cultivars was rated a 4 or 5 by 49 of 59 individuals who responded [83%]; and [5] FDA Update: Facility Registration and GAPS was rated a 4 or 5 by 49 of 56 individuals who responded [83%].

All 17 of the commercial vegetable growers who completed the evaluation checked at least one topic as a 4 or 5, while 13 checked a 5 rating for at least one session topic. All topics were rated 4 or 5 by more than half of those who responded. The list of topics rated the highest by percentage are as follows: [1] The Perfect Tomato Variety and How to Feed It was rated a 4 or 5 by 14 of 17 individuals who responded [82%]; [2] Portable Soil Sterilization System was rated a 4 or 5 by 12 of 16 individuals who responded [75%]; [3] The Process of Pollination/Fertilization & Factors That Impact Fruit Set--rated 4 or 5 by 9 of 12 individuals who responded [75%]; and [4] Disease Management of Cucurbits--rated 4 or 5 by 12 of 16 individuals who responded [75%].

All but two of the 38 responding participants in the **Stateline Fruit and Vegetable School** rated at least one session topic as a 4 or 5 and 26 checked a 5 rating for at least one topic session. Topics rated as best meeting respondents learning needs are as follows: [1] Cantaloupe Chaos, What Happens When Contamination Occurs was rated a 4 or 5 by 18 of 29 individuals [62%]; [2] Produce Safety Tips was rated a 4 or 5 by 16 of 29 individuals [55%]; and [3] Fruit Pest Management Plans was rated a 4 or 5 by 13 of 29 individuals [42%].

In addition, seven individuals provided comments regarding knowledge they gained related to Good Agricultural Practices [GAP]. Twenty-eight [28] individuals at the **Southern Illinois Fruit School** also provided comments related to knowledge they gained regarding Good Agricultural Practices [GAP]. The following were mentioned by several individuals: [1] New proposed regulations and required registration categories [9 individual comments]; [2] Website location for finding and commenting on proposed regulations [6 comments]; and [3] Required record-keeping [3 comments].

Practices Implemented by Individuals Who Attended the 2013 Southern Illinois Fruit Schools and 2013 Southern Illinois Vegetable School

Attendees at the 2013 **Southern Illinois Fruit Schools** were asked to indicate practices that they implemented as a result of what they learned at last year's schools. Thirty-six individuals responded to this question, representing 57% of those who completed the evaluation. Thirty [30] of 36 [83%] controlled a fruit pest using

herbicide/fungicide recommendations shared by a presenter; 25 [60%] made adjustments in their spray schedule; 20 [55%] planted a new variety of peaches or apples; 14 [39%] evaluated and/or adjusted soil micro-nutrient levels; 13 [36%] surveyed their operation for correctable produce contamination risks; eight [22%] investigated or planted new rootstock or cultivars or found a substitute for cultivars; five [14%] registered as having a crop that is sensitive to spray drift; and four [11%] developed a GAP plan.

Attendees at the 2013 **Southern Illinois Vegetable School** were asked to indicate which of six practices they implemented as a result of what they learned at last year's school. Only five individuals responded to the question with four [80%] indicating that they improved field monitoring/scouting insects and disease; three controlled a vegetable pest using herbicide/fungicide recommendations shared by a presenter; and two adjusted their spray schedules and/or surveying their operation for correctable produce contamination risks.

Small Acres Evaluation

An end-of-program evaluation was distributed to the 290 **Putting Small Acres to Work** participants and collected from 166. In addition, an online follow-up survey was distributed to 525 participants in the **Small Farms Webinar** series and collected from 91 respondents. Respondents were asked to identify the degree to which their knowledge, confidence and abilities were changed regarding putting their small acres to work. Using a scale from one to five [with 1 being no change and 5 being greatly improved], the average score for 160 respondents was above a 3.4 for all the items. [1] Ability to effectively find and access resources to support their small acreage systems [3.98 average group score with 116 of 158 [3.4%] choosing a rating of 4 or 5]; [2] Ability to develop goals for their property [3.84 average group score with 103 of 147 [70.1%] choosing a rating of 4 or 5]; [3] Knowledge of concepts and principles of managing small acreage [3.78 average group score with 101 of 158 [63.9%] choosing a rating of 4 or 5]; [4] Confidence in using small acreage management principles [3.66 average group score with 88 of 143 [61.6%] choosing a rating of 4 or 5]; [5] Knowledge about land stewardship and resource management [3.65 average group score with 79 of 142 [55.6%] choosing a rating of 4 or 5]; [6] Understanding about farming practices [3.52 average group score with 79 of 152 [52.0%] choosing a 4 or 5 rating]; and [7] Preparedness to start a farming enterprise [3.46 average group score with 75 of 157 [47.7%] choosing a rating of 4 or 5].

When asked if their personal objectives for attending this workshop were met, 153 respondents provided a rating using a five part scale [1 = Not met, 3 = Satisfactorily met and 5 = Extremely met]. All except nine participants [94%] chose a rating of 3 [Satisfactorily met] or above. Fifty-one [33.3%] marked a rating of 5, 62 [40.5%] marked a rating of 4, and 31 [20.3%] marked a rating of 3.

When asked to list the most important ideas they plan to put into practice as a result of participating in the workshop, 74 [44.5%] responded. Twenty-nine [39%] of the 74 participants listed specific planned actions. Most often mentioned [14 responses] were developing/writing a business or marketing plan and setting goals.

Fifty [59%] of the 85 **Small Farms Webinar series** participants indicated that they gained both answers to questions they had before attending the session and resource materials they can use to make more informed decisions. Thirty-seven [43%] reported

gaining ideas they can try on their farm immediately. Sixteen [19%] gained confidence in making management decisions. Other benefits mentioned included specific session topical information. One individual commented 'Just as importantly, I learned what not to do!'

An additional question asked **Small Farms Webinar** series participants to provide information on production changes in four commodity categories resulting from what they learned. Participants were asked to check all changes that apply to each of the categories. Options for checking included 'Did not raise any', 'Made no changes', 'Began production', 'Expanded production', or 'Tried a new variety, species, or technique'. Of those 54 who were involved in producing vegetables, 37 [69%] made one or more of the following changes in production: 21 tried a new variety or technique; 10 expanded production acreage; and 11 began production. Of the 33 who were involved in fruit production, 20 [61%] made one or more of the following changes in production: 11 tried a new variety or technique and 9 began production. Of the 34 who were involved in herb or flower production, 18 [53%] made one or more of the following changes in production: 12 tried a new variety or technique, three [3] expanded production acreage, and four [4] began production. Of the 14 who were involved in raising livestock, five [36%] made one or more of the following changes in production: two tried raising a new species and one began production.

Key Items of Evaluation

Good Agricultural Practices [GAPS] Training

Approximately half of the end-of-program evaluation respondents indicated they had learned a great deal about enhancing specialty food safety pertaining to preparing for an audit of implementation of safety practices, keeping appropriate records related to these practices, and manure handling and application. A follow-up evaluation evidenced food safety practice changes had been implemented by nearly three-fourths of the respondents primarily with respect to providing training for workers on personal hygiene and facilities and equipment sanitation [cleaning harvesting bins/aids daily and sanitizing trucks and other transportation vehicles before loading]. Ten of the respondents [21%] initiated an audit of their safety practices and one-fourth created a written food safety plan for their food production enterprise that will reduce their risk of food contamination by microorganisms that cause food borne illnesses.

These actions will position the program participants to be in compliance with rules and policies of the Food and Drug Administration to regulate the production and handling practices of fresh produce. Extension training is bringing about practice changes to prevent the spread of food contamination, and thus, reducing the risk of consumer foodborne illnesses and their associated health costs. In addition, these safe practices substantially reduce the financial risk to a given producer as well as other producers in the same industry who incur losses when the public refuses to buy any product associated with a given foodborne illness outbreak.

Food Service Safety Evaluation

The responses to questions before and after the food safety programs for individuals involved in retaining certification to serve food to the public indicated that 94% of the 88

participants gained knowledge in handling food safely. Most notably 66 [75%] of the participants learned that ready-to-eat potentially hazardous foods can be stored in the refrigerator for no more than seven days. In addition, more than half of them learned the temperature range [danger zone] during which food is most susceptible to the growth of bacteria that cause foodborne illnesses and how to correctly label prepared foods that are stored in the refrigerator or coolers. In addition, 21 food bank staff members [64%] gained knowledge regarding the temperature zone when food is most susceptible to the growth of bacteria that cause foodborne illness, to keep frozen food solid and freezers set at zero degrees, and/or to pack cold foods last when transporting them in a vehicle.

Using the information collected in 2011 through a University of Illinois Extension random survey that indicated that the conservative number of meals participants reported serving daily was 100 and the annual number of food handlers trained this year, an estimated 8,800 meals per day are free of contaminants that can cause foodborne illnesses. Based on the March, 2010 study funded by the Pew Charitable Trust indicating that the average cost each time someone gets sick from food is \$1,850, this shared knowledge could represent a very significant contribution toward reducing healthcare costs.

Fruit and Vegetable School Evaluation

Responses collected through the evaluation forms evidenced a high level of knowledge gained regarding all the topics for the **2013 Southern Illinois Commercial Tree Fruit School, Southern Illinois Commercial Vegetable School** and **Stateline Fruit and Vegetable Conference**. All topics offered at the **Southern Illinois Fruit School** received a 4 or 5 rating from 66% to 90% of those who completed the evaluation. Likewise, approximately 66% of those completing the evaluation listed something they planned to do with the information on implementing suggested practices.

With one exception, all 2013 **Southern Illinois Vegetable School** participants who completed an evaluation indicated that they learned new information about one or more topics covered by the presenters. Six individuals shared plans for using the information.

Stateline Fruit and Vegetable Conference attendees felt that their objectives for attending were met. Most notably, their responses to the end-of-program workshop indicated that more than half of them gained knowledge of concepts and principles in managing pest problems and produce safety, as well as confidence using management principles to improve produce safety and manage pest problems. In addition, more than half increased their ability to find and access new resources for production issues faced during the growing season. Ten of the participants indicated plans related to making changes in pest management and eight mentioned plans addressing food safety. Thirty-six participants reported specific practices changed or implemented as a result of what they learned at last year's school regarding pest control, variety selection, soil micro-nutrient levels, and safe food production.

Small Acres Evaluation

An end-of-program evaluation was distributed to the 290 **Putting Small Acres to Work** participants and collected from 166. In addition, an online follow-up survey was distributed to 525 participants in the **Small Farms Webinar** series and collected from 91

respondents.

Respondents to the **Putting Small Acres to Work** evaluation were asked to identify the degree to which their knowledge, confidence and abilities were changed regarding putting their small acres to work. Using a scale from one to five [with 1 being no change and 5 being greatly improved], the average score for 160 respondents was above a 3.4 for all the items. For individual items: [1] Ability to effectively find and access resources to support their small acreage systems [3.98 average group score with 116 of 158 [73.4%] choosing a rating of 4 or 5]; [2] Ability to develop goals for their property [3.84 average group score with 103 of 147 [70.1%] choosing a rating of 4 or 5]; [3] Knowledge of concepts and principles of managing small acreage [3.78 average group score with 101 of 158 [63.9%] choosing a rating of 4 or 5]; [4] Confidence in using small acreage management principles [3.66 average group score with 88 of 143 [61.6%] choosing a rating of 4 or 5]; [5] Knowledge about land stewardship and resource management [3.65 average group score with 79 of 142 [55.6%] choosing a rating of 4 or 5]; [6] Understanding about farming practices [3.52 average group score with 79 of 152 [52.0%] choosing a 4 or 5 rating]; and [7] Preparedness to start a farming enterprise [3.46 average group score with 75 of 157 [47.7%] choosing a rating of 4 or 5].

When asked if their personal objectives for attending this workshop were met, 153 respondents provided a rating using a five part scale [1 = Not met, 3 = Satisfactorily met and 5 = Extremely met]. All except nine participants [94%] chose a rating of 3 [Satisfactorily met] or above. Fifty-one [33.3%] marked a rating of 5; 62 [40.5%] marked a rating of 4, and 31 [20.3%] marked a rating of 3.

When asked to list the most important ideas they plan to put into practice as a result of participating in the workshop, 74 [44.5%] responded. Twenty-nine [39%] of the 74 participants listed specific planned actions. Most often mentioned [14 responses] were developing/writing a business or marketing plan and setting goals.

Fifty [59%] of the 85 **Small Farms Webinar series** participants indicated that they gained both answers to questions they had before attending the session and resource materials they can use to make more informed decisions. Thirty-seven [43%] reported gaining ideas they can try on their farm immediately. Sixteen [19%] gained confidence in making management decisions. Other benefits mentioned included specific session topical information. One individual commented 'Just as importantly, I learned what not to do!'

An additional question asked **Small Farms Webinar** series participants to provide information on production changes in four commodity categories resulting from what they learned. Participants were asked to check all changes that apply to each of the categories. Options for checking included 'Did not raise any', 'Made no changes', 'Began production', 'Expanded production', or 'Tried a new variety, species, or technique'. Of the 54 who were involved in producing vegetables, 37 [69%] made one or more of the following changes in production: 21 tried a new variety or technique, 10 expanded production acreage, and 11 began production. Of the 33 who were involved in fruit production, 20 [61%] made one or more of the following changes in production: 11 tried a new variety or technique and 9 began production. Of the 34 who were involved in herb or flower production, 18 [53%] made one or more of the following changes in production: 12 tried a new variety or technique, three [3] expanded production acreage, and four [4] began production. Of the 14 who were involved in raising livestock, five [36%] made one or more of the following changes in production: two tried raising a new species and one began

production.