

**Kentucky**

**12-25-B-0925**

**Specialty Crop 2009 Farm Bill**

**Final Report**

**December 31, 2012**

*Revised 2/19/13*

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## **Project 1: Socially Disadvantaged and Beginning Farmer Education at Kentucky State University**

**PROJECT SUMMARY:** The Third Thursday Thing is a monthly workshop that is held at the Kentucky State University Research and Demonstration Farm. The goal of The Third Thursday Thing is to provide sustainable agriculture training to Extension, State and USDA Agencies, and small farmers in the areas of new, specialty and alternative crops and enterprises. This grant helped to support Third Thursday monthly workshops and the 2012 Third Thursday 15<sup>th</sup> Anniversary Small Farm Field Day.

**PROJECT APPROACH:** The Kentucky State University College of Agriculture, Food Science and Sustainable Systems offered monthly workshops on alternative and specialty crops, marketing, production and management, on the Third Thursday's of January through November annually. These workshops focused on five (5) hour intensive training, including hands-on trainings, sessions on the subjects. Participants were from some 40 Kentucky Counties.

On the Third Thursday of July, 2012, the 15<sup>th</sup> Anniversary of The Third Thursday Thing Small Farm Field Day provided an overview of some 40 different specialty crops, marketing techniques, production alternatives, and energy crops and alternatives. There were an estimated 400 participants from some 60 Kentucky Counties. Additionally, the 1890 Small Farmer Leadership Institute used this for their summer training session. The Leadership Institute brought 35 minority small farmers and University specialists from fifteen (15) states to learn from the activity.

**GOALS AND OUTCOMES ACHIEVED:** The period of the Specialty Crop Grant had some 2,000 participants, of which encompassed minority farmers and women. When participants were asked in evaluations, some 70%-90% of the responding participants indicate that they have used the information learned in their farming operations. Some 80%-90% of the Extension professionals indicate that they have used the information learned in their farmer advising.

A summary of the activities and topics will be outlined in the Additional Information section.

**BENEFICIARIES:** Small farmers in Kentucky; specialty crop producers in Kentucky and the Southern Region; farmers served and assisted by Extension, USDA and Kentucky agencies; consumer groups, particularly those desiring fresh, healthy produce; some 40 refugees who are sponsored by the Catholic Charities of Louisville, KY; researchers at Kentucky State University who are seeking new, specialty crop opportunities for Kentucky and U.S. farmers

**LESSONS LEARNED:** Specialty crop producers are seeking research-based information that is practical and designed for the scale of their operations. They are also seeking a "community of like farmers." The Third Thursday Thing has provided a community where small farmers and researchers learn together and support each other.

September 2010 and 2011: The Third Thursday Thing Workshops: Pawpaws, Sweet sorghum/molasses/syrup, Energy crops: 148 participants

August 2011: The Third Thursday Thing Workshop: MarketReady for specialty crop producers: 45 participants

August 2010: The Third Thursday Thing Workshop: Horticulture and Livestock: 67 participants

January 2011: The Third Thursday Thing Workshop: Specialty equipment and equipment maintenance: 56 participants

February 2011: The Third Thursday Thing Workshop: Organic systems and cold frame production: 85 participants

April 2011: The Third Thursday Thing Workshop: NRCS programs, pond construction, cold frames for early production: 87 participants

June 2011: The Third Thursday Thing Workshop: Horticulture crops, specialty crops, organic pest control methods: 72 participants

July 2011: The Third Thursday Thing Workshop: Overview of the research and demonstration projects at the Kentucky State University Research and Demonstration Farm. Participants selected four one-hour workshops on specialty crops and new enterprises: 95 participants.

#### **CONTACT PERSON:**

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#### **FINAL FINANCIAL REPORT:**

<b>GRANT FUNDS RECEIVED</b>	<b>\$ 15,000</b>
<b>GRANT FUND EXPENDED</b>	<b>\$ 7,500.00</b>
<b>TOTAL REMAINING</b>	<b>\$ 7,500</b>

LINE ITEMS	
<b>SALARIES/ WAGES</b>	\$
<b>BENEFITS</b>	\$
<b>TRAVEL</b>	\$ 105.00
<b>EQUIPMENT</b>	\$ 2,396.05
<b>SUPPLIES</b>	\$ 4,998.95
<b>CONTRACTUAL</b>	\$
<b>OTHER</b>	\$
<b>TOTAL</b>	<b>\$ 7,500.00</b>

## **PROJECT 2: Farmers' Markets and CSA Marketing Specialist**

### **1. Project Summary**

Prior to this project, there were smaller amounts of specialty crop producers that new how to grow and more importantly, where to sell their products. The goal of this product was to have an individual to help grow the markets throughout Kentucky and to assist specialty crop producers with production suggestions to grow for the farmers' market crowd.

Also, this specialist was to bring information to producers in such areas as food safety, marketing, packaging, etc. for farmers' markets. The hiring of a marketing specialist on a statewide level would greatly

CSAs were another focus area that Kentucky wanted to grow for specialty crop producers. Never before had there been any information, registration or push from the state level to our producers and consumer about CSAs.

There were small amounts of specialty crop producers that knew how to grow and more importantly, where to sell their products. But the need was to have an individual to help grow the markets throughout Kentucky and to assist specialty crop producers with production suggestions to grow for the farmers' market crowd and the CSA farms.

Not only educating and providing information to producers in such areas as food safety, marketing, packaging, etc. for farmers' markets but including the CSA program as another avenue for producers to market their products.

The project included establishing a CSA registration program for the producers to provide information on their CSA so the Kentucky Department of Agriculture could be the link for their operation to consumers.

The original intent of the position when hired was to be for two years. After hiring Sharon Spencer, KDA was able to secure state funding to keep the position on state funds permanently. Given the three year parameters of the Specialty Crop Block Grant, 1.5 years of the position was funded through the grant and the other 1.5 years through state funding. State funding of the promotion of specialty crops through the position has continued past the initial three years of the project.

## **2. Project Approach/Goals and Outcomes Achieved**

Farmers' Markets are playing an important role in the local food systems and are key to providing consumers access to fresh, locally produced foods. The markets continue to grow in number, sales volume and the length of market season. For 2012, we had 147 Farmers' Market registered with our office with over 2,490 vendors selling at the markets. Every day of the week you can find an open Farmers' Market in Kentucky and even four markets have extended their market season with staying open all year long. Tracking the individual market sales has improved and continued to show sales increasing. In 2008, Farmers' Markets in Kentucky reported sales at the markets of \$7,665,465.00 and with sales reported for the 2011 market season the increase was up to \$10,498,103.00. Even with the unexpected weather conditions we've had this market season, markets seem to be pleased with sales and report and increase. By the end of 2012, we're expected to be close to \$12 million in sales for our Farmers' Market producers in Kentucky.

Markets are growing and have become a permanent part of their communities and it shows by the number of markets providing a permanent structure to house their market. In 2006, only 34 markets reported a permanent covered structure for their market and the number increased to 62 markets in 2012. With funding being provided by the Governor's Office for Agricultural Development six more markets will have a new structure, bringing the total up to 68 Farmers' Markets with a permanent covered structure to call home for their market.

In the spring of 2011, KDA planned and conducted Farmers' Market training that would benefit market managers, market vendors and CSA operations. The training was conducted at 4 separate sites across Kentucky with over 206 producers registered. The training agenda consisted of Food Safety and Good Agricultural Practices, Marketing, Promotion and planning special events, web development and social media, evaluating your market and panel discussion with local area market markets and vendors. Out of the evaluations received, the producers were pleased with the sessions and able to take valuable information back to their markets.

Along with the Farmers' Markets our CSA farms continue to grow and expand in becoming a valuable resource for fresh produce to our consumers. We have over 58 CSA farms registered with our office. Many of the CSA producers are local vendors at the area Farmers' Market which provides a drop off location for their customers. While visiting with numerous markets this season, I was able to talk to CSA customers and discuss their opinions of the CSA program and how satisfied with their CSA baskets. Everyone was very pleased with the variety of products that is offered and even the recipes that are included. Even one vendor had a customer wanting to sign up after learning about their CSA program and seeing the baskets of products that were available.

The CSA program is still an unfamiliar program to many consumers and KDA takes advantage of each opportunity to provide educational material and promotion of our CSA producers with booths setup at Earth Day events and employees wellness programs. I have continued to work with agencies in getting the CSA program as part of their employee wellness plans.

Another area of interest and concern has been markets in our rural communities of Eastern Kentucky. Many areas have the customers wanting to purchase but not enough vendors to supply the demand. Local area meetings are being planned and coordinated to get a plan of action together on satisfying both the customer and producers. One item that will benefit these markets has been the money that has been allocated to Kentucky from the USDA for the Supplemental Nutrition Assistance Program, SNAP and getting the Electronic Benefit Transfer (EBT) machines to local area markets at no cost for the machine or monthly transaction service. KDA has teamed up with the Department of Public Health in this project and locating the markets that would be interested in applying for the program. As of November, we have over 42 markets interested in participating that hasn't accepted SNAP at their markets in the past.

Along with selling at a Farmers' Market, we encourage sampling products as a way to market their products. Any producer wanting to offer a sample of their products at a registered KDA Farmers' Market, an on-farm market stand or a Kentucky Farm Bureau Certified Roadside Market would be required to complete a Sampling Application and send to our office for review and issuance of their sampling certificate. As of December 31, 2011 all samplings certificate issued by our office expired and would require any producer wanting to offer samples to reapply. We mailed out 1,700 letters to sampling certificate holders stating their sampling certificate had expired and a new sampling application would be required for a new certificate. We have over 600 sampling applications that have been processed and certificates issued.

Goal was to create and increase the CSA program within the State.

This has been completed by the following:

- In the past, limited information had only been gathered if a CSA producer had contacted KDA but no special registration was required or requested. There was no listing available for consumers calling in wanting information on a CSA. During the course of this project, a registration form was developed for CSA farms to submit information to KDA regarding their CSA operation detailing the products available, the counties that are served by the CSA, number of weeks the CSA would be offered, the variety of baskets and size options including the cost to the consumer.
- On the KDA website, an additional web page was created for the CSA program and listing information from the registration form for consumers looking for a producer. Along with the website, a brochure providing information and details on the CSA program including an active updated listing of all CSA producers was developed and distributed at trainings and KDA table displays.
- Worked directly with CSA producers to assist with their marketing needs and promoting the CSA program in Kentucky. CSA registration with KDA continues to grow and has increased to 58 CSA farms from the 11 at the start of this project.
- Promotional efforts continue with a successful CSA program at the University of Louisville which is in their third year offering a CSA program to their faculty and students. Each

year with this program a well-attended CSA fair is held in the spring for the potential CSA customers to meet with the producers in selecting a CSA that will meet their needs. KDA plays an important role in connecting the CSA producer and the University during this time and monitors the success of the program.

- Even though we haven't been successful in obtaining additional locations for CSA sites, continued communications with several employers including a YMCA that is considering the CSA as part of their employee wellness plans and part of the membership benefits is still in the works. The project coordinator working with our office on this plan for the YMCA left her job and a new replacement for this project hasn't been hired during this time.

Through this grant KDA began collecting data for our CSA farms and providing them with marketing opportunities to increase their sales and customer awareness. KDA has continued to work with agencies and educate them on the benefits of beginning a CSA program as part of their wellness plans for their employees. KDA continues to grow the CSA registration database and promote the program.

### **3. Beneficiaries**

For 2012, we had 147 Farmers' Markets registered with our office with over 2,490 vendors selling at the markets. Every day of the week you can find an open Farmers' Market in Kentucky and even four markets have extended their market season with staying open all year long. Tracking the individual market sales has improved and only shows sales have increased. In 2008, Farmers' Markets in Kentucky reported sales at the markets of \$7,665,465.00 and with sales reported for the 2011 market season the increase was up to \$10,498,103.00. Even with the unexpected weather conditions we've had this market season, markets seem to be pleased with sales and report an increase. By the end of 2012, we're expected to be close to \$12 million in sales for our Farmers' Market producers in Kentucky.

We have over 58 CSA farms registered with our office

### **4. Lessons Learned**

In the past a problem has been collecting the data needed. This year with the 2012 KDA Farmers' Market registration packet, I included a market sales tracking worksheet that seems to be working with better results than we've had in the past. Many market managers are aware of the need for this information and continue to collect the data from their vendors. However, there are still markets that feel this is personal information and will not ask. So, getting an actual yearly income for all market sales will continue to be a challenge.

One challenge that we will be facing for the 2013 market season will be to get the interested Farmers' Markets setup under the USDA SNAP program with all their required numbers so the electronic benefit transfer (EBT) machines will have a positive effect on the markets sales. Several obstacles are in the way of using this machine. The first is to have someone responsible for the machine. If the Farmers' Market isn't incorporated, then one individual would have to provide their personal information including their social security number to be linked with the machine. The next will be to provide training and assistance in getting the machines running at their market sites.

### **5. Contact Person**

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## 6. Final Financial Report

### Project 3: Specialty Crop Recipe Development with Nutritional Research Component Grant

#### 2. Project Summary

The Plate it Up! Kentucky Proud project was a successful collaboration between multiple partners to focus on the defined need to maximize resources and leverage national and state marketing efforts of educational and state agencies to support local food systems and increase the consumption of healthy foods.

The current and potential importance of specialty crops to Kentucky economy and Kentucky health was recognized broadly by nutrition, agriculture, small business professionals and health advocates as a means to provide a source of local revenue and local access to fruits and vegetables as evidenced by statewide food sustainability discussions and collaborations (Growing Kentucky II, 2007). Local economies can be supported by the efforts of producers to market to area residents and expand their production to include specialty products for local consumption.

An added economic benefit to communities of increased sales of specialty crops is the potential for decreased healthcare cost, if as a result of local access; community residents adopt healthy lifestyles through increased consumption of fruits and vegetables (CDC, 2009). Kentucky was ranked as the seventh state with the most need to increase vegetables and fruits in the diet according to the 2009 CDC study of nationwide fruit and vegetable consumption. According to the study only 10.8% of Kentuckians eat the minimum daily requirements of fruits and vegetables (CDC, 2009). The development and dissemination of recipes that feature seasonal specialty crops to be used by agents

and producers at displays, educational fairs is one method consumer to awareness and products. The Kentucky Agriculture concept of grown products implementation of

<b>GRANT FUNDS RECEIVED</b>	<b>\$ 62,590.08</b>
<b>GRANT FUND EXPENDED</b>	<b>\$ 62,590.08</b>
<b>TOTAL REMAINING</b>	<b>\$ 0</b>
<b>LINE ITEMS</b>	
<b>SALARIES/WAGES</b>	<b>\$46,612..55</b>
<b>BENEFITS</b>	<b>\$15,977.53</b>
<b>TOTAL</b>	<b>\$ 62,590.08</b>

point of purchase demonstrations, programs and of reaching the increase exposure to local

Department of supported the marketing locally through the the Kentucky

Proud marketing initiative. The logo was marketed statewide to brand products that have been locally produced. Consumers recognized that the brand signifies a community connection to their food choice (Futamura, 2007).

The School of Human Environmental Sciences at the University of Kentucky houses the Department of Dietetics and Human Nutrition (DHN) and the Family and Consumer Sciences (FCS) Extension unit. Within these two units the partnership between teaching, research and extension outreach led to the development of a potential student engagement experience in the course DHN 304: Experimental Foods. The Extension agents were requesting recipes that were culturally appropriate to the state and were healthy to use in their nutrition outreach programs.

The University of Kentucky Cooperative Extension Service (CES) is an active supporter of the development and promotion of Kentucky specialty crop production as an economic investment in local and state economy through the educational outreach of county Extension agents. During 2009, CES Extension agents reported making 66,927 contacts with producers and consumers to promote Kentucky farmers markets. One aspect of the CES mission is to educate local consumers about the benefits of a diet high in fruits and vegetables as a lifestyle practice that promotes optimum health. In order to market Kentucky crops as a staple to a healthy lifestyle, consumers must understand and value access and availability of local specialty crops and adopt best practices for selection, storage and food preparation. Collectively in 2009, CES made 675,878 educational contacts to teach nutrition and health concepts within the state.

The University of Kentucky CES has offices in each of the 120 counties of the Commonwealth in order to offer educational programs to local residents through the efforts of county Extension agents. Currently there are 126 Family and Consumer Sciences Agents (FCS) who are responsible for developing and implementing programs to strengthen the physical and economic health and welfare of individuals and families in their communities. On campus at the University of Kentucky College of Agriculture subject matter specialists and associates are tasked to translate current research into educational programs to support Extension agents' work. Additionally, research and teaching faculty have expertise in the area of nutrition and food science to provide valuable experience and data to support the efforts of the Extension system. As a result of the expertise and infrastructure to support a statewide outreach effort the University of Kentucky CES was well-positioned to partner with Kentucky Department of Agriculture (KDA) to develop a broad-based outreach program.

A partnership between KDA, UK CES, and the School of Human Environmental Sciences was established through specialty crop grant funds to meet the specific aims of this project:

1. Increase consumer awareness of the availability and nutritional value of Kentucky specialty crops through new recipes.
2. Provide educational resources for Extension agent, producer, and others use to promote Kentucky products to local consumers.

In order to reach these goals a database of recipes that include selection, storage and nutritional content of the specialty crop was developed and disseminated through local Kentucky CES outreach programs.

### **3. Project Approach**

To accomplish the specific aims of the project the following seven steps were taken:

#### **1. Recipe solicitation and review**

A Kentucky Recipe Proud Database (KRPD) Advisory committee led by UK CES was developed that included FCS agents, nutrition education specialists, KDA representatives, and consumers to guide the project. The advisory committee solicited specialty crop recipe ideas from Extension agents, chefs, producers and consumers to be screened to include 1) a variety of locally accessible commodities, 2) ease of preparation, and 3) potential as a healthy diet choice. Using the screening criteria, the committee chose recipes to submit to the faculty teaching DHN 304, Experimental Foods, prior to the beginning of each semester. The committee met via face to face, conference calls and web-based sessions on 18 occasions during the grant period (Informal meetings have also occurred with sub committees.

## ***2. Recipe testing and adaptation***

The DHN state of the art foods lab has capabilities to test and prepare foods for student learning experiences and research projects. Dietetic and Human Nutrition students enrolled in DHN 304 study the chemical and physical properties of foods and the changes resulting from processing and preparation. A key component to the class is for students to design, execute and report on an independent research project related to recipe modification. Students in the course have completed food preparation coursework and have the expertise to modify recipes using the knowledge they are learning in lecture and through class assignments. Guided by the course faculty 160 students adapted recipes submitted by the KRPD Advisory committee. Recipes were modified in ingredients and preparation method to develop a high-quality, health-promoting, easy-to-prepare product that can be incorporated into a well-balanced diet. 107 recipes were tested during the five semesters, exceeding the 80 recipe goal for the grant. Students prepared both the original and adapted recipes for three consecutive lab periods, completing both sensory and objective evaluations of both products each week. Objective testing equipment including a penetrometer, Warner-Bratzler Shear, viscometer, and

volumeter allowed for evaluation of parameters such as texture, viscosity (thickness), and volume (baked goods). Sensory testing using discrimination, descriptive, and affective techniques allowed for students to evaluate specific attributes of the product and overall likability and likelihood of consumers to purchase, prepare, and serve the product to their families (McWilliams, 2008). Taste testing cards are developed under the guidance of the course instructors. 21 taste testers (minimum of 5 per semester) evaluated both the original and modified recipes during each testing period. In addition, a panel of FCS Extension agents and consumers evaluated all of the recipes on the third week of trials to assure taste and texture appeal. Students submitted a scientific report of their adapted recipe with statistical analysis of subjective and objective test results and nutritional analysis of the recipes to the KRPD Advisory committee. Appendix A pictures the students and taste test panel.

### **3. Menu planning**

Students in DHN 304 developed nutritionally sound menu plans for the recipes to be used in marketing and educational outreach with local consumers each semester. The menu plans encouraged the use of multiple recipes (salads, entrees, desserts, etc.) by families in their meal planning. The menu ideas were shared via Extension agents programs and newsletters. Menu planning ideas featuring Plate it Up! Kentucky Proud recipes will be continued through KRPD Advisory Committee, campus-based specialists and FCS Extension agents as requested.

### **4. Final recipe database development**

Based upon the DHN 304 students' reports and FCS Extension agents taste-testing experience, the KRPD Advisory committee determined the recipes that were considered appealing and appropriate for dissemination. University of Kentucky nutrition education specialists provided a final review of the recipes and include storage, selection, and preservation information where appropriate. The recipes were included on the UK FCS nutrition education website and linked to local Extension offices, KDA and other appropriate websites to maximize distribution. The recipes chosen for dissemination via recipe cards were sent to a graphic designer within the FCS Extension unit to format. Appendix B pictures an example of the front and back of a recipe card from the project. Thirty recipe cards completed for distribution during this time frame are:

Baked Apples and Sweet Potatoes  
Apple Cranberry Waldorf Salad  
Asian Asparagus Salad  
New Potato and Asparagus Soup  
Roasted Root Vegetables  
Blackberry Lemon Upside Down Cake  
Blackberry Peach Crumble  
Blueberry Cream Cheese Pound Cake  
Broccoli and Beef Stir Fry  
Broccoli Pizza  
Broccoli Salad with Creamy Feta Dressing  
Brussels Sprouts with Ham  
Cabbage Noodle Casserole  
Cucumber, Corn and Bean Salsa  
Fresh Corn Salad  
Scalloped Okra and Corn  
Summertime Sensation Casserole  
Cushaw Pie  
Easy Cheesy Eggplant  
Green Beans with Feta Cheese and Dill  
Green Beans with Ham and Basil  
Squash Supreme

Bacon and Tomato Dip  
Watermelon Tomato Salad  
Turnip Green Soup  
Glazed Butternut Squash with Carrots and Turnips  
Herbed Pasta with Roasted Cherry Tomatoes  
Spring Harvest Salad  
Sweet Potato Crisp  
Nutty Sweet Potato Biscuits

### **5. Lesson Plan Development**

Lesson plans, demonstration instructions and media scripts have been developed for all recipe cards in order for FCS Extension agents to share the recipe preparation, and the featured specialty crop selection, storage, preparation and nutrition information to broad audiences by Department of DHN Faculty in conjunction with KRPD and UK extension specialist. These thirty lesson plans were made available via the agent resource website for use by Extension agents and volunteer leaders teaching the concepts of buying local and selection, storage and preparation of specialty crops.

### **6. Distribution of Recipe Cards and Resources**

12,600 copies of each recipe card have been printed (30 cards @ 12,600 = 378,000) and distributed to 120 Kentucky county Extension offices. FCS Extension agents have disseminated these cards to local consumers via farmers markets, newsletters, grocery store displays and nutrition and food preparation programs.

#### *a. Extension programs*

The FCS Extension agents used the cards as a teaching tool at a variety of meetings, workshops and demonstrations to teach nutrition and raise awareness of Kentucky specialty crops. The recipe cards also will be used by producers and FCS agents at farmers market demonstrations, newsletters, at grocery store displays, etc. to target potential consumers. The recipe cards will be printed in quantity for each county and disseminated through the FCS agent.

#### *b. Specialty Crop Producers, Chefs, Grocery Stores*

The FCS Extension agents in each county were the point of contact for local specialty crop producers, chefs and grocery stores to use and disseminate printed recipe cards. The KRPD Advisory committee and KDA augmented the local efforts by developing statewide web-based database and network to market the specialty crop recipes broadly.

#### *c. Kentucky State Fair*

Kentucky Department of Agriculture partnered with the Kentucky State Fair to unveil the Plate it Up! Kentucky Proud project at the 2011 State Fair. Recipes were featured at the annual Commodity Breakfast and West and South Wing activities included demonstrations and displays for fair-goers. Appendix C features pictures of the event.

#### *d. Web and Media Access*

Recipes are available on the Kentucky Department of Agriculture Kentucky Proud website for easy access. The KRPD Advisory Committee maintains a facebook page to market the project. Two Kentucky magazines have featured the recipes in three additions for statewide circulation. Agents have been featured in local television shows, segments and two cable access channels sponsored monthly or weekly demonstrations of the Plate it Up! Kentucky Proud recipes by agents. Appendix D illustrates the media and web programs.

## **4. Goals and Outcomes Achieved**

### **Assessment of Effort**

The assessment of the effectiveness of the recipe card distribution will be determined through quantitative and qualitative means.

a. Throughout the grant process FCS agents were surveyed to determine quantity of recipe cards distributed and the methods used for dissemination. Agents have each received 4500

recipe cards during the grant period. Agents (n= 89) reported via an online survey after receiving eleven of the recipe card sets, that they had disseminated 66% of the cards to date as educational and point of purchase tools. Figure 1 shows the venues where they have most often shared the cards face to face. Figure 2 explains the venues where they shared the recipe in other ways besides face to face. Appendix E illustrates program outreach within the state through Cooperative Extension agents, paraprofessionals and volunteers.

Figure 1. Venues for face to face use of Plate it Up! Kentucky Proud Recipe Cards

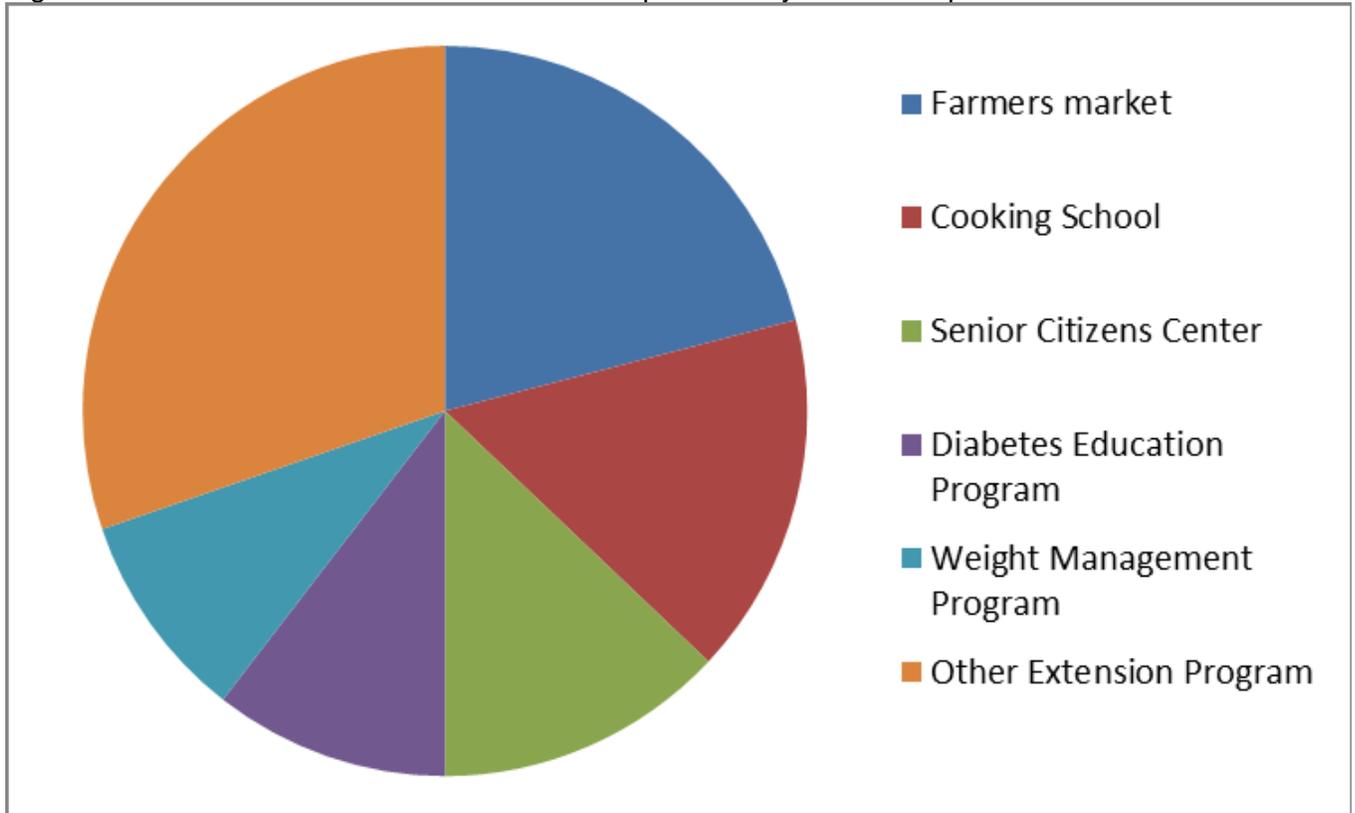
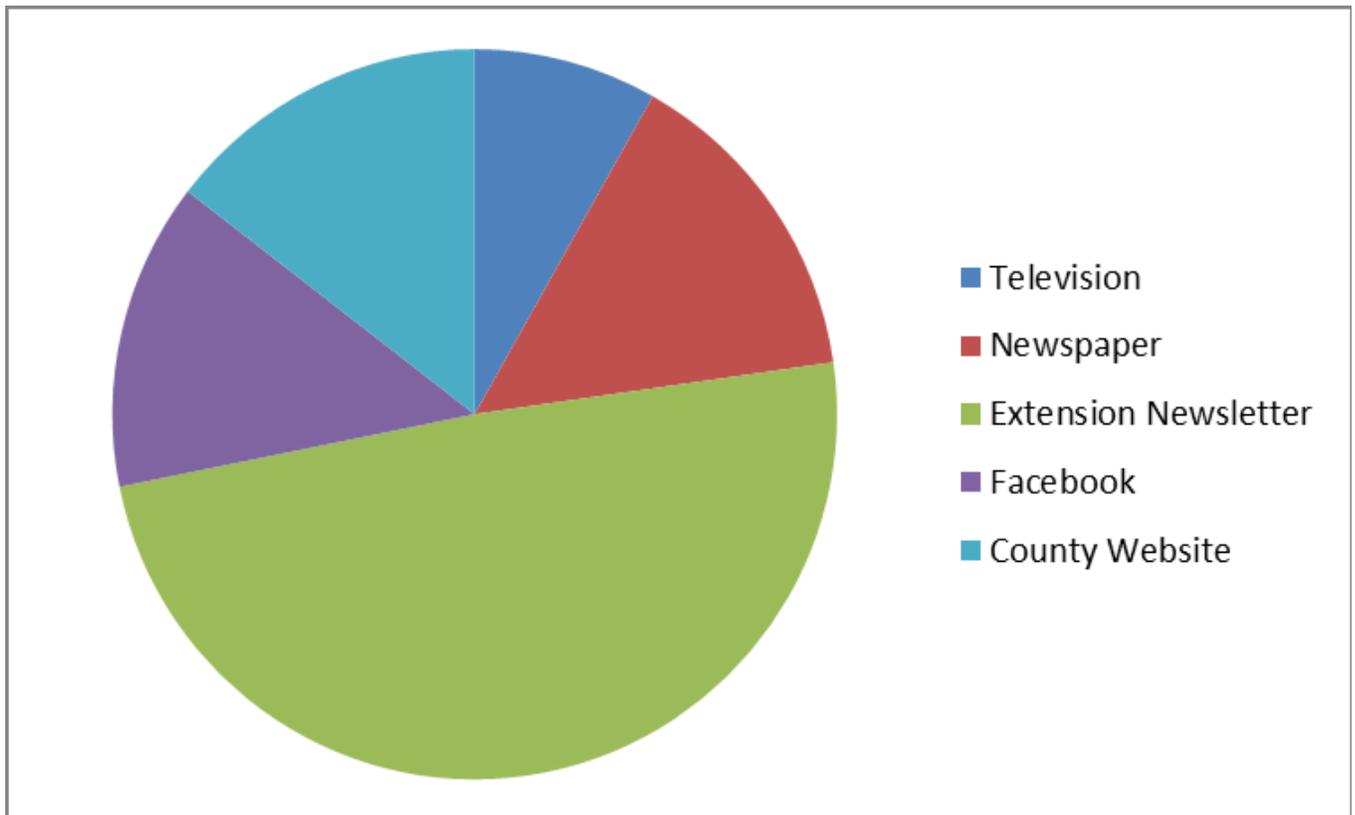


Figure 2. Venues for non-face to face use of Plate it Up! Kentucky Proud Recipes



b. Statewide consumer behavior change data was compiled via program evaluation questions developed to complement lesson plans used by agents beginning July 1, 2011 – July 1, 2012. Agents collected and entered the evaluation data into the statewide CES reporting system annually. The results of the program were:

*After tasting the sample of the Plate it Up! Kentucky Proud recipe:*

- 22,722 participants indicated that they are likely to buy the featured fruit or vegetables.
- 18,645 participants indicated that the taste test contributed (at least somewhat) to their plans to try the recipe at home.

*After receiving the Plate it Up! Kentucky Proud recipe card:*

- 18,888 participants indicated that they are likely to buy Kentucky fruits or vegetables.
- 21,841 participants indicated that the recipe card contributed to their plans to try the recipe at home.
- 16,062 participants indicated that the recipe cards influenced their decision to buy Kentucky fruits or vegetables.
- 7424 participants reported that the recipe cards helped them evaluate their nutritional needs.
- 12,592 participants reported that the recipe cards helped them plan future purchases at the market/grocery store.
- 9138 participants indicated plans to increase their consumption of fruits after participating in the program.
- 10,437 participants indicated plans to increase their consumption of vegetables after participating in the program.
- 3880 participants reported consuming at least 4-6 servings of fruit per day before participating in the program.
- 4352 participants reported consuming at least 4-6 servings of vegetables per day before participating in the program.

In some counties the agents conducted a follow-up survey (3 or 6 months) after disseminating the recipe cards. *The agents reported that the follow-up surveys indicated:*

- 841 participants reported an increase in their consumption of fruits after participating in the program.

- 1993 participants reported an increase in their consumption of vegetables after participating in the program.
- 524 participants reported consuming at least 4-6 servings of fruit per day after participating in the program.
- 551 participants reported consuming at least 4-6 servings of vegetables per day after participating in the program.

c. A representative sample of specialty crop producers selling at local farmers markets were surveyed as to the difference in sales of product before and after distribution of the recipe cards. 100 producers were given four seasonal sets of recipe cards (100 cards in each set) and a point of purchase recipe rack with the Plate it Up! Kentucky Proud logo. Preliminarily, 15 producers have responded to a follow-up survey after the end of the 2012 summer harvest. Results of the survey indicated:

- 86.7% of producers reported that consumers provided positive feedback upon receiving the recipe cards.
- 100% of producers said that the recipe cards had at least a minor impact on the consumer.
- 60% of producers said having the recipe cards affected the number of questions or inquiries they received about varieties best for certain recipes.
- 93.3% of producers said having the recipe cards increased consumer interest of the featured commodities.
- 66.7% of producers said having the recipe cards increased consumer purchase in the featured commodities.
- 93.3% of producers would be interested in receiving PIUKP recipe cards in the future.

d. 1074 farmers market consumers at ten diverse markets participated in a point of purchase paper survey to determine the impact of three recipe cards on their purchases from October 2010

through August 2011. 362 consumers responded to a follow-up email survey two weeks after completion of the market survey. Appendix F shows the DHN students surveying farmers market consumers.

#### *Recipe sampling Results:*

Participants had a very favorable impression of all of the recipes sampled. On a scale of 1-10, with 10 being “Loved the flavor, I will definitely make”, the overall ranking was  $8.3 \pm 1.9$ . Recipe impression was similar for cucumber, corn, and bean salsa ( $8.4 \pm 1.9$ ), apples and sweet potatoes ( $8.2 \pm 2.1$ ), and asparagus salad ( $8.2 \pm 1.7$ ).

Participants who tried the recipe samples reported they were likely to try recipe samples at the supermarket or grocery. Of those surveyed, 51 % frequently and 40% sometimes tried samples at these venues. Participants reported that sampling of the recipe contributed to the likelihood that the recipe was made at home. On a scale of 1-10 (10=extremely important), participants rated the overall impact of sampling on at-home preparation as  $7.8 \pm 2.5$ . Similar results were found for sampling impact on at-home preparation of cucumber, corn, and bean salsa ( $8.1 \pm 2.3$ ), apples and sweet potatoes ( $7.2 \pm 2.8$ ), and asparagus salad ( $7.8 \pm 2.5$ ).

#### *Commodity purchasing*

Survey at time of sampling: For those who did not plan on purchasing the commodity before arriving at the market, their likelihood to buy the commodity that day after trying the sample was  $5.9 \pm 3.0$  and their likelihood to purchase the commodity at a later date was  $6.8 \pm 3.0$ , on a scale of 1-10 with 10 being most likely. For those who had planned to buy the featured commodity on that day, after sampling, their likelihood of purchasing on that day was  $7.6 \pm 3.2$  and their likelihood to purchase at a later date was  $8.2 \pm 2.4$ .

Follow-up survey: Two-weeks following the sampling experience, 36% of those surveyed had prepared the recipe at home. The cucumber, corn, and bean salsa had been prepared an average of  $1.3 \pm 1.9$  times, the apples and sweet potatoes  $0.3 \pm 0.6$  times, and the asparagus salad  $0.8 \pm 1.5$  times.

For those who had not prepared the recipe, the key reasons were not enough time (44.8%), not having the commodity on hand (19.8%), did not like the recipe or ever plan on making it (18.8%), waiting for the right occasion/holiday (15.6%), or not involved in food preparation at home (14.6%).

#### *Recipe cards*

On a scale of 1-10 (10=extremely important), participants rated the overall impact of providing recipe cards on product preparation at home as  $7.9 \pm 2.6$ . No significant differences were found for recipe card impact for cucumber, corn, and bean salsa ( $7.9 \pm 2.5$ ) or asparagus salad ( $7.7 \pm 2.6$ ). Data were not collected for apples and sweet potatoes.

On a scale of 1-10 (10=extremely important), participants rated the importance of having nutrition information listed on recipes provided at the supermarket or farmers market as  $7.2 \pm 3.0$ . Participants were asked to rate the quality of the cards themselves, irrespective of the recipe itself. On a scale of 1-4 (1=poor, 4=excellent) the *Plate It Up! Kentucky Proud* recipe cards received the following ratings: easy to understand instructions ( $3.7 \pm 0.8$ ), easy to read font ( $3.7 \pm 0.8$ ), color choices ( $3.7 \pm 0.8$ ), nutrition information ( $3.7 \pm 0.8$ ) and size of card ( $3.7 \pm 0.8$ ).

Participants were asked if having recipe cards at the farmers market would influence their market habits. On a scale of 1-4 (1=rarely impact, 4=always impact) participants felt that recipe cards would “Help me feel more comfortable trying unusual products” ( $2.8 \pm 1.0$ ), “Help me evaluate my nutritional needs” ( $2.6 \pm 1.1$ ), “Help me decide how much of a product to purchase” ( $2.8 \pm 1.0$ ), “Help me know what questions to ask producers about their product” ( $2.4 \pm 1.0$ ) and “Help me plan my future purchases the farmers market or supermarket” ( $2.6 \pm 1.0$ ).

*Note: Consumer survey data has been submitted for journal publication and currently is in review.*

<b>Activity</b>	<b>Outcome measure</b>	<b>Accomplishment of goals of project</b>	<b>Baseline vs. impact data</b>
Development and implementation of KRPD Advisory to oversee and guide project	KRPD Advisory council was identified and functioning effectively	Council provides leadership for the project and trajectory of program efforts	Baseline – No advisory council Current – Advisory council is actively functioning having met 18 times
Recipe Testing and Menu development	Recipe testing and menu development initiated and sustained	Recipe testing protocols have been implemented and refined. Menu suggestions for featured recipes were initiated for one semester	Baseline – no recipe testing protocols and no menu suggestions Current – Recipe testing has been initiated and functions effectively. Menu suggestions have been developed by students to be shared with agents
Development, printing and distribution of Recipe Cards	For each completed recipe 100 - 250 copies of recipe cards printed and distributed to all 126 FCS Extension agents	Thirty sets of recipe cards were distributed during the grant period to each agent	Baseline – no recipe cards Current – 30 recipe cards disseminated
Development of complementary lesson plans and media scripts for recipes	Lesson plan and media script developed to complement each recipe card	Thirty lesson plans and media scripts have been developed	Baseline – no recipe card Current – 30 lesson plans and media scripts available on line for agents use.
Development of featured program questions and implementation of statewide evaluation via UK CES reporting system	Developments of evaluation tool for agents use to collect Plate it Up! Kentucky Proud featured program data	Evaluation tool designed and made available on line	Baseline – no evaluation tool Current – Evaluation tool is available and reporting system open for data collection

## **5. Beneficiaries**

*a. To specialty crop industry* – As a result of the project, producers have had access to a thirty new recipes that they can use to market their specialty crop to consumers. These were used as a resource to handout or as an insert in CSA baskets, newsletters, flyers, etc. target-marketing their products. The potential benefit was increased sales of product and expansion of local market demand.

*b. To Extension agents* – For many years agents have requested consistent access to high quality recipes that support their efforts to provide hands-on, healthy learning opportunities for consumers. The

recipes adapted and tested through this project answered that need. Further the media scripts and lesson plans provided a solid educational resource to support a consistent statewide effort to teach the importance of buying local specialty crops and eating fruits and vegetables.

*c. To consumers* – CDC (2009) studies have shown that accessibility to fruits and vegetables is a deciding factor in the number of servings per day consumed by individuals. For consumers this project raised their awareness of the local availability of specialty crops as well as broadening their knowledge of selection, storage, and food preparation techniques which may increase their willingness to try new products.

*d. To DHN students* – Higher education research supports the numerous benefits to college students being engaged in their community through both extracurricular and curricular activities. Students evaluate courses more positively and have higher academic achievement as measured by midterm and final exams. As well, these experiences have a positive impact on personal, moral, social and cognitive outcomes. Dietetic and nutrition students had a unique opportunity to impact their community through this recipe adaptation project.

## **6. Lessons Learned**

This project has opened the door for a successful partnership between the teaching and extension missions of the University and Kentucky Department of Agriculture. Leveraging the statewide recognition of the Kentucky Proud marketing logo was pivotal in branding the program to consumers at local markets. Integrating the concepts of the MyPlate initiative with the Kentucky Proud logo through the tagline Plate it Up! Kentucky Proud has resonated with consumers.

The recipe development and taste-testing protocols were time intensive in finalizing, however the five semesters have been crucial in the refinement and synthesizing of the protocols to establish best practices. Extension agents visited the DHN classroom early in the semester to impress upon the students the need to consider the culture and accessibility of local foods as they adapt the recipes. The taste test panel was broadened to be more inclusive and the process for obtaining feedback was streamlined. Communication between Advisory committee and DHN Faculty and graduate student was enhanced as the project evolved.

Evaluation processes were hard to implement consistently across the state. Venues and program timeframes did not always lend themselves to adequate time or space for surveys. Future survey questions will be refined based on the lessons learned in this project. Producer survey via email had very poor response rates and consumer follow-up email surveys had several bounce back email addresses. Future evaluation plans will weigh the benefits vs. problems of email surveys to determine best feedback loops.

## **7. Contact Person**

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## **8. Financial Report**

Project Title: Speciality Crop Recipe Development with Nutritional Research Component  
 Prin. Investigator: Laura Stephenson  
 Budget Period: 4/15/10-6/30/12  
 Award: \$40,000.00

	Cumulative 4/15/10-6/30/12
Salaries	\$8,568.82
Fringe Benefits	1,259.92
Travel	963.40
Printing	0.00
Services	4,613.97
Printing	19,702.36
Sub-Ct < \$25,000	0.00
Sub-Ct > \$25,000	0.00
Materials & Supplies	837.28
Equipment	0.00
<i>Direct</i>	<u>\$35,945.75</u>
Indirect @ xx.x%	<u>\$3,993.63</u>
<b>Total</b>	<b><u>\$39,939.38</u></b>

Cumulative Receipts	\$40,000.00
Cumulative Expenses	<u>\$39,939.38</u>
<b>Current Cash on Hand</b>	<b>\$60.62</b>

Below is the budget as proposed and the final project report of expenditures. Attached is the March 25, 2010 budget revision request. According to those the chart should read this way and the total cumulative budget change was 17.024% that falls under 20% and does not require budget approval:

Cost	Approved Budget	Final Budget	Budget Change	% Budget Change
Travel	\$1000	\$963.40	(\$36.60)	.009%
Supplies	\$2,500	\$837.28	(\$1,662.72)	4.2%
Other	\$29,000	\$34145.07	\$5145.07	12.8%
Indirect	\$4,000	\$3993.63	(\$6.37)	0.015%

## 9. Additional Information

### Logic Model

[http://www.ca.uky.edu/hes/FCS/plateitup/Resources/Logic\\_Model.pdf](http://www.ca.uky.edu/hes/FCS/plateitup/Resources/Logic_Model.pdf)

### Website for recipes

<http://www.kyproud.com/recipes/index.aspx>

### Facebook

<https://www.facebook.com/PlateItUpKentuckyProud?ref=hl#!/PlateItUpKentuckyProud>

### Example Media Script

[http://www.ca.uky.edu/hes/FCS/plateitup/Cucumber/Script\\_Cucumber.pdf](http://www.ca.uky.edu/hes/FCS/plateitup/Cucumber/Script_Cucumber.pdf)

### Example Demonstration Guide

[http://www.ca.uky.edu/hes/FCS/plateitup/Cucumber/RofMonth\\_Cucumber.pdf](http://www.ca.uky.edu/hes/FCS/plateitup/Cucumber/RofMonth_Cucumber.pdf)

### Example Television Show

<http://video.ca.uky.edu/videos/video/392/>

### Example of Bookmark Promotional Item

<http://www.ca.uky.edu/hes/FCS/plateitup/Marketing/BookmarkFINAL.pdf>

### Evaluation Tool

<http://www.ca.uky.edu/hes/FCS/plateitup/Resources/evaluation.pdf>

### Marketing Display for Banners and Table Top Exhibits

<http://www.ca.uky.edu/hes/FCS/plateitup/Marketing/PlateItUpCoverFCS.jpg>

### Periodicals

Cushaw Pie. October 10, 2012. *Kentucky Monthly*. Retrieved at

<http://www.kentuckymonthly.com/articles/cushaw-pie>

Fritschner, S. June 2012. Plate up fresh recipes. *Kentucky Living*. Retrieved at

<http://www.kentuckyliving.com/article.asp?articleid=3547&issueid=384>

Heralding Spring. February 22, 2012. *Kentucky Monthly*. Retrieved at

<http://www.kentuckymonthly.com/articles/heralding-spring>

### Refereed Publications

Stephenson, T., Stephenson, L. & Mayes, L. (In Press) Engaging students in service learning through collaboration with Extension: A recipe for success with community partners.

*Journal of North American Colleges & Teachers of Agriculture*.

Stephenson, T., Stephenson, L. Mayes, L. & Weber, K. (In Review). *Plate It Up! Kentucky Proud: A case*

study of local food system fruit and vegetable point of purchase social marketing campaign

### Case Studies in Public Health Communication and Marketing.

Webber KH, Stephenson TJ, Mayes L, Stephenson L. (In Review). Characteristics of farmers market patrons: implications for promoting consumption of locally-grown produce. *World Applied Sciences Journal*.

### Presentations

Stephenson, L., Stephenson, T., & Branscum, K. (2012). *Plate it Up Kentucky Proud: promoting Local Food Sustainability Through Classroom/Community Interaction*. Paper presented at the 2012 International Community Development Society Conference.

Stephenson, L., Stephenson, T., Branscum, K., Johnson, J. & Mayes, L. (2012). *Plate it Up! Kentucky Proud: Statewide social marketing campaign to increase consumer purchase and consumption of locally grown fruits and vegetables*. Paper presented at the 2012 Social Marketing in Public Health Conference.

Stephenson, T., Stephenson, L., & Johnson, J. (2011). *Plate It Up, Kentucky Proud: A successful and sustained collaboration engaging students, faculty, administrators, extension agents, and communities throughout the state of Kentucky*. Paper presented at the 2011 Kentucky Engagement Conference.

### Seminars

Johnson, J., Stephenson, L. Stephenson, T. & Branscum, K. (2012). *Plate it Up! Kentucky Proud: A partnership with Kentucky Department of Agriculture and Family and Consumer Sciences Extension*. Program presentation at National Extension Association of Family and Consumer Sciences Conference.

### Posters

Mayes, L., Stephenson, T., & Stephenson, L. (2011). Nutrition knowledge and dietary habits of Farmers Market patrons: Implications for promoting consumption of locally grown fruits and vegetables. American Dietetic Association.

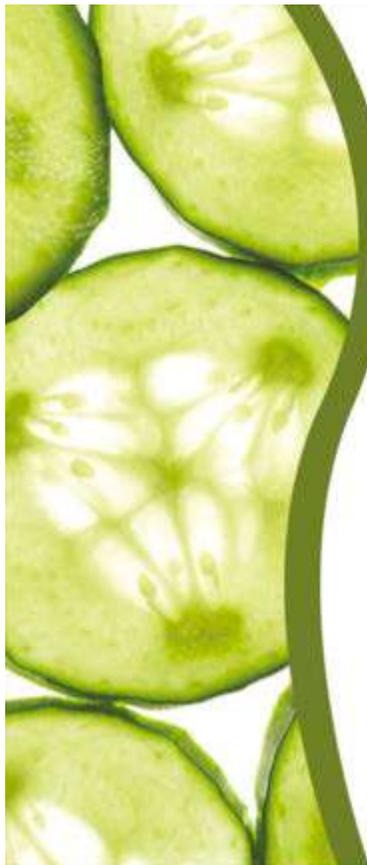
*References:*

Centers on Disease Control. 2009. *State Indicator Report on Fruits and Vegetables, 2009*. Accessed via the web on January 10, 2010 at <http://www.fruitsandveggiesmatter.gov/healthprofessionals/statereport.html#Background>

Futamura, Taro. 2007. "Made in Kentucky: The Meaning of "Local" Food Products in Kentucky's Farmer's Markets." *The Japanese Journal of American Studies*. No. 18. (pp. 209-225)

Growing Kentucky II. 2007. University of Kentucky Land, Food and Culture: Creating Sustainability Where you Live. conference. March 13-14, Lexington, Ky.

Appendix A. Example of Recipe Cards



## Cucumber, Corn, and Bean Salsa

**2-3** large cucumbers  
**2** tomatoes  
**1** yellow bell pepper  
**1** small red onion  
**¼ cup** chopped fresh cilantro  
**½ cup** black beans

**½ cup** fresh whole kernel corn, cooked  
**1 ounce** package dry ranch dressing mix  
**⅓ cup** cider vinegar  
**⅛ teaspoon** sugar

**Wash** all vegetables. Finely chop cucumbers, tomatoes, pepper, and onion. Combine in a large mixing bowl with chopped cilantro. Drain and rinse beans and add to chopped vegetables. Add corn. If using canned corn instead of fresh, drain off liquid prior to adding to vegetables.

dressing packet, vinegar, and sugar. Pour dressing over vegetables and mix well. Serve immediately or refrigerate until chilled.

**Yield:** Makes 10, 1 cup servings.

**Nutrition Analysis:** 50 calories, 0 g fat, 130 mg sodium, 7 g carbohydrates, 2 g fiber, 70% Daily Value of vitamin C and 6% Daily Value of vitamin A

**In a small bowl,** mix together ranch

Buying Kentucky Proud is easy. Look for the label at your grocery store, farmers' market, or roadside stand.



# Kentucky Cucumber

**SEASON:** June to September.

**NUTRITION FACTS:** Cucumbers are naturally high in water; a one-half cup serving contains only 7 calories.

**SELECTION:** Choose firm, fully green cucumbers with no yellowing or soft spots. Cucumbers suitable for slicing and eating are 6 to 9 inches long with small, white spines on the surface that rub off easily. Pickling cucumbers are smaller and have black spines on the surface.

**STORAGE:** Store unwashed cucumbers in the refrigerator for up to a week. Sliced cucumbers should be tightly wrapped and refrigerated for up to 3 days.

**Source:** [www.fruitandveggiesmatter.gov](http://www.fruitandveggiesmatter.gov)

**PREPARATION:** Wash under cool, running water to remove visible dirt. You may want to remove the seeds in mature cucumbers by cutting lengthwise and scooping seeds from the center with a spoon.

**FOR PICKLING:** Follow recipe instructions. Four pounds of cucumbers yield 5 to 6 pints of pickles.

## CUCUMBER

### Kentucky Proud Project

County Extension Agents for Family and Consumer Science  
University of Kentucky, Nutrition and Food Science students.

May 2010

Educational programs of Kentucky Cooperative Extension serve all people regardless of race, color, age, sex, religion, disability, or national origin. For more information, contact your county's Extension agent for Family and Consumer Sciences or visit [www.ca.uky.edu/fcs](http://www.ca.uky.edu/fcs).



## Appendix B. Recipe Development and Taste-testing



## Appendix C. 2011 Kentucky State Fair

## 2011 Kentucky State Fair



## Appendix D. Statewide Media

### Statewide Media



## Appendix E. Local Education Programs

## Local Education Programs



## Appendix F. Farmers Market Consumer Survey

## Farmers Market Survey of Consumers



## **Project 4: Healthy Living Forums Through the Commonwealth Institutional Food Market Coalition (CIFMC)**

### **2. Project Summary**

The Commonwealth Institutional Food Market Coalition (CIFMC) was created to connect large volume institutional buyers in the private, public and not-for-profit sectors with Kentucky produce auctions, growers and other producers of Kentucky specialty crops. Kentucky has made great strides in promoting the benefits of buying local, but until this project started little of the food moved through large-volume purchases. This project targeted large-volume buyers, including hospitals, universities, and school systems, to inform them about sources of local food, in addition to helping farmers identify markets and increase their professionalism in order to secure those markets. These efforts took the form of workshops, tours and fairs intended to connect producers and the market represented by large-volume buyers.

### **3. Project Approach**

A total of ten activities were sponsored from November 2010, to December 2012, including several workshops, a tour of Kentucky farms, a vendor fair and a caterers' fair (the "Programming"). Each workshop focused on a distinctive aspect of the institutional food market. Over 500 unique participants, including institutional representatives, food service providers, large-volume distributors, producers and government agencies, participated in the Programming. Through these forums, representatives of all groups involved were educated on institutional buying, informed about buying local food, connected with resources that help increase the use of local food in institutions and encouraged to build relationships with others in the market.

Partners played a significant role in the effectiveness of the project. A number of institutions, including Jewish Hospital and St. Mary's HealthCare, Scott County Public Schools, Bellarmine University and the University of Louisville, hosted Programming activities. Food service company Aramark also co-hosted an event. The Kentucky Department of Agriculture and the University of Kentucky Cooperative Extension Service were instrumental to the project's success, providing resources, support and expertise to the Programming.

### **4. Goals and Outcomes Achieved**

The grant's purpose was to conduct Healthy Living forums, educational sessions or individual meetings that expand opportunities for specialty crop sales to larger institutional buyers either by increasing current volume or encouraging new purchases. Programming goals were to provide institutional decision makers with education on the health and economic benefits of using Kentucky specialty crops, to create opportunities for new relationships between growers, distributors and institutional buyers, and to assist in building regional food-system capacity to meet demand for locally-produced food.

The grant's ultimate objective was to positively affect Kentucky specialty crop producers by solidifying relationships with at least two organizations with large institutional buying capabilities in Kentucky. The target was to affect 200 employees of these organizations and between 15 and 30 specialty crop producers through the increased buying efforts of these targeted organizations. The following is a list of programming activities that were completed over the course of the project to help achieve performance goals and measurable outcomes:

#### *1. Institutional Food Market Workshop (November 2010)*

Attendees:

- 15 chefs from Morrison Management, which runs food service at several Kentucky hospitals (Norton Healthcare, Baptist Healthcare, University of Kentucky), airports and senior facilities
- Director of food service for the Kentucky Department of Corrections, which oversees 26 juvenile facilities operating under the school lunch program
- Five representatives from nearby public school food service
- Three representatives from FLIK food service for independent schools
- At least two representatives of large-volume buyers (Sysco and GFS)

Speakers/Panelists/Presentations:

- Variety of speakers with national reputations for successfully using local foods in own operations
- Managers of produce auctions who sell in large volume
- Managers of institutional feeding operations who have begun serving local food
- Distributors who distribute local food

*2. Healthy Food in Healthcare (August 2011)*

Attendees:

- At least eight hospital dietitians
- Representatives from Aramark and Morrisons, food service providers for major hospitals in the area
- Several representatives of large-volume distributors Sysco and GFS

Speakers/Panelists/Presentations:

- Speaker with national reputation for successfully using local foods in own operation
- Policy-maker
- Dietitian and food service manager from a Kentucky hospital that uses local food
- Farmers who explained how they raise and sell product
- Distributors who can sell to health care facilities

*3. Farm Fresh Tour (September 2011)*

Attendees:

- Five chefs from prominent Louisville restaurants
- Three agriculture representatives from the USDA
- Three media representatives
- Four restaurant employees
- Ten others including culinary students, culinary instructors, farmers' market managers, government agencies and agriculture business

Speakers/Panelists/Presentations:

- Tour stops included Capstone Produce Auction, Smith-Berry Winery and Gallrein Farms, a wholesale produce grower
- Speakers from Marksbury Farms and Horseshoe Bend
- Representatives from Four Hills Farm, Kenny's Farmhouse Cheese and Stone Cross Farm

*4. Breaking Down Barriers: Putting Farm to School into Practice (October 2011)*

Attendees:

- 11 county school system food service workers
- Three government workers, including representatives from the Kentucky Department of Agriculture, Kentucky Department of Education and Kentucky Farm to School program
- Three extension agents

Speakers/Panelists/Presentations:

- School food service director from Burlington, Vermont, whose Farm to School program has grown since it began 10 years ago and whose best practices have been included in the USDA Farm to School summary report
- USDA representative discussed procurement and geographic preference
- Owner of Capstone Produce Auction
- Farmer
- Representative from Marksbury Farms

#### *5. Beyond Farmers' Markets: Making Money Growing Food (October 2011)*

Attendees:

- Farmers
- Producers
- Extension agents
- Government workers

Speakers/Panelists/Presentations:

- Panelists with expertise or information on large volume produce buying, the need for specialty products, food buying for public schools and GAP training
- Agent from Kentucky Farm Bureau discussed product liability insurance and how that affects conventional farm policies
- Large-volume produce buyers such as Jefferson County Public Schools, Piazza Produce, Grasshoppers Distribution and Green Bean Delivery

#### *6. Farm to Campus: Exploring the Farm-to-Food Service Connection (January 2012)*

Attendees:

- 19 food service representatives
- 27 college administrators
- Eight college sustainability representatives
- Six wellness coordinators
- 12 distributors
- 12 government representatives

Speakers/Panelists/Presentations:

- Food service contractors
- Local food distributors
- Director of the Yale University Sustainable Food Project
- Director of University of Montana dining services
- University of Louisville Associate Vice-President for Business Affairs

#### *7. Connecting Farms to Local Markets (September 2012)*

Attendees:

- Farmers
- Wholesale buyers
- School food service representatives
- Government representatives

Speakers/Panelists/Presentations:

- Large-volume buyers of specialty products, including public schools and wholesalers
- Producers
- Representatives with information on small farm grants, business analysis and alternative markets
- Kentucky Agriculture Commissioner James Comer spoke about market opportunities and incentives provided through the Kentucky Proud program

#### *8. Local Vendor Fair (November 2012)*

Attendees:

- University of Louisville representatives

- Wholesale sellers Sysco, Creation Gardens and Piazza Produce
- Four local producers
- 11 catering facilities ranging from large (Sodexo) to small (Farm to Fork)

Speakers/Panelists/Presentations:

- Representative from the Kentucky Department of Agriculture informed catering companies about the Restaurant Rewards rebate program

*9. Local Caterers' Fair (December 2012)*

Attendees:

- More than 100 University of Louisville personnel from all three campuses
- Nine caterers

*10. Wholesale success (December 2012)*

Attendees:

- Produce farmers

Speakers/Panelists/Presentations

- National consultant with Risk Management Agency, USDA, on post-harvest handling and food safety records
- Business consultant on cost analysis and profit identification
- Agriculture specialists with information on high tunnels, pests and diseases

The ten programming activities held by the CIFMC were designed as forums, educational sessions and individual meetings to expand opportunities for specialty crop sales to larger institutional buyers by increasing current volume or encouraging new purchases. The primary project goals were met through these activities. Institutional decision makers were provided with education on the benefits of using Kentucky specialty crops through workshops focused on such issues as the institutional food market, integrating local food into healthcare institutions, farm-to-school programs and using local food in higher education institutions. All of the forums created opportunities for new relationships between growers, distributors and institutional buyers by bringing these groups together and encouraging interaction among them. The Programming also assisted in building regional food-system capacity to meet demand for locally-produced food by providing information and resources that allow producers to expand their capacity, as well as introducing producers to a larger market for their goods.

The objectives of the grant were eclipsed in terms of results achieved. Louisville Farm to Table solidified relationships with several larger organizations with the ability to purchase Kentucky specialty crops, including universities, and public school systems. A number of higher education institutions were involved in the project. Universities and colleges attending the Farm to Campus workshop together serve more than 55,000 meals per day. This conference helped to instigate a growing relationship between Louisville Farm to Table and Sodexo, the food contractor for the University of Louisville. As a result of this relationship, Louisville Farm to Table visited Sodexo at Berea College to investigate additional possibilities for serving local food and has been able to begin building relationships among Sodexo-serviced colleges including Transylvania, Georgetown, Centre and Bellarmine. The University of Louisville, with nearly 6,000 employees and over 22,000 students, was especially affected by the project. Not only did the University of Louisville provide leadership and a meeting venue for one of the workshops, they also hosted both a Vendor Fair and Caterers' Fair to familiarize university Unit Business Managers and others who order catering on campus to identify businesses that support local food.

At least 11 hospitals were represented at programming activities, including Jewish Hospital and St. Mary's Healthcare, Norton Healthcare, Baptist Healthcare System and University of Kentucky Healthcare. Aramark and Morrison Management, food service providers for these and other area hospitals, were highly involved and several of the hospitals were also represented by dietitians and

wellness coordinators who help make decisions about food served by the institution. Since that workshop, Morrison in particular has worked with Piazza Produce to incorporate more local produce in its menus.

Another important institutional buying segment affected by the project is Kentucky's school systems. The Breaking Down Barriers workshop alone hosted representatives from 14 school districts that together account for 43,100 students. Each of these organizations was linked with specialty crop producers at the workshop. Examples of commitments made to buy Kentucky specialty crops include Scott County Public Schools, which agreed to increase its use of local foods the following year, and Jefferson County Public Schools, which plans to buy 20% of its produce in Kentucky for the 2012-2013 school year. Another workshop was attended by three representatives from FLIK, which provides food service for independent schools. This forum led to a meeting with FLIK managers and corporate representatives who expressed commitment to buying locally. These representatives committed to connecting Louisville Farm to Table with the group's corporate purchasing department to identify and overcome obstacles that prevent local farm purchases. They also agreed to begin working with local distributors to develop systems for carrying local products. FLIK's Louisville service amounts to around 4,200 meals per day.

The objective of affecting between 15 and 30 specialty crop producers through the increased buying efforts of targeted institutions was also easily exceeded. Throughout all forums, producers made connections with institutions, food service providers and large-volume distributors. Farmers and producers were especially involved in the Beyond Farmers' Markets workshop. At this conference, 46 farmers and producers returned evaluations, which showed that they represented Kentucky farmland ranging from 1500 square feet to 740 acres and totaling over 5,700 acres. Out of these 46 farmers and producers, 30 said they connected with a buyer that they will supply as a result of the workshop and 30 stated that they plan to increase production as a result of what they learned at the conference.

Evaluations from the Connecting Farms to Local Markets also revealed the benefits of the forums for Kentucky's specialty crop producers. All attending that conference stated that they increased their knowledge of possible markets for their products. Several wholesale buyers commented that they had begun relationships at the workshop that they hope will continue. 80% of school food service directors and 86% of hospitality industry representatives in attendance said they had made a connection at the forum with a local food producer.

The Wholesale Success workshop was designed to help produce farmers manage both their post-harvest handling and profitability by installing record-keeping systems that allow them to monitor food safety practices and profit centers. More than 60 farmers attended the sessions in Bowling Green and Frankfort. About 45 evaluations were returned; and 100% of respondents said they understood more about post-harvest handling and food safety following the workshop. A "meet the buyers" panel allowed them to meet wholesale buyers who were interested in buying more local produce, including organically grown produce.

## **5. Beneficiaries**

A large and assorted collection of groups and other operations benefited from this project, including large institutions such as hospitals, universities, and school systems, institutional food service providers, large-volume distributors and Kentucky specialty crop producers. Institutions, institutional food service providers and large-volume distributors learned the benefits of serving local food and strategies to overcome barriers to doing so. Kentucky's specialty crop producers were educated on institutional food markets, identified markets for their products and increased their professionalism in order to secure those markets.

## **6. Lessons Learned**

Several lessons were learned during the course of this project that will provide insight as Louisville Farm to Table continues its work in the future. The majority of large-volume feeding operations in Kentucky

are run by outside food service contractors such as Sodexo, Compass, and Aramark. These contractors have long-term contracts with large food manufacturers that earn them cash rebates for food purchases. These rebate schedules result in direct payments not only to the food service, but figure into bonuses for on-site personnel, and to the institutions as well. Kitchen managers buy food from large corporations to earn bigger bonuses. Hospitals and universities get “facility upgrades” without having to pay for them, and earn annual cash commissions from their foodservice contractors. In short, no cook wants to buy from a local farmer, because it cuts down on the money he or she earns. A hospital administrator will lose commission and upgraded facilities if his or her foodservice contractor makes less money. Additionally, in any large-volume feeding operation, there is a predictable list of barriers that include cost, seasonal availability, food safety, inadequate supply, inconsistent supply, inconsistent quality, dealing with multiple suppliers, procurement restrictions and processing/labor. To encourage the use of local foods in any large-volume operations, it is valuable to address these barriers directly. In educational workshops for large-volume food service, experts were provided to address the barriers and provide solutions. But to change the food system in a way that will benefit Kentucky farmers, cost issues will also need some investigation. Currently, the most successful wholesaler of Kentucky produce buys fungible products – Kentucky summer squash looks like squash from everywhere else. Involving Kentucky’s 84,000 farmers in the economy of mainstream produce may not provide security in the long run. Kentucky’s most successful meat processor has value-added to its products, issuing specifications including grass-access, minimum space requirements, no antibiotics, hormones and steroids, among others, setting it apart from mainstream competition, and this may be a model for specialty crop producers to follow in competing in the broader marketplace. Furthermore, because Kentucky horticulture has languished in the shadow of the lucrative tobacco market, there is a lot of catching up to do in terms of creating markets and systems to get product to those markets. Produce grown on less than 10 acres is currently inhibited from reaching large-volume markets due to limitations in the food system involving transportation, aggregation and storage. Finally, the more large-volume feeding operations sign on to serve local, the more possibility there is for consumer deception. In at least one of this project’s events, food served was very likely misrepresented.

**7. Contact Person**

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**8. Additional Information**

More information on Louisville Farm to Table can be found at [www.louisvillefarmtotable.com](http://www.louisvillefarmtotable.com). The site includes Power Point presentations from the Programming and will provide video of select workshops in the future

**9. Final Financial Report**

We very much appreciate the opportunity to engage with large volume purchasers and Kentucky farmers through this grant opportunity. If you have questions about the content of this final report, please contact me using the information provided above.

GRANT FUNDS RECEIVED	\$40,000
GRANT FUND EXPENDED	\$40,000
TOTAL REMAINING	\$0
LINE ITEMS	
SALARIES/ WAGES	\$0
BENEFITS	\$0
TRAVEL	\$221.17
EQUIPMENT	\$0
SUPPLIES	\$700.92
CONTRACTUAL	\$0
OTHER	\$39,077.91
TOTAL	\$40,000

## Project 5: Organic Specialty Crop Pest Management Research

### Project 5a: Optimizing No-Till Vegetable Production Systems for Organic Growers

Organic farmers in Kentucky face a “perfect storm” when it comes to pest control; soils in much of the state are fertile, promoting prolific weed growth, and hot, humid summers promote insect and disease outbreaks. In this work, we developed and evaluated a no-till production system for organic sweet corn and winter squash using a systems approach that integrates weed management with insect and insect-vectored disease control techniques.

Organic sweet corn can command significant price premiums (New Crop Opportunities Center 2009), bringing higher profitability to producers on what is typically considered a necessary, but not highly profitable enterprise. Organic winter squash commands consistently high organic price premiums, averaging 50% - 250% of than conventional wholesale prices nationally (NewFarm 2010, Bomford 2011). However, organic production of these crops faces significant challenges, specifically in regards to weed and insect pest control. Organic farmers cite weed control as one of the major hindrances to bringing organic crops to market and to farm profitability (Walz 2004). As with most organic crops, weed control in sweet corn and winter squash is typically accomplished through cultivation. Adequate weed control in sweet corn can be difficult to achieve (Diver et al. 2001), and in winter squash production requires precision to avoid damage to shallow root systems (Bachmann 2003). In addition to limiting yields, competition with weeds has been shown to weaken cucurbit and corn plants and make them more susceptible to insect damage (Delate et al. 2002, Wright et al. 2009, respectively).

In this work, winter squash and sweet corn were selected as ‘model’ crops, as they represent both a transplanted (winter squash) and direct-seeded (corn) crop, therefore techniques developed for each type of crop could be extrapolated to other widely-spaced specialty crops. The weed management focus of this work was designed to achieve weed control through shallow, high residue cultivation. Insect pests were controlled with crop-specific treatments targeting the chief economic pests of each crop; corn ear worm and European corn borer in sweet corn, and cucumber beetle and squash bug in winter squash production. Our experimental design allowed us to explore both these main effects of cultivation and pest control methods, as well as the interactions between residue management and organic control techniques on the chief economic pests of both of these specialty crops. This project does not build on previously funded work.

#### **Project Approach**

We studied 3 residue management systems, 2 of which were conservation tillage oriented, and one that conventional tillage treatment utilizing a rotary spader for primary cultivation. During this project we ‘piloted’ the residue management systems in Year 1, growing only the sweet corn crop and focusing on development of low cost tillage implements for medium scale organic farmers. During year 2, we ran the complete experiment with both crops, taking crop yield, weed biomass and soil nitrogen data in both sweet corn (‘Ecstasy’ variety) and winter squash (acorn, ‘Autumn delight’ variety) (Table 1). Each system consisted of 4 replicate plots, arranged in a randomized block design, blocked by crop.

**Table 1.** Description of experimental systems.

System	Cover crop	Weed management	Sweet corn pest	Winter squash pest
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	management		management	management
<b>No till</b>	Roller crimped	Hand cultivation	a) Low spray (direct application of Bt using Zea-later) b) Traditional foliar spray of Bt	a) Low spray (row cover) b) Traditional spray (organic pyrethrin)
<b>Minimum tillage</b>	Flail mowed	High residue sweep cultivator, hand cultivation	Same as above	Same as above
<b>Conservation tillage</b>	Flail mowed	High residue sweep cultivator, hand cultivation	Same as above	Same as above

All systems included a rye/vetch winter cover crop, sown at a rate of 100 lbs/acre rye and 20 lbs/acre vetch. Cover crops were terminated when the vetch was 75% flowering and the rye was in a “soft dough” stage. We had good synchrony between the maturation of the rye and vetch, which meant that both cover crops could be terminated relatively readily using a flail mower or roller crimper. Cover crop biomass samples were taken on 5/23/2011, sorted into functional groups of rye, vetch and weeds, dried, weighed and homogenized on a mill for future nutrient analysis. Cover crops were terminated approximately 2 weeks prior to planting when the vetch reaches flowering stage. The cover crop in the Min-till and Spaded systems was flail mowed, and was “rolled” with a Buffalo Rolling Stalk Chopper in the No-till Rolled system. This resulted in a high residue, low disturbance soil environment on the soil surface, and incorporated into the soil in the Spaded system.

An organic granular fertilizer (Harmony Brand 5-4-3) was broadcast by hand in each plot at a rate of 120 lbs/acre for the sweet corn and 100 lbs/acre for the winter squash. Winter squash transplants were grown according to USDA Organic Standards and hand transplanted into the field at approximately 4 weeks of age on 6/3/2011. Prior to planting, kaolinitic clay (Surround) was applied to the plant foliage to deter insect pests. Immediately after planting, insect barrier row cover was installed over wire hoops in low-spray treatments. Sweet corn was direct seeded with a John Deere Maximerge 4-row seeder with 30” spacing between rows at a 31,000 seeds per acre rate (approximately 8” within row spacing) on 6/5/2011. Soils were sampled for inorganic nitrogen (ammonium and nitrate) approximately every 10 days, beginning immediately following fertilizer application.

Crops were harvested in early August, 2011. Sweet corn yields were sampled by collecting 10 ears randomly from the middle 2 rows per plot. Yield data included ear size (width and length), degree of pest damage (inches of damage to tip of ear), and whether the crop was marketable. Given the sprawling nature of squash plants and the difficulty in isolating individual plants, all fruits were harvested from each plant rooted in the plot. Squash fruits were weighed, measured and assessed for pest damage.

## **Significant results and accomplishments**

### *Sweet corn results*

The presence of pests in organic sweet corn ears was relatively high for wholesale market conditions. However, much of this damage was the presence of a corn earworm in the ear, which according to our grading, rendered this ear “unmarketable.” Insect presence was significantly greater in the conventionally tilled treatments ( $p < 0.0001$ ), and was not significantly affected by pest control treatments (Table 2). One hypothesis for the increased pest presence in conventionally tilled treatments can be related to the increased “apparency” of the corn plants in these plots. We had better weed control in the conventionally tilled treatments, which rendered the plants more apparent to insect pests as compared to those in “weedier” conservation tillage treatments.

**Table 2.** Pest presence in sweet corn ears in no till, minimum tillage, and conventional tillage (spaded) treatments. \* indicates values that are not significantly different.

Treatment	% With Insect Present
Minimum Tillage	55.7*
No Till	59.7*
Spaded	91.1

Although conservation tillage treatments had significantly fewer pests present, ears were also significantly smaller than ears in conventionally tilled treatments in both length and weight ( $p < 0.0001$ ).

**Table 3.** Corn ear weight and length by tillage regime. \* indicates values that are not significantly different.

	Average of Corn Wt. (g)	Average of Corn Length (cm)
Mintill	142.0	14.5*
Notill	158.9	14.5*
Spaded	198.4	16.9

From our results in this pilot study, we conclude that conventionally tilled treatments yield significantly larger ears, approximately 1” on average. However, decreased pest pressure in conservation tillage treatments justifies further exploration of the mechanism behind this decreased pressure. We did not find significant differences between the mechanisms of application of Bt, nor were the interactions between tillage and pest management significant.

### *Winter squash results*

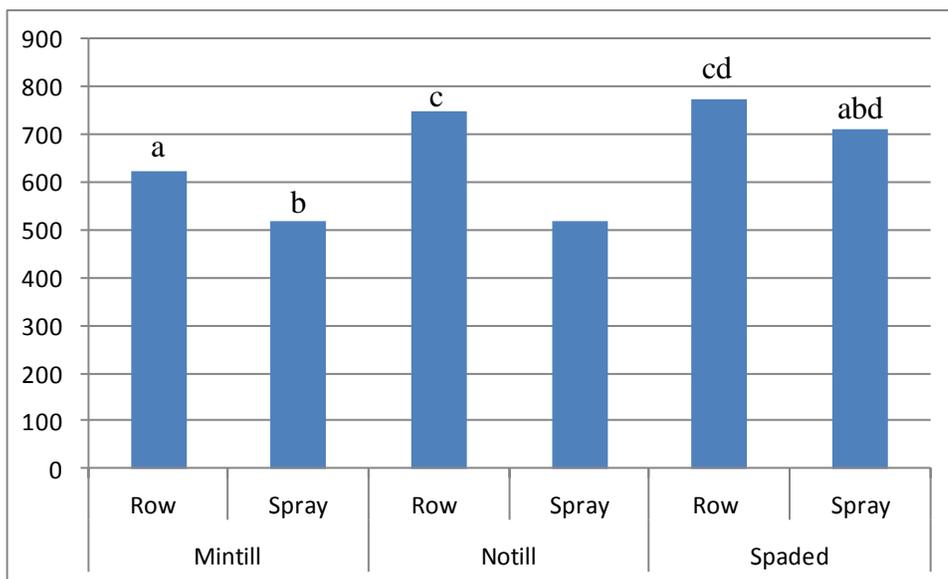
Across all treatments, nearly 72% of all organic winter squash fruits were free of pest damage, and would be marketable for direct marketing (farmer’s markets, etc.). There were significant main effects of tillage ( $p < 0.001$ ), pest control method ( $p < 0.0001$ ), and the interaction between these two ( $p = 0.0214$ ) on squash fruit weight. Overall, squash in the conventionally tilled treatments were larger, likely due to decreased weed pressure during the early season (Table 4). Overall, despite increased weed pressure under row covers in the mid- to late-season, fruit weights were significantly greater across all row covered treatments (Table 4).

**Table 4.** Winter squash fruit weights as influenced by tillage and pest control strategies.

Main Effect	Average Squash Weight (g)
<b>Tillage Regime</b>	
Minimum tillage	570.97
No tillage	648.73
Conventional tillage	741.00
<b>Pest Control</b>	
Spray	589.81
Row Cover	718.45

The significant interactions between tillage regime and pest management were driven by poor yield performance in conservation tillage treatments without row covers (the sprayed treatments) (Figure 1). These plots experience both early season soil compaction relative to the tilled treatments, and were exposed to squash bugs and cucumber beetles throughout the season, and were sprayed with the organically-approved pyrethrin spray as the only means of pest control.

**Figure 1.** Average weight of acorn squash fruit in no till, minimum tillage, and conventional tillage (spaded) with low spray (row cover) and spray-intensive pest management treatments. Treatments sharing letters are not significantly different.



### **Conclusions and recommendations**

This project builds upon a history of high-residue, organic research systems that have been developed for agronomic crops in the Northeast. We have developed some promising tools and insights from this project as to how to minimize soil disturbance and costly inputs in organic farming systems. However, we were never totally satisfied with the weed control in these systems. In the sweet corn, cultivation was limited to prior to the V6 – V8 stage, which was as long as we had clearance on our high clearance tractor. Similarly, it was unrealistic to cultivate while winter squashes were under row cover prior to anthesis (that is, it is unlikely a mid- to large-scale grower would remove the row covers, cultivate, and re-cover). Thus, weeds were allowed to grow without cultivation until row covers were removed. Thus, we were not particularly satisfied with any combination of these treatments. However, components of each system appear promising, and we are incorporating them into additional conservation tillage work on the Organic Farming Unit.

We have concluded that on our soils, which often harbor heavy weed pressure, in these systems the combination of cultivation techniques that controlled weeds best was primary cultivation at least around the seed/transplant bed, with early, somewhat frequent high residue cultivation. Thus, we have used this work to inform our efforts to “optimize” conservation-oriented systems, and have refined our focus, in large part due to this and affiliated work. To alleviate the inconsistent germination we are exploring strip tillage systems, as well as exploring living mulches as a way to suppress weeds using living biomass in both conservation and conventional tillage systems.

### **Goals and Outcomes Achieved**

This project consisted of 2 years of field research, the first as a pilot year (due to funding delays), and the second as a full study of both a direct-seeded and transplanted organic crop. We collected yield and soil data, and perhaps more meaningful, determined what components of the system were sufficiently efficacious to warrant further use and study. The details of these components and their benefits and shortcomings are detailed further in the “Lessons Learned” section of this document. Actual accomplishments that were proposed and completed include development of high residue cultivation equipment that is scaled to the medium- to large-scale grower, including a high residue cultivator and rotary hoe. These implements were tested in a systems context, in combination with insect pest control treatments in both a transplanted and direct-seeded crop. We collected yield, weed biomass and soil inorganic nitrogen data in Year 2. We had proposed to conduct this study over 2 years. However, we experienced a funding delay in Year 1, as well as delays in implement building at the UK Horticulture Research Farm. Thus, we used the preliminary year as a pilot year using sweet corn as a model. The results from Year 2 were used to inform other conservation tillage work at the UK HRF. We originally proposed to create enterprise budgets of each of these systems. However, given these 2 years were essentially establishment years with a steep “learning curve” on operating the equipment efficiently, we did not feel confident in using labor or input data as representative of the true costs and benefits of these systems. This enterprise budget data *is* being collected for future work that this pilot study has informed.

The results of the project were not published or disseminated. Due to the delays in funding, we were not able to purchase a key piece of equipment and perform the necessary modifications until Year 2 of the project. Therefore, we only had 1 year of data with both crops, and the PI found the level of weed control and fruit quality to be unacceptable to disseminate to farmers, and the lack of replication to be a critical flaw for publication purposes. However, this work has informed the experimental design of a current project using conservation tillage and living mulches to accomplish the same project goals in regards to weed control and soil quality (conservation tillage systems for diversified organic farms).

### **Lessons Learned**

As mentioned above, we gained valuable knowledge and experience with various components of these systems, in particular, with the high residue cultivation implements. We were not convinced the rotary harrow was consistently efficacious for early season weed control. In fact, the conditions in which this implement afford good control of germinating early season weeds are quite specific (weeds must be thread-stage), and dependent on soil moisture (this implement will not work well in wet soils). Thus, for our wet springs, we found this tool that is used widely in organic conservation systems in other parts of the east is not an ideal tool for the heavy, wet soils on our site. Based on our results, we will continue to use the high residue cultivator in both conventional and conservation tillage systems on the Organic Farming Unit, using the nitrogen and yield data in particular as a basis of comparison with other conservation tillage systems. Similarly, the Zealator and row cover insect control treatments offered promising results, and will be used when crop and labor conditions warrant use of these

techniques. We had proposed to use a high residue rotary hoe to “blind cultivate” under the residue in the early growing season. However, the greatest outcome of this work was how this systematic project shifted our thinking about conservation tillage in organic farming systems.

Even with the selection of corn varieties that were tolerant of cool soils, we experienced inconsistent germination in the conservation tillage systems. To alleviate this issues, we are exploring strip tillage systems for direct seeded crops. We are also exploring living mulch systems as a way to suppress weeds using living biomass to compete with weeds, rather than strict cultivation approaches in both conservation and conventional tillage systems.

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**Final Financial Report**

The final financial summary report is detailed by category in Table 5. Specific details on materials and supplies are detailed in Table 6.

**Table 5.** Final financial summary report, 2009-2011.

<b>GRANT FUNDS RECEIVED</b>	<b>\$20,000</b>
<b>GRANT FUND EXPENDED</b>	<b>\$20,006.81</b>
<b>TOTAL REMAINING</b>	<b>-\$6.81</b>
<b>LINE ITEMS</b>	
<b>SALARIES/ WAGES</b>	\$ 13,837.94
<b>BENEFITS</b>	\$ 1293.76
<b>TRAVEL</b>	\$0.00
<b>EQUIPMENT</b>	\$0.00
<b>SUPPLIES</b>	\$ 2875.11
<b>CONTRACTUAL</b>	\$0.00
<b>F&amp;A</b>	\$2000.00
<b>TOTAL</b>	<b>\$20,006.81</b>

*We would like to request a budget change to redirect funds to student labor to complete the significant amount of weeding and soil sampling associated with this work, for a total of 13,837.94 for Salaries, and the Associated \$1,293.76 Fringe Benefits. This shift in funding categories is made possible by reducing the Supplies budget to \$2,875.11 from the requested amount of \$10,500. We were able to acquire a used*

rotary hoe for a cost significantly lower than the budget estimate, and worked with the manufacturer to modify the implement for high residue conditions.

Please reference the attached proposal, which was submitted as a revised budget due to negotiations between the sponsor and the UK Office of Sponsored Programs on May 25, 2010. This budget indicated that the Final Budget approved by the sponsor (KDA) for the sub-award included Indirect Costs.

<i>Cost</i>	<i>Approved Budget</i>	<i>Final Budget</i>	<i>Budget Change</i>	<i>% Budget Change</i>
<i>Salaries</i>	\$9,000	\$13,837.94	\$4,837.94	24.2%
<i>Benefits</i>	\$0	\$1,293.76	\$1,293.76	6.5%
<i>Supplies</i>	\$10,500	\$2,875.11	(\$7,624.89)	38.1%
<i>Other</i>	\$500	\$0.00	(\$500.00)	2.5%
<i>Indirect</i>	\$0	\$2,000	\$2,000.00	10.0%

**Table 6.** Detailed materials and supplies expenses.

<b>Date</b>	<b>Vendor Name</b>	<b>Amount</b>	<b>Description/Purpose</b>
4/19/2010	Vincennes Tractor	750	Yetter rotary hoe- used
4/13/2010	Yetter	1376.8	Min-till attachment arms for rotary hoe
5/1/2010	7 Springs Farm	300	Bt and fertilizer, row covers, row cover material
2/20/2011	Seedway	70.45	Seeds
3/22/2011	lowes	9.92	Wire Brush for cleaning rotary hoe
5/8/2011	Seedway	51	Ecstasy II sweet corn (10M)
4/18/2011	Arbico Organics	20.07	Lady beetles for greenhouse
5/19/2011	Fisher Scientific	45.69	HCl for extractions
5/11/2012	Fisher Scientific	251.18	KCl for extractions
Total Materials and Supplies		2875.11	

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## Project 5b: Mowing of Primocane Blackberries to Manage Stink bugs Organically

### 1. Project Summary

The purpose of this project was to develop environmentally sound agricultural insect pest management practices that allow certified organic production of high value primocane-fruiting blackberries to reduce pesticide inputs and increase biodiversity.

Primocane fruiting blackberries produce a niche-market crop for Kentucky growers from late summer until frost. This type of blackberry fruits on current-season canes (primocanes). The commercially available primocane-fruiting blackberry varieties, 'Prime-Jim<sup>®</sup>', 'Prime-Jan<sup>®</sup>', and 'Prime-Ark 45' have been released by the University of Arkansas. All previous blackberry varieties are floricanes-fruiting, thus the canes must be overwintered for fruiting the second year. This new type of blackberry can produce more than one "crop" per year, having the potential for the normal summer crop (floricane) and a later crop on the current season primocanes. Thus, this multi-cropping blackberry type is very attractive to farmers or CSAs and Farmers' Markets. These primocane fruiting blackberries flower and fruit from late summer until frost, depending on temperatures, plant health, and the location in which they are grown. Primocane-fruiting blackberry selections can be pruned by mowing the canes down in the late-winter; this also provides anthracnose, cane blight and red-necked cane borer control without pesticides. Primocane fruiting blackberries have been grown successfully at the Kentucky State University Research Farm since 2006 using methods that comply with NOP standard.

Stink bugs (Hemiptera: Pentatomidae *Euschistus spp.* and *Acrosternum hilare*) have become insect pests of organic blackberries in Kentucky and the surrounding region (Johnson and Lewis, 2005). Brown, one spotted, green, and other species of stink bugs cause damage directly by feeding on blackberry drupelets discoloring fruit and imparting foul odors. Producers have set very low tolerance levels for presence of insects or damage to meet consumer demand for blemish and insect-free blackberries. Populations of these insects have not been studied in Kentucky and the number of generations per year has not been quantified. Damage has been noted often, but not quantified under controlled conditions.

Managing insect pests infesting blackberries presents serious challenges to small and organic farmers. Concerns about product efficacy, timing, impact on beneficial insects, the environment, social factors, and economics determine which pest management system is selected by growers. Methods of control that have little or no environmental impact, reduce worker exposure to potentially harmful pesticides, leave no residues toxic to wildlife, humans, or beneficial insects yet are highly effective against pest species are increasingly important in fruit production systems. Results of this research will enable growers to utilize more sustainable pest management systems that are economical, socially responsible, environmentally friendly, and support NOP goals.

### 2 Project Approach

In June 2006, a blackberry variety trial was established at Kentucky State University (KSU). Plants of the primocane-fruiting blackberry cultivars 'Prime-Jim<sup>®</sup>' and 'Prime-Jan<sup>®</sup>' (both thorny erect, primocane-fruiting) were planted at the KSU Research and Demonstration Farm, in Frankfort, KY. Plants were arranged in a completely randomized design, with 3 plots, including 5 plants of each cultivar per treatment combination in a 3 m plot. Rows were spaced 4.3 m apart. This trial was managed with organic growing practices following the National Organic Program standards. Weed control was achieved by hand weeding.

#### Summarized Activities 2010

Three meter plots either of 'Prime-Jim<sup>®</sup>' or 'Prime-Jan<sup>®</sup>', were initially mowed to ground level on March 30-31, 2010 (control). Three replicate plots of each variety were then either mowed once on May 24 (treatment 1) or mowed on May 24 and then again on July 6 (treatment 2). Percent flowering canes, number of ripe fruit per plot and berry damage assessment were determined weekly. Stink bugs were sampled weekly by hand picking them from blackberry bushes and with 15 cm x 15 cm yellow sticky traps. Data collection began on May 24 and ended on October 6, 2010.

Mowing in May delayed flowering by approximately 3 weeks in both 'Prime-Jim<sup>®</sup>' and 'Prime-Jan<sup>®</sup>' plants. When primocanes were mowed in March (control) in either variety, ripe fruit production peaked between 10-15 weeks after mowing. When primocanes were mowed in May (treatment 1) in either variety, ripe fruit production peaked between 13-18 weeks after mowing. Average fruit weight for ripe fruit for control and treatment 1 was 1.8 and 0.7 g/fruit, respectively, for 'Prime-Jim<sup>®</sup>' and for control and treatment 1 was 2.7 and 1.6 g/fruit, respectively, for 'Prime-Jan<sup>®</sup>' plants. Mowing primocanes in July (treatment 2) for either variety delayed growth and primocanes did not flower. Extremely hot summer and fall temperatures coupled with drought conditions starting in August and extending into the fall, likely negatively impacted all treatments, especially plots that were mowed in May and July.

Stink bug species caught during the study period were the brown stink bug, *Euschistus servus*; one spotted stink bug, *E. variolarius*; green stink bug, *Acrosternum hilare*; twice stabbed, *Cosmopepla lintneriana*; rice, *Oebalus pugnax*; and the red shouldered stink bug, *Thyanta custator*. The brown stink bug was the most abundant species caught followed by the green stink bug and rice stink bug with 38%, 17% and 15% of the total number captured, respectively. One spotted and twice stabbed stink bugs each accounted for 14% of the total stink bugs caught. The red shouldered stink bug represented less than 3% of the total number caught. Stinkbugs were found throughout the sampling period. Almost all ripe fruit, approximately 70%, harvested from both cultivars showed some feeding damage on berry drupelets. Average number of damaged drupelets on ripe fruit for control and treatment 1 was 1.7 and 0.9 drupelets/fruit, respectively, for 'Prime-Jim<sup>®</sup>' and for control and treatment 1 was 2.7 and 2.4 drupelets/fruit, respectively, for 'Prime-Jan<sup>®</sup>' plants. Stink bugs may not have been the only insect feeding on the ripe fruit; Japanese beetles and June beetles were also noted in the plantings. Yellow sticky traps were not a satisfactory method of sampling stink bugs in blackberries. Earlier treatment mowing dates may be required for optimal fruit production and stink bug management.

### Summarized Activities 2011

The same plots of primocane-fruiting blackberry cultivars 'Prime-Jim<sup>®</sup>' and 'Prime-Jan<sup>®</sup>', was selected as the study site at the Kentucky State University Research and Demonstration Farm in Frankfort, Kentucky. A completely randomized design of 3 plots with 5 plants of each cultivar per treatment was used. Each plot was 3 m and the rows were 4.3 m apart. The plots were managed in 2011 with organic growing practices following the National Organic Program standards. Weed control was achieved by hand weeding and using a weed eater. Three replicate plots of each variety were mowed on April 6 (Control). Treatment 1 mowing occurred on June 24. Stink bugs were sampled weekly by hand collecting from blackberry bushes. We used hand collecting stink bugs in each plot and Florida Stink Bug Traps to quantify stink bugs. Traps were placed in each cultivar treatment and were emptied weekly from July 11 to September 29. Stink bugs were identified, counted and the results were tabulated.

Stink bugs were found across treatments during the 2011 sampling period which extended from July 11<sup>th</sup> until September 29<sup>th</sup>. Five stink bug species were identified during the period of fruit ripening in the planting. The green stink bug was the most abundant, followed by rice stink bug and then brown, twice stabbed and one-spotted stink bugs at 53%, 16%, 11%, 11% and 11%, respectively. Brown marmorated stinkbug is a new invasive pest in Kentucky; however, this species was not identified in the planting this year. Both visual inspection and hand collection of stink bugs, as well as the use of the Florida Stink Bug Traps, resulted in the capture of stink bugs. Although hand collecting required more time, more than twice as many stink bugs were captured compared to the stink bug trap, at 68% and 32%, respectively. Populations of stink bug species may vary year to year and affect management decisions; therefore, this study will be repeated again next year.

### Summarized Activities 2012

The same plots of primocane-fruiting blackberry cultivars 'Prime-Jim<sup>®</sup>' and 'Prime-Jan<sup>®</sup>' were used as the study site at the Kentucky State University Research and Demonstration Farm in Frankfort, Kentucky. A completely randomized design of 3 plots of each cultivar replicated 3 times was used. Each plot was 3 m and the rows were 4.3 m apart. The plots were managed in 2012 with organic growing practices following the National Organic Program standards. Weed control was achieved by hand weeding and using a weed eater. Three replicate plots of each variety were mowed on March 21. Subsequent mowing was not performed due to the negative impact of multiple mowings on blackberry growth and fruit set in 2011.

We used visual inspection and hand collecting stink bugs in each plot and Florida Stink Bug Traps to quantify stink bugs weekly in blackberry bushes. Visual and hand collection began May 21 and ended October 1, 2012. Florida stink bug traps were deployed June 4, 2012 and checked weekly from June 11 through October 1. Stink bugs were identified, counted and the results were tabulated.

Stink bugs were found in both 'Prime Jan<sup>®</sup>' and 'Prime Jim<sup>®</sup>' in the 2012 sampling period which extended from May 21<sup>st</sup> until October 1<sup>st</sup>. Four stink bug species were identified during the period of fruit ripening in the planting. The red shouldered stink bug was the most abundant, followed by the twice stabbed stink bug, brown and green bugs at 46%, 23%, 20%, and 11%, respectively. Brown marmorated stinkbug, however, was again not identified in the planting this year. Both visual inspection and hand collection of stink bugs, as well as the use of the Florida Stink Bug Traps, resulted in the capture of stink bugs. Although hand collecting required more time, more than six times as many stink bugs were captured compared to the stink bug trap, at 86% and 14%, respectively. Populations of stink bug species vary year to year and may cause serious damage. Therefore, we will continue to monitor stink bug incidence in blackberry plantings.

Dr. Kirk Pomper (KSU Horticulture Program) and Dr. Michael Bomford (KSU Organic Sustainable Program) both assisted with experimental design and statistical analyses of data. Each periodically supplied personnel for plot maintenance and management.

### 3 Goals and Outcomes Achieved

The overall goal of this project was to develop a biologically based and sustainable insect pest management strategy for organic blackberry growers. The objectives were to 1) identify pest stink bug species in organically produced blackberries, 2) quantify life history attributes such as seasonal abundance and number of generations per year, and 3) quantify reduction in fruit damage by stink bugs through several different primocane mowing regimes to delay blackberry flowering and fruiting, as well as reduce weed pressure.

We were able to identify and quantify relative and seasonal abundance of stink bugs in organically produced blackberries in Franklin County, Kentucky. Over the course of the three summers we found the brown stink bug, *Euschistus servus*; one spotted stink bug, *E. variolarius*; green stink bug, *Acrosternum hilare*; twice stabbed, *Cosmopepla lintneriana*; rice, *Oebalus pugnax*; and the red shouldered stink bug, *Thyanta custator*. However, we did not find all species in each year. The most abundant stink bug species varied among years. The brown stink bug was the most abundant species caught in 2010. In 2011 the green stink bug was most abundant and during 2012 the red shouldered stink bug was the most common species caught.

The greatest number of stink bugs were captured during the first year of the study (2010) before the decline of the blackberry stand which was apparently due to the severe management regimes of mowing. We did not find brown marmorated stink bugs present in any of the three years even though it has been found in neighboring counties. These results suggest continued monitoring is necessary in order to make accurate and timely recommendations for management.

Trapping with Florida stink bug traps was not an effective means of capturing stink bugs in both 2011 and 2012. Hand collecting and counting was a much better means of quantifying stink bugs, but took significantly longer to perform. Overall low numbers of stink bugs were caught in each of the three years of the study. This suggests that in times of severe heat and draught that a more sensitive method of stink bug capture be implemented or



Figure 3. 2010.

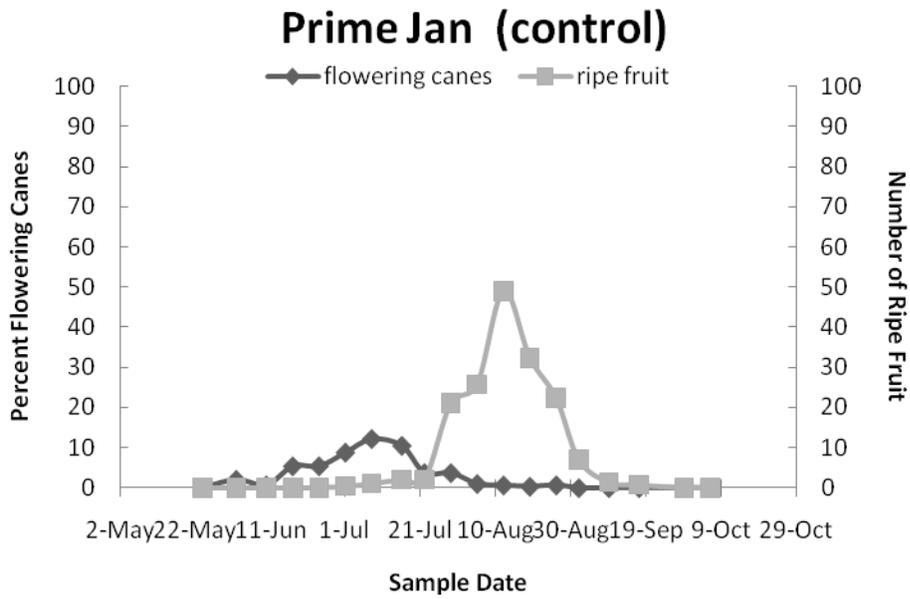


Figure 4. 2010.

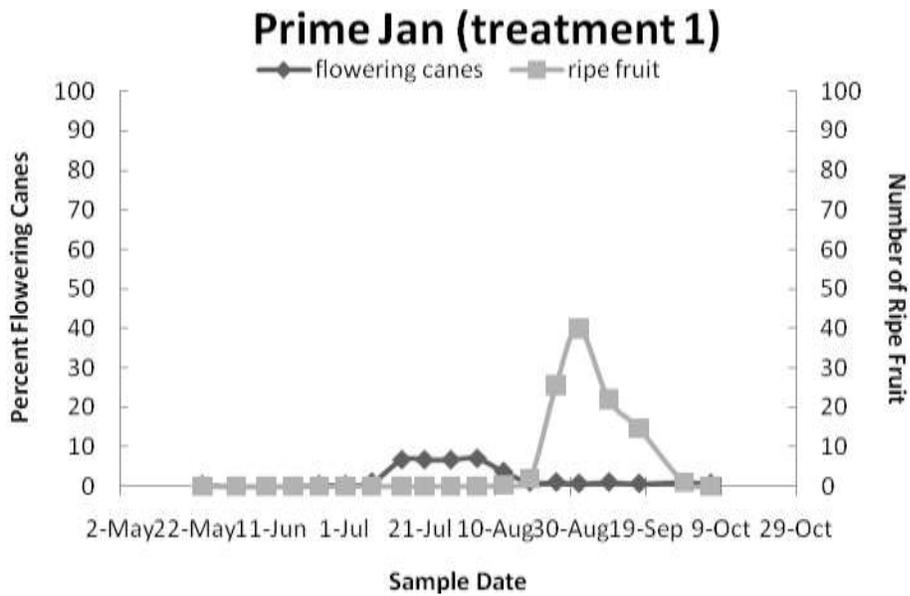


Figure 1. 2011.

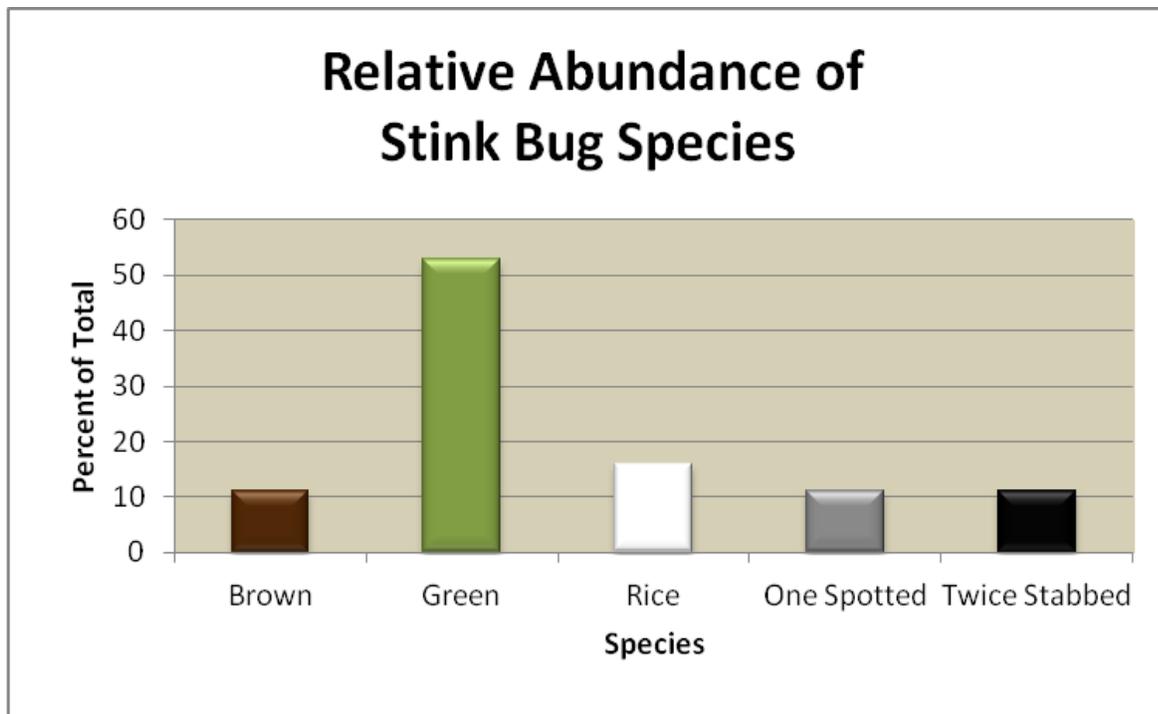


Figure 2. 2011.

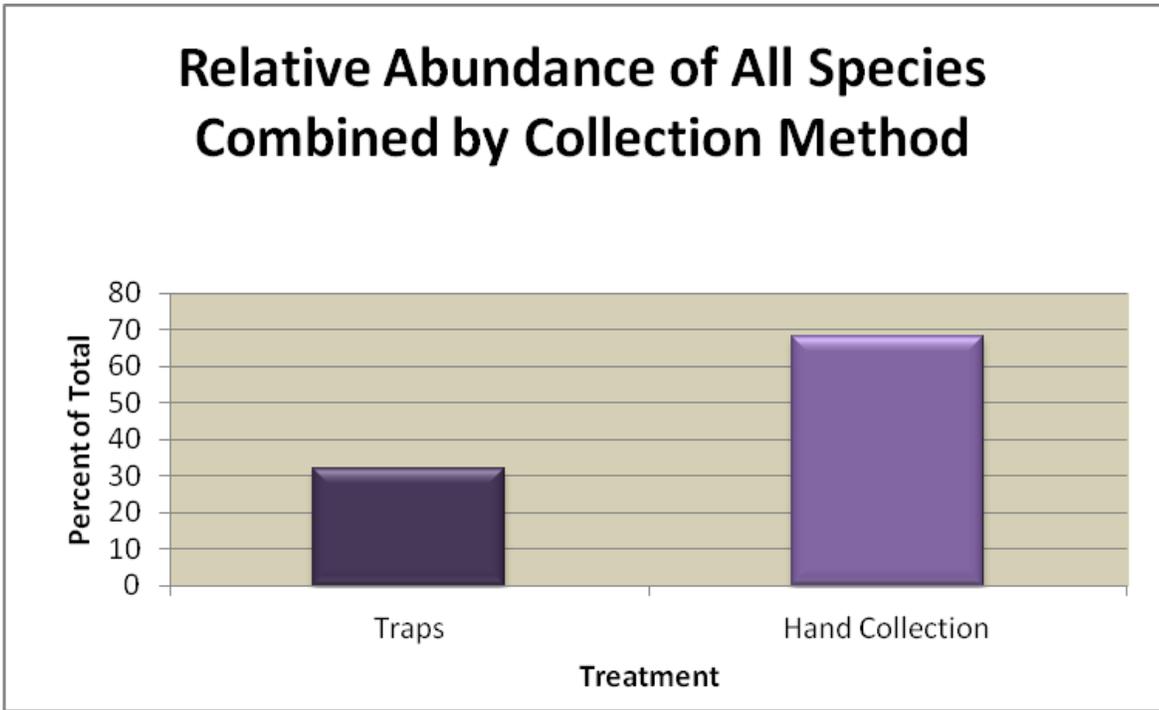


Figure 1. Relative abundance of stink bug species 2012.

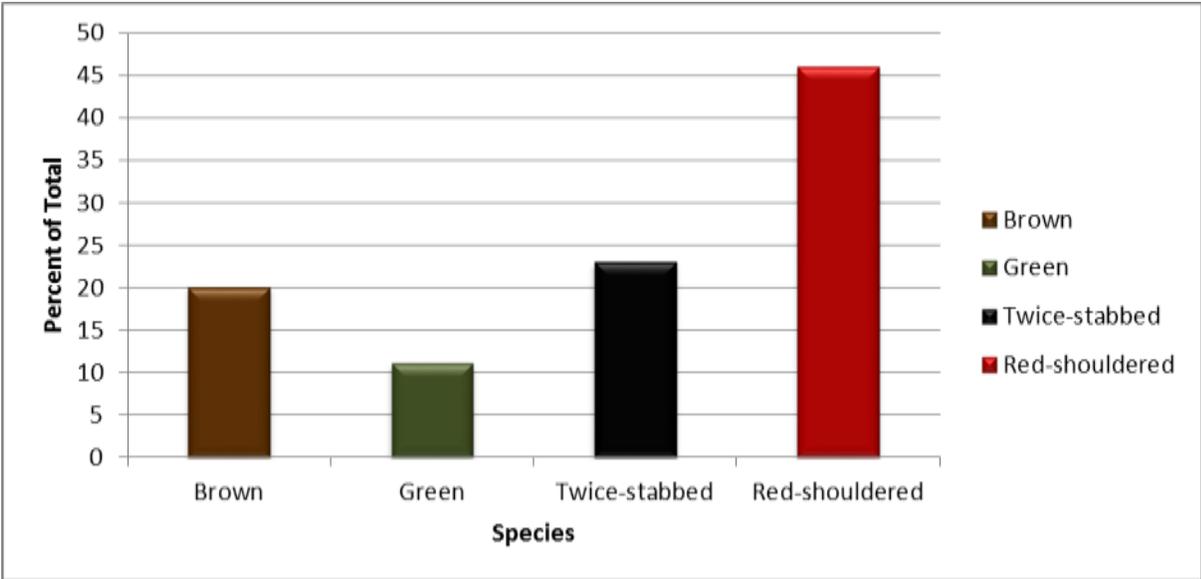
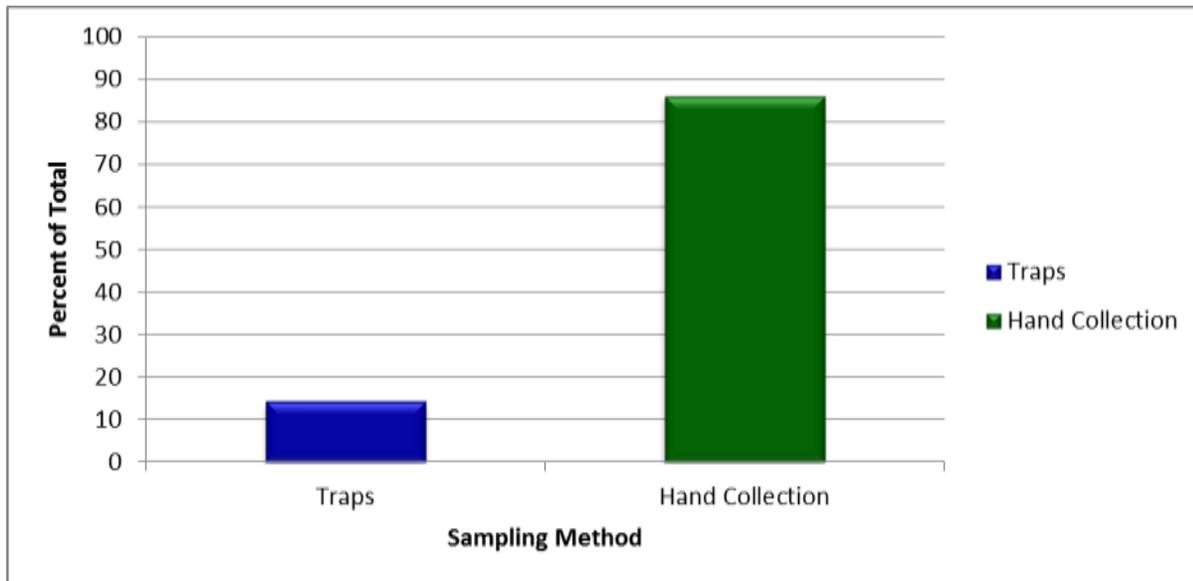


Figure 2. Relative abundance of all species combined by sampling method during 2012.



**Results were published in:**

*Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. (Distributed to: 470 in 2010; 538 in 2011; 611 in 2012: available on line at UK Horticulture Dept.)*

*Annual Posters at the Capitol. Abstract Book (Frankfort, KY). (average annual attendance 450; abstracts available on line).*

*Journal of the Kentucky Academy of Science (distributed to 2,125 in 2010; 2,155 in 2011; and 2,400 in 2012)*

**Presentations were made at the following scientific meetings:**

*Kentucky Academy of Science (direct contact 60 in 2010; 70 in 2011 and 60 in 2012)*

*Annual Posters at the Capitol. Frankfort, KY (average direct contact per year 20)*

*Entomological Society of America Annual Meeting. Reno, NV (direct contacts 8, indirect contacts 35)*

*The Association of Research Directors 16<sup>th</sup> Biennial Research Symposium. Atlanta, GA. (direct contacts 40 )*

*Kentucky Horticulture Society Meeting, Lexington, KY (estimated direct contacts 150)*

**Presentations at Extension Meetings/Field Days:**

*Kentucky State University Small Limited Resource Minority Farmers Conference, Frankfort, KY 196 in 2010; 209 in 2011; 211 in 2012*

*Kentucky State University Third Thursday Sustainable Agriculture Workshop, Frankfort, KY*  
July 2010, 60 direct contact  
July 2011, 30 direct contact  
July 2012, 45 direct contact

*Agriculture, Food and Environment Day at Kentucky State University's Agriculture Research and Demonstration Farm*  
April 24, 2012; 326 High School Students

### **Publications**

Sedlacek, J.D., K.L. Friley, K.W. Pomper, J.D. Lowe, S.B. Crabtree, I. Howard and M. K. Bomford. 2012. *Incidence of Stink Bug Species in Organically Grown 'Prime Jan' and 'Prime Jim' Blackberry Plantings in Central Kentucky. The University of Kentucky 2012. Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. (In press.)*

Sedlacek, J. D., K. L. Friley, K.W. Pomper, J. D. Lowe, S.B. Crabtree, and M. K. Bomford, 2011. *Stink Bug Incidence in Primocane-fruiting Blackberry Selections in Kentucky. The University of Kentucky 2011 Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. PR-626: 19–20.*  
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Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, M.L. Grayson-Holt, C.M. Wales, and R.S. Hayden. 2011. *Will Mowing of Primocane-fruiting Blackberries Affect Fruit Ripening? J. Kentucky Acad. Sci. 72: 118.*

Grayson-Holt, M.L., J.D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M.K. Bomford and S.B. Crabtree. 2011. *Stink Bug Species in Organic Blackberries. Annual Posters at the Capitol Abstract Book, p. 47.*

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Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, S.B. Crabtree, and M.K. Bomford. 2010. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections in Kentucky. *J. Kentucky Acad. Sci.* 71: 105.

Grayson-Holt, M.L., J. D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M. K. Bomford, C.M. Wales, R.S. Hayden, and S.B. Crabtree. 2010. Stink Bug Species Associated with Organic Blackberry Production in Kentucky. *Journal of the Kentucky Academy of Science.* 71: 105.

### **Presentations**

Howard, I., Sedlacek, J.D., K.L. Friley, K.W. Pomper, J.D. Lowe, M.K. Bomford and S.B. Crabtree. 2012. Incidence of stink bugs in organically grown 'Prime Jan' and 'Prime Jim' blackberries in Central Kentucky. *Kentucky Academy of Science.* Richmond, KY.

Grayson-Holt, M., J.D. Sedlacek, K.L. Friley, K.W. Pomper, and J.D. Lowe. 2012. Stink bug species in organic blackberries. *Annual Posters at the Capitol.* Frankfort, KY

Friley, K.L., J.D. Sedlacek, M. L. Grayson-Holt, K.W. Pomper, J.D. Lowe and M.K. Bomford. 2011. Stink bug species associated with organic blackberry production in Central Kentucky. *Entomological Society of America Annual Meeting.* Reno, NV.

Friley, K.L., J.D. Sedlacek, K. W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, M.L.Grayson-Holt, C.M. Wales and R.S. Hayden. 2011. Will mowing of primocane-fruiting blackberries affect fruit ripening? *Annual Meeting of the Kentucky Academy of Science.* Murray, KY.

Grayson-Holt, M.L., J.D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, C.M. Wales and R.S. Hayden. 2011. Stink bug species in organic blackberries. *Annual Meeting of the Kentucky Academy of Science.* Murray, KY.

Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, S.B. Crabtree and M.K. Bomford. 2011. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections in Kentucky. *The Association of Research Directors 16<sup>th</sup> Biennial Research Symposium.* Atlanta, GA.

Grayson-Holt, M.L., J. D. Sedlacek, K. L. Friley, K. W. Pomper, J. D. Lowe, M. K. Bomford, C. M. Wales, and R. S. Hayden. 2011. Stink Bug Species Associated with Organic Blackberry Production in Central Kentucky. *The Association of Research Directors 16<sup>th</sup> Biennial Research Symposium.* Atlanta, GA.

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Wales, C.M., J.D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M. Grayson-Holt, R. Hayden. 2011. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections in Central Kentucky. *Annual Posters at the Capitol.* Frankfort, KY.

*Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, and S.B. Crabtree. 2010. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections. Annual Meeting of the Kentucky Academy of Science. Bowling Green, KY.*

#### **4 Beneficiaries**

Ecologically based insect pest management has the potential to reduce input costs, decrease reliance on insecticides and nonrenewable resources, increase biodiversity, and obtain premium prices for agricultural commodities. However, as farmers attempt to establish alternative agricultural enterprises, a major constraint to adoption of organic and more sustainable practices is the lack of research-backed information on ecologically based insect pest management and control strategies, especially for high value fruit crops. Some pesticides with NOP certification can increase production input costs making cultural pest management approaches particularly attractive to organic growers. Development of organic methods to reduce stink bug damage in blackberries and increase the number and quality of marketable fruit will increase profits for organic growers and likely attract additional conventional growers to transition to organic and more sustainable production practices.

The stink bug species caught and the general low numbers of them mean that continued monitoring and scouting is necessary in order to enact the best IPM management tactics.

#### **5 Lessons Learned**

We anticipated that stink bugs would be more abundant than they were during this study and did not anticipate that a different species of stink bug would be dominant in each year of the study. We also anticipated finding brown marmorated stink bugs in the blackberry plots but did not.

The mowing regimes to alter berry set were too severe resulting in stand decline.

Overall, determining the species of stink bugs present and their relative abundance is beneficial to blackberry growers in Kentucky. Results also point out the importance of regular IPM scouting and vigilance.

#### **6 Contact Person**

- Name the Contact Person for the Project- John D. Sedlacek
- Telephone Number- (502) 597-6582
- Email Address- john.sedlacek@kysu.edu

#### **7 Additional Information**

##### Publications

Sedlacek, J.D., K.L. Friley, K.W. Pomper, J.D. Lowe, S.B. Crabtree, I. Howard and M. K.

Bomford. 2012. Incidence of Stink Bug Species in Organically Grown 'Prime Jan' and 'Prime Jim' Blackberry Plantings in Central Kentucky. The University of Kentucky 2012. Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. (In press.)

Sedlacek, J. D., K. L. Friley, K.W. Pomper, J. D. Lowe, S.B. Crabtree, and M. K.

Bomford, 2011. Stink Bug Incidence in Primocane-fruited Blackberry Selections in Kentucky. The University of Kentucky 2011 Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. PR-626: 19–20.

<http://www.ca.uky.edu/agc/pubs/pr/pr626/pr626.pdf>

Sedlacek, J. K. Friley, K. Pomper, J. Lowe, S. Crabtree, and M. Bomford. 2010. The Influence of Primocane Mowing Date on Flowering, Ripening, and Stink Bug Populations on Primocane-fruiting Blackberry Selections in Kentucky. The University of Kentucky 2010 Fruit and Vegetable Research Report. University of Kentucky College of Agriculture, Lexington, KY. PR-608: 24-25. <http://www.ca.uky.edu/agc/pubs/pr/pr608/pr608.pdf>

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Grayson-Holt, M.L., J.D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, C.M. Wales and R.S. Hayden. 2011. Stink Bug Species in Organic Blackberries. J. Kentucky Acad. of Sci. 72: 118-119.

Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, M.L. Grayson-Holt, C.M. Wales, and R.S. Hayden. 2011. Will Mowing of Primocane-fruiting Blackberries Affect Fruit Ripening? J. Kentucky Acad. Sci. 72: 118.

Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, S.B. Crabtree, and M.K. Bomford. 2010. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections in Kentucky. J. Kentucky Acad. Sci. 71: 105.

Grayson-Holt, M.L., J. D. Sedlacek, K.L. Friley, K.W. Pomper, J.D. Lowe, M. K. Bomford, C.M. Wales, R.S. Hayden, and S.B. Crabtree. 2010. Stink Bug Species Associated with Organic Blackberry Production in Kentucky. Journal of the Kentucky Academy of Science. 71: 105.

#### Presentations

Howard, I., Sedlacek, J.D., K.L. Friley, K.W. Pomper, J.D. Lowe, M.K. Bomford and S.B. Crabtree. 2012. Incidence of stink bugs in organically grown 'Prime Jan' and 'Prime Jim' blackberries in Central Kentucky. Kentucky Academy of Science. Richmond, KY.

Grayson-Holt, M., J.D. Sedlacek, K.L. Friley, K.W. Pomper, and J.D. Lowe. 2012. Stink bug species in organic blackberries. Annual Posters at the Capitol. Frankfort, KY

Friley, K.L., J.D. Sedlacek, M. L. Grayson-Holt, K.W. Pomper, J.D. Lowe and M.K. Bomford. 2011. Stink bug species associated with organic blackberry production in Central Kentucky. Entomological Society of America Annual Meeting. Reno, NV.

Friley, K.L., J.D. Sedlacek, K. W. Pomper, J.D. Lowe, M.K. Bomford, S.B. Crabtree, M.L. Grayson-Holt, C.M. Wales and R.S. Hayden. 2011. Will mowing of primocane-fruiting blackberries affect fruit ripening? Annual Meeting of the Kentucky Academy of Science. Murray, KY.

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Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, S.B. Crabtree and M.K. Bomford.

2011. Timing of Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections in Kentucky. The Association of Research Directors 16<sup>th</sup> Biennial Research Symposium. Atlanta, GA.

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Friley, K.L., J.D. Sedlacek, K.W. Pomper, J.D. Lowe, and S.B. Crabtree. 2010. Timing of

Primocane Mowing Influences Flowering and Ripening Time in Primocane Fruiting Blackberry Selections. Annual Meeting of the Kentucky Academy of Science. Bowling Green, KY.

8 Final Financial

Unspent funds encountered in undergraduate this project during 2011 and 2012.

GRANT FUNDS RECEIVED	\$ 20,000.00
GRANT Fund EXPENDED	\$ 10,405.68
TOTAL REMAINING	\$ 9,594.32
Line Items	
SALARIES/ WAGES	\$ 5,845.78
BENEFITS	\$ -----
TRAVEL	\$ 2,342.35
EQUIPMENT	\$ _____
SUPPLIES	\$ 1,180.67
CONTRACTUAL	\$ _____
other	\$ 1,036.88
TOTAL	\$ 10,405.68

Report

reflect the difficulty attempting to hire students to work on the summers of

## **Project 5c: Organic Pest Management In Kentucky Vineyards**

### **1. Summary**

The Kentucky wine grape industry was once one of Kentucky's top crops prior to prohibition. During prohibition, the vineyards were all but burned to the ground and Kentucky farmers set about producing tobacco.

Over the past eight years, Kentucky vineyards have become more prominent and in greater demand due to the 65+ wineries that have been established in the state. The importance of buying Kentucky grapes has been placed on the wineries by their consumers and their own desires to support the local economies and producers.

Because of the demand for more organic production methods in specialty crops and grapes, the University of Kentucky found it paramount to provide research to growers on organic pest management. Also, at this juncture of Kentucky renewing its focus on grape production, any type of research that can be done regarding the reduction of pests is helpful to the entire industry, not only those that are interested in organic production.

### **2. Approach**

Vineyard Establishment consisted of spading the vine row, while allowing natural vegetation to serve as a ground cover in the row middles. Vines and trellis were established in the spring of 2011.

Vine training, irrigation, and fertilization were the same for both the Organic and Conventional blocks in both 2011 and 2012.

Herbicides were used to control weeds in the Conventional block. Two applications of Glyphosate were applied as an in-row banded spray to the conventional block in both May and July. In order to prevent the herbicide spray from contacting the vine foliage; grow tubes were applied around each vine immediately before spraying, and were then removed the following day. In the Organic block weeds were controlled using mechanical tillage (Weed Badger). Five tillage passes per year were required to adequately control weeds directly under each vine row of the Organic block. Although more passes were required to control weeds in the Organic block, this block did not require the application or removal of grow tubes used in the Conventional block, thus resulting in a significant savings in both labor and materials required to control in-row weeds. Mechanical cultivation generally provided a more uniform and pleasing appearance; with the weed control provided by the herbicide application looking both scorched and less uniform in appearance. Due to appropriate vine vigor, fertilization was not necessary in either the conventional or organic grape planting.



Conventional Weed Control – using herbicide



Organic Weed Control- using mechanical tillage

Between treatment blocks there were few differences in vine vegetative vigor when considering either average shoot length or average number of nodes per shoot in 2011; however the number of laterals, cane diameter, and internode length appeared to be slightly higher for vines in the Organic block. All but the strongest cane developed during the 2011 season was pruned away in March of 2012 with this cane serving as the newly established vine trunk. The average length of the newly established trunk measured nearly 43 inches after dormant pruning of both the Organic and Conventional blocks.

Differences in vine vigor were more apparent during the 2012 growing season with Organically treated vines appearing to have significantly higher vigor than the vines in the Conventional block. This increase in vine vigor allowed for nearly full establishment of the fruiting wire for the Organic block, while many vines in the Conventional block failed to completely fill the same space. The difference in vine vigor can likely be attributed to the effectiveness of the mechanical weed control as compared to the herbicide control used in the conventional block. Improved vine vigor and vine size during vineyard establishment may result in a potentially larger yield during the third growing season and a sooner return on the investment of vineyard establishment.

Fungicides were applied prophylactically to the Conventional vines according to the protocols established in the Midwest Commercial Small Fruit and Spray Guide (3). No significant occurrence of foliar diseases was observed in the Organic block; therefore no fungicides were applied to these vines in either 2011 or 2012. This suggests that the need for preventative fungicide sprays may not be warranted during the first two years of vine establishment of the

disease resistant cultivars grown in this experiment. Reductions in the number of applied pesticide sprays required during vineyard establishment could be a significant financial incentive for farmers who may be considering the considerable costs of vineyard establishment.

This study has shown the potential advantages of using Organic production practices during establishment of disease resistant cultivars adapted to the climate of Kentucky. Although there was a limited need for fungicide application to treat common foliar diseases during the current experiment the biggest challenge moving forward with Organic vineyard production will be the control of foliar and fruit diseases of a mature vine that will express a much larger canopy.

**Table 1.** A comparison of vine vigor characteristics between conventional and organically established vineyard blocks.

<b>Treatment</b>	Shoot Length (inches)	Total No. Nodes	No. of Laterals	Cane Diameter (mm)	Internode Length (cm)	Internode Length (cm)
Conventional	42.5	27.7	3.4	6.4	5.2	5.0
Organic	45.2	25.3	4.2	6.9	5.3	5.2

All project partners significantly contributed to the overall success of this project. The University of Kentucky took the appropriate measures to successfully fulfill the research needs of this project. In addition the University of Kentucky and the Kentucky Vineyard Society (KVS) collaborated to disseminate preliminary results of this projects through the UK/KVS Viticulture Field day that was held at Acres of Land Vineyard and Winery in 2011 and the UK Horticulture Research Farm in 2012. In 2012 growers were able to tour and interact with both the conventional and organic grape planting. In addition, both the organic and conventional grape planting have been used as learning tools for students in the Sustainable Agriculture Program.

### **3. Goals and Outcomes Achieved**

*Each summer the Kentucky Vineyard Society and the University of Kentucky collaborate to hold a technical Viticulture Field Day. In 2011 the annual Field Day was held at Acres of Land Vineyard and Winery and in 2012 the Field Day was held at the University of Kentucky Horticulture Research Farm. The total attendance was 65 attendees in 2011 and 85 attendees in 2012. Although most attendees were vineyard and winery owners and/or workers, there were approximately 15 attendees that were simply interested in the Kentucky grape and wine industry at the 2011 and 2012 Field Day. In 2012 all growers had the opportunity at the Field Day to tour both the conventional and organic plantings. All growers in attendance toured the conventional planting where a presentation was given and were given information about the organic replication across the farm. The organic planting is within view from the conventional planting and was pointed out to all growers. Due to distance limitations and feasibility of transporting all growers across the farm, individual groups of growers were given the opportunity to be transported to the organic grape planting via passenger van after the meeting had concluded. Over the course of the project timeline approximately 20 individual growers have been given the organic grape planting tour. Most of these growers made direct contact to the UK Viticulturist with the specific*

*request to tour the organic grape planting and acquire information on the feasibility of organic grape production in Kentucky.*

#### 4. Benefactors

This project was established to help define methods to organic grape production in Kentucky. Although the outcomes were not as expected with the respect to fungicide use, this did not alter the potential impact that the results obtained will have on the grape and wine industry. Although a fungicide program will need to be developed in the coming years, the use of fungicides in the first two years is an unexpected positive result. Vineyard establishment is the foundation for a successful vineyard. Developing cost efficient methods that reduce the amount of chemicals used in the vineyard as well as improve vine health will affect the sustainability of any vineyard venture. This project succeeded in providing this information to the industry.

#### Lessons Learned

Contrary to the expected outcome, the organic grape planting did not need to be controlled for foliar diseases through the use of fungicides. Because of this, an organic spray protocol was not developed. Although the original expected outcome of developing such a protocol was surprisingly not met, invaluable information was acquired about non-chemical weed management and vine vigor. In addition, such measures can be used in both organic and conventional grape plantings suggesting that as a whole, herbicide use can be decreased in the vineyard and successful weed management can be achieved.

#### Final Budget

\$13,120.30 of the requested \$20,000 has been expended. Due to surprising project outcomes \$6,879.70 of the total requested was not expended. It was anticipated that disease control would require continuous vineyard scouting as well as the purchase of organic pesticides. Because fungicides were not necessary in the first two years of production the funds requested in this area were not expended.

<b>GRANT FUNDS RECEIVED</b>	<b>\$ 20,000</b>
<b>GRANT FUND EXPENDED</b>	<b>\$ 13,120.30</b>
<b>TOTAL REMAINING</b>	<b>\$ 6,879.70</b>
<b>LINE ITEMS</b>	
<b>SALARIES/ WAGES</b>	\$ 1,597.50
<b>BENEFITS</b>	\$ 94.90
<b>TRAVEL</b>	\$ 2,384.01
<b>EQUIPMENT</b>	\$
<b>SUPPLIES</b>	\$ 7,851.13
<b>CONTRACTUAL</b>	\$
<b>OTHER</b>	\$
<b>TOTAL</b>	<b>\$ 13,120.30</b>

## **Project 5d: Effectiveness and financial feasibility of two integrated pest management systems for organic potato production in Kentucky**

### **2. Project Summary**

The purpose of this project was to evaluate the effectiveness and financial feasibility of different integrated pest management systems for organic potato production in Kentucky. Potatoes are a popular and highly nutritious vegetable, but organic production can be challenging and risky for farmers. Not only are market prices relatively low, generating only a marginal return on investment, but yield losses to pests can be substantial if not managed effectively. Losses to annual weed competition, Colorado potato beetle (*Leptinotarsa decemlineata*), early blight (*Alternaria solani*) and late blight (*Phytophthora infestans*) can be devastating. We evaluated and compared different systems for producing organic potatoes and assessed their financial viability. Plastic mulch was the most financially viable means of suppressing weeds and protecting soil. Floating row covers were too cumbersome to use and only marginally effective at protecting plants from Colorado potato beetle. Spinosad was effective for suppressing this pest. Wet soil conditions and disease were the most challenging hurdles to organic potato production over the two years. Resistant cultivars and well-drained soils appear to prerequisites for organic production.

### **3. Project Approach**

In 2011, two potato cultivars were grown in the trial under two organic production systems. Both systems used 6-ft wide beds under white plastic mulch with two rows of potato planted per bed (2 ft between rows, 1 ft within rows). One system also used floating row covers as a possible barrier to Colorado potato beetle. Two production systems which did not use beds and plastic mulch were lost several days after planting due to severe rains and flooding. Among the four production-system-cultivar combinations only one had gross returns above variable costs at conventional market prices of \$0.75/lb: 'Désirée' grown without floating row cover had a slim positive net return (gross returns minus variable costs). The conventional market price was used because these potatoes were grown in transitional organic land and many were sold to institutions at the wholesale price of \$0.50 per lb. while the remainder was sold through a farmers market for \$1.00 per lb. At the typical local, certified organic, retail market price of \$2.00/lb the 'Désirée' would have had a

reasonable net return of \$6,000-10,000 per acre (not including fixed costs) even at the relatively low yields obtained in this trial (Table 1). By contrast, 'Peanut' produced very poor yields, apparently due to diseased seed tubers, and would have been a financial loss even at certified organic prices (Table 2). The results also suggest that the row cover did not provide sufficient protection to the potatoes to justify their cost and use. In fact, yields of both cultivars under row covers were about 70% of those without the covers. So it appears that the row covers are not only marginally effective at reducing CPB, at best, they also inhibit potato growth.

After concluding from our 2010 field trial that floating row covers were: 1) not effective in preventing Colorado potato beetles from accessing the plants; 2) cumbersome to put on and hold down, resulting in high labor costs, and 3) made weed management difficult, we decided to discontinue their use in 2011. Instead, we added a straw mulch treatment, which was suggested by a reviewer. The goal in 2011 was to determine which mulch system, plastic or straw, would be most cost effective. The plastic system relied on making raised beds and installing plastic mulch and drip tape prior to planting. Bed preparation was done with a tractor-mounted bed shaper and plastic-mulch layer but the seed potatoes still had to be planted by hand. Seed potatoes in the other two systems (straw mulch and bare ground) were planted in a furrow and hilled later in the season.

Although the plastic-mulch system had positive net returns after all variable costs were subtracted, the economic performance of all three systems was poor. The most important factor was the extremely low yields due to saturated soil conditions and disease. None of the yields generated in this study would sustain a farming operation. And the marketability of the harvested potatoes was low due to charcoal rot in all three systems and greening and rodent damage in the plastic mulch system.

#### 4. Goals and Outcomes Achieved

Our goal was to determine the best insect pest and weed management system for commercially producing organic potatoes on a small farm in this region. In contrast to our expectations, in both years (2010 and 2011) neither insect pests nor weeds were the most important limiting factor. Instead, it was excessive water and disease pressures. And only the potatoes grown on raised beds with plastic mulch produced any reasonable market yield under those conditions. But yields in this system were still very low, and given the high costs of inputs, especially labor, we can only conclude that under these conditions organic potato production is risky and that the returns will be marginal.

#### **5. Beneficiaries**

The Berea College Farm is an educational laboratory and students studying agriculture interact with or are exposed to all projects, including this one. Thus dozens of students who will be future farmers and agricultural professionals were able to gain first-hand knowledge

about the challenges of organic potato production. In addition, over 1,000 individuals visited the farm on educational tours during the two years of this study. Many of them visited the study site or heard the details of the study. We are prepared to give oral or poster presentations based on the study at the meetings of the Organic Association of Kentucky and/or the Kentucky Fruit and Vegetable Conference.

## **6. Lessoned Learned**

Although the challenges were different than anticipated we learned several lessons. First, to avoid the wet conditions of spring we'll plant in the summer for a fall harvest. We'll also use a field with demonstrably better drainage that has been under organic management for a longer period of time. This, we hope, will also reduce our disease pressures and ensure good fertility. We may evaluate different cultivars for suitability and disease-resistance but our options are limited by organic certification. Based on our experiences over the two years, we are confident in relying on Entrust (spinosad) for suppressing CPB numbers if they exceed the economic threshold. However, we may need to invest in a tractor sprayer if production is scaled up beyond an acre. We also feel that the cultivating tools in our arsenal are sufficient to effectively manage weeds with or without plastic mulch. The use of straw mulch seems cost prohibitive due to the expense of purchasing the material as well as for labor to apply it. Using straw mulch in 2011 did not save us any cultivations and resulted in no yield increase in comparison to bare soil. The mulch can't be applied until after hilling, so its role in weed suppression is limited; however, it has value as a soil amendment as well and that could be factored into the analysis. Straw mulch could be viable if a more costeffective means of applying it were available. Labor costs for planting and harvesting are also high and should be given consideration. At the scale of an acre to a few acres per year it isn't possible to justify high capital investments in planting and harvesting equipment, yet the high labor demands of doing without that equipment may be too costly as well.

## **7. Contact Person**

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## **8. Additional Information**

Figures and tables with the data were presented in the two annual reports. Consult those for details.

## 9. Final Financial Report

<b>GRANT FUNDS RECEIVED</b>	<b>\$20,000</b>
<b>GRANT FUND EXPENDED</b>	<b>\$20,109</b>
<b>TOTAL REMAINING</b>	<b>\$0</b>
<b>LINE ITEMS</b>	
<b>SALARIES/ WAGES</b>	<b>\$10,480</b>
<b>BENEFITS</b>	<b>\$2,620</b>
<b>TRAVEL</b>	<b>\$1,075</b>
<b>EQUIPMENT</b>	<b>\$0</b>
<b>SUPPLIES</b>	<b>\$3,184</b>
<b>CONTRACTUAL</b>	<b>\$0</b>
<b>OTHER</b>	<b>\$2,750</b>
<b>TOTAL</b>	<b>\$20,109</b>