



# Mississippi Department of Agriculture and Commerce

## Specialty Crop Block Grant Program-Farm Bill FY2010

**Final Performance Report  
Agreement # 12-25-B-1077  
Submitted 1-28-2014  
Revised 3-24-2014  
Approved 3-24-2014**

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## Introduction

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The Mississippi Department of Agriculture and Commerce (MDAC) was awarded \$293,555.29 in funding for the Specialty Crop Block Grant Program (SCBGP) in November 2010. MDAC has partnered with six organizations to implement twelve projects to enhance the competitiveness of specialty crops throughout the state. The Final Report for the projects, "Conducting High Tunnel Construction Workshops in Mississippi," implemented by Mississippi State University was completed in addition to "Educational Beekeeping Programs 2011-2013" implemented by the Mississippi Beekeepers Association; these final reports were submitted and approved in the Second Annual Report. The project "Public Relations Campaign to Promote Buying Local Specialty Crops" implemented by Farm Families of Mississippi was previously submitted and approved in the First Annual Report.

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## OFF-SEASON PRODUCTION OF BLUEBERRIES

### Project Summary

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There is a highly profitable market for blueberries in the off-season from September through mid-May. Fruit is currently imported into the United States from the southern hemisphere at extremely high prices during this time period. High tunnel production of blueberries represents an opportunity for Mississippi growers to expand production into this time frame.

Naturally, blueberry plants need to undergo a yearly cycle of summer vegetative growth and flower bud development, winter chilling, followed by flowering, and fruiting in spring and early summer. However, unique blueberry cultivars from the breeding programs of University of Florida and the USDA show promise for production in the off-season. These cultivars have exhibited the ability to flower and fruit with exposure to a reduced chilling period (low-chill). 'Low-chill' plants have been bred to require a low amount of exposure to temperatures 45 °F and below, and have therefore met their chilling requirements by late December - January. Once this chilling requirement has been met, plants growing in a high tunnel could be forced into bloom by closing up the tunnel and allowing the temperature to build up naturally. By forcing the plants into an earlier bloom date, the harvest period would occur earlier in the season. The primary goal of this project is to move the harvest into the period where market prices are at their highest peak.

By bringing blueberries into an earlier production season would allow growers:

- 1) To have additional income at premium prices. On April 13, 2009 blueberries were selling at \$37 for a flat of 12, 4.4 oz. cups. By May 13, when early season blueberries in Mississippi were being harvested, the price had dropped to \$24 a flat.
- 2) To help maintain or capture market share. Once a grower is established in an early market, vendors will often continue to purchase from them even when other sellers become available.
- 3) To save their crop in the event of frost. Early and mid-April frosts in 2008 and 2009 reduced blueberry yield in Mississippi by 30 – 100%

The request for this project came from one of the largest blueberry grower/shippers in Mississippi – Great Southern Farms in Richton, MS. They were considering the use of high tunnels but wanted more research and information on how they operated and if there would be a real advantage to growing blueberries in the tunnels. They partnered with Mississippi State University Extension Service to conduct this project.

This project did not build upon previously funded SCBGP projects.

## **Project Approach**

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Blueberry plants were planted on February 18, 2011 at Great Southern Farm in Richton, MS. The southern highbush varieties planted were ‘Emerald,’ ‘Star,’ and ‘Rebel;’ ‘Brightwell’ and ‘Alapaha’ were the rabbiteye varieties planted in replicated plots inside with matching plots outside the tunnel. The planting was established before the high tunnel was erected.

In the initial plan of work, only early maturing southern highbush were going to be planted for the study. The grower/cooperator requested that some rabbiteye varieties be included in the trial since they produced greater yields than the southern highbush varieties. His logic was to move the peak yield period of the rabbiteye varieties into a higher price period.

The high tunnel was erected in March 2011 over a three week period using labor supplied by the grower/cooperator. Rainy weather and missing parts caused the protracted erection process. After completion of the high tunnel, the grower/cooperator installed an automatic drip irrigation system. On April 20, 2011, weed-barrier fabric was installed in the plots to reduce weed infestations (Photos 1 & 2).

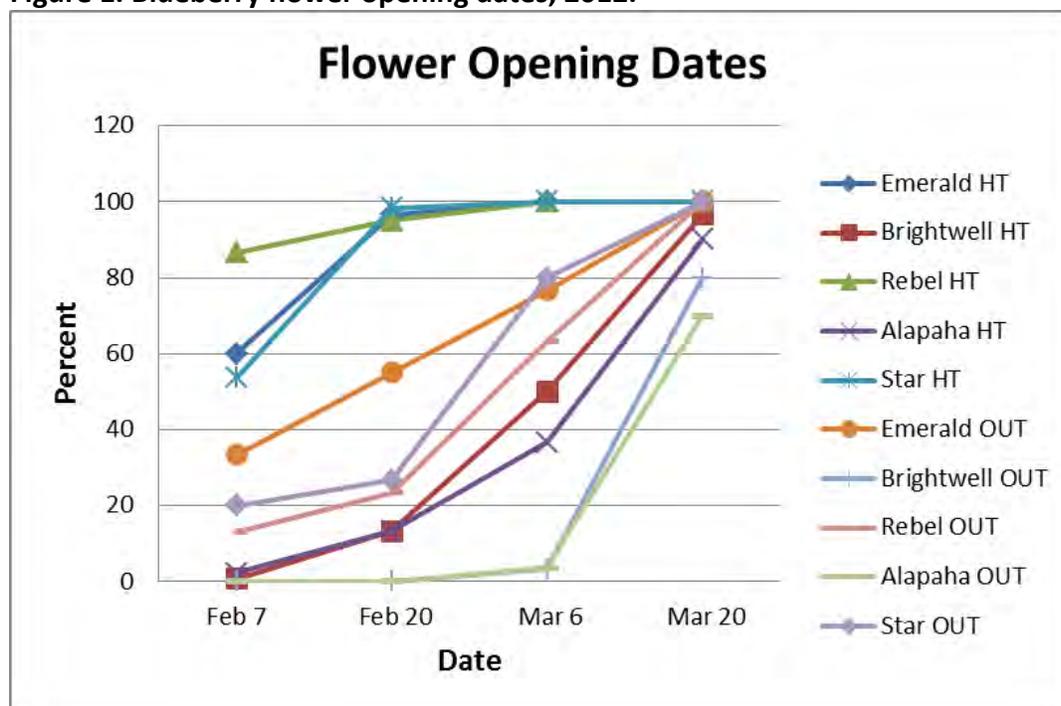
Flowers on the southern blueberries in the high tunnel began opening in early February 2012 (some possibly in late January), even though the sides and ends were open so adequate chilling-hours would accumulate. The grower/cooperator was unaware of the actual date when flowers first began opening. Consequently, when first data was recorded (2/7/12), the southern highbush cultivar, ‘Rebel’ had greater than 80% of flowers open in the high tunnel (Figure 1). Cultivars ‘Emerald’ and ‘Star’ had 55 – 60% open flowers on that date. The rabbiteye cultivars ‘Brightwell’ and ‘Alapaha’ only had a few scattered flowers open at that time.

Due to the unusually mild weather conditions, the southern highbush cultivars outside the high tunnel had open flowers but only about half as many as the plants growing inside the tunnel. Neither of the rabbiteye cultivars outside the high tunnel had flowers open on February 7.

A small hive of bumblebees was purchased and introduced into the high tunnel on February 13, 2012. These were introduced in addition to some native honeybees already pollinating the open flowers. By February 20, 2012, all the southern highbush cultivars in the tunnel were at nearly 100% bloom with small fruit present. Also, by this time the rabbiteye cultivars in the tunnel had begun to open but would not reach 100% opening until about March 20, 2012. 'Alapaha' still had flowers opening after this date.

Outside the high tunnel, Emerald was the most advanced in flowering with over 50% open flowers by February 20, 2012. The southern highbush cultivars did not reach 100% open flowers until March 20, 2012. The rabbiteye cultivars did not achieve 100% open flowers until after March 20, 2012.

**Figure 1. Blueberry flower opening dates, 2012.**



Fruit on the 'Rebel' and 'Star' cultivars started maturing in early April 2012 in the high tunnel but was not noticed by the grower/cooperator until he saw birds feeding on them. Early bird predation destroyed or reduced early yield data on these cultivars. Bird netting was installed in the tunnel to reduce bird predation. Ribbon streamers were also put around the plants outside the tunnel but it was not effective in scaring away birds.

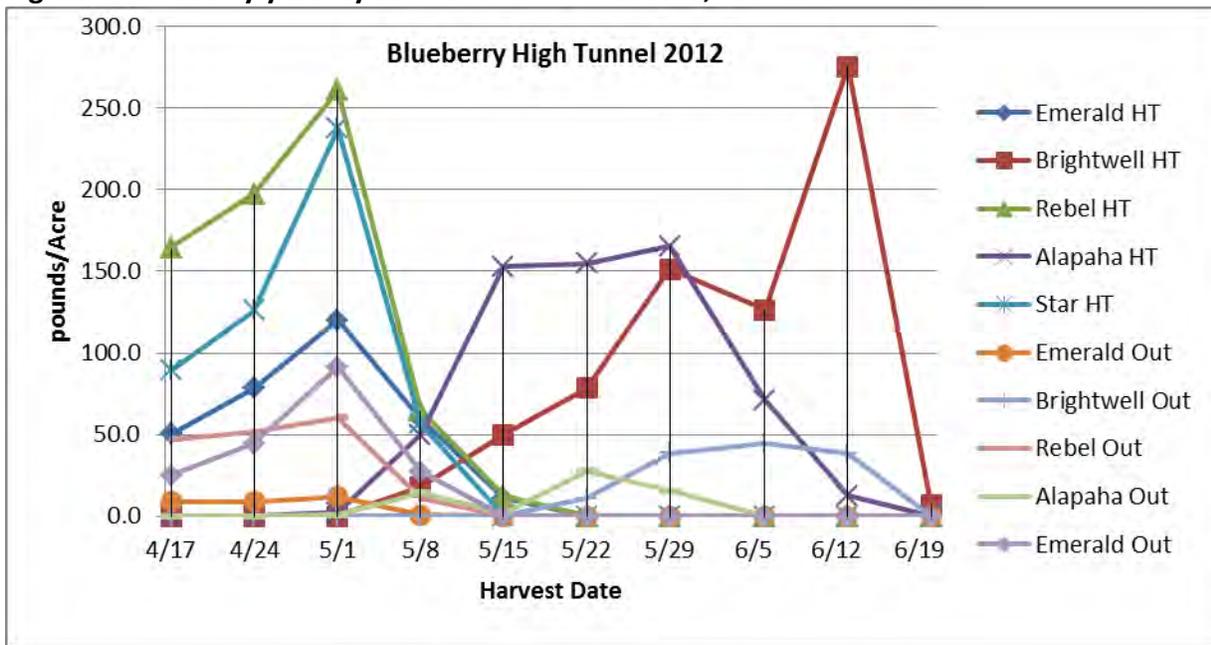
Most of the plants of the 'Emerald' southern highbush variety outside the tunnel died as result of the damage from a late frost, leading to an infection of twig blight and had to be replaced.

The blueberry plots were harvested from mid-April to late June 2012. The data shown in Figure 2 represents the yield per acre by harvest date throughout the growing season. As previously noted, bird predation destroyed a possible earlier harvest of the southern highbush cultivars growing inside the high tunnel. All highbush cultivars were ready to harvest before the rabbiteye cultivars both inside and outside the tunnel. All the southern highbush cultivars matured in the same relative time frame.

Harvest of the 'Alapaha' variety began about the time the highbush varieties ended (5/8/2012). 'Brightwell' was the last variety to be harvested.

Yield of all blueberries grown outside the tunnel was less than those grown inside the tunnel. The plants inside the high tunnel were much more vigorous than those on the outside. Another factor was bird predation. Once the netting was erected for the high tunnel bird predation was eliminated. Although streamers were installed around the blueberry plants outside the tunnel, birds consumed part of the crop.

**Figure 2. Blueberry yield by cultivar and harvest date, 2012.**



One of the goals of this project was to move the harvest date up in the growing season in the high tunnels. The above average temperatures compressed the harvest period of the southern highbush varieties into the first part of April and May both inside and outside the high tunnel (Table 1). All southern highbush varieties had higher yields inside the tunnels in April than similar plots outside the high tunnel.

As seen in Table 1, the rabbiteye varieties produced higher yields in May inside the tunnels rather than outside. This is clearly seen in pounds per acre harvested.

The yield of all varieties of blueberries was advanced inside the high tunnel. There were 5 harvest dates in May 2012, the May 2, 2012 harvest could almost be considered part of April. This would have shifted the amount of blueberries harvested earlier a bit more. Trying to express this by using percent yield by harvest by month does not reflect a clear picture because of late frost damage and bird predation outside the high tunnel.

**Table 1. Blueberry yield percentage by cultivar by month, 2012.**

<b>Cultivar</b>	<b>lb./A April</b>	<b>% Yield April</b>	<b>lb./A May*</b>	<b>% Yield May</b>	<b>lb./A June</b>	<b>% Yield June</b>	<b>Total lb./A</b>
Emerald HT	128	40.3	190	59.7	0	0	318
Emerald Out	18	60.0	12	40.0	0	0	30
Brightwell HT	0	0	297	42.1	409	57.9	706
Brightwell Out	0	0	49	37.3	83	62.7	132
Rebel HT	362	51.7	338	48.3	0	0	700
Rebel Out	99	58.2	71	41.8	0	0	170
Alapaha HT	0	0	525	86.2	84	13.8	609
Alapaha Out	0	0	60	100	0	0	60
Star HT	215	42.3	294	57.7	0	0	509
Star Out	70	37.2	118	62.8	0	0	188

\*There were 5 harvest dates in May 2012.

The price paid for blueberries drops rapidly as the production season advances. The amount paid per flat decreases and the size of the containers in the flat increases. The time of the season that these changes occur vary from year to year. In Table 2, estimated income by months is displayed. For discussion purposes, estimated price changes are on a monthly basis and the numbers used are average prices received by the grower/cooperator. See Table 2 footnotes.

The economic advantage to the southern highbush varieties grown in the high tunnel is magnified (Table 2) for the April harvest when the prices are at their highest. There is also a price advantage for the rabbiteye varieties as more of their yield was advanced into May when prices were still fairly high.

**Table 2. Estimated gross monthly income of blueberries, 2012.**

<b>Cultivar</b>	<b>\$/A April<sup>1</sup></b>	<b>% \$ April</b>	<b>\$/A May<sup>2</sup></b>	<b>% \$ May</b>	<b>\$/A June<sup>3</sup></b>	<b>% \$ June</b>	<b>Total \$/A</b>
Emerald HT	1,024	50.3	1,013	497	0	0	2,037
Emerald Out	144	69.2	64	30.8	0	0	208
Brightwell HT	0	0	1,584	74.4	545	25.6	2,129
Brightwell Out	0	0	261	70.2	111	29.8	372
Rebel HT	2,896	61.6	1,803	38.4	0	0	4,699
Rebel Out	792	67.6	379	32.4	0	0	1,171
Alapaha HT	0	0	2,800	96.2	112	3.8	2,912
Alapaha Out	0	0	320	100	0	0	320
Star HT	1,720	52.3	1,568	47.7	0	0	3,288
Star Out	560	47.1	629	52.9	0	0	1,189

1. Price determined at \$36/flat 6 oz. cups.

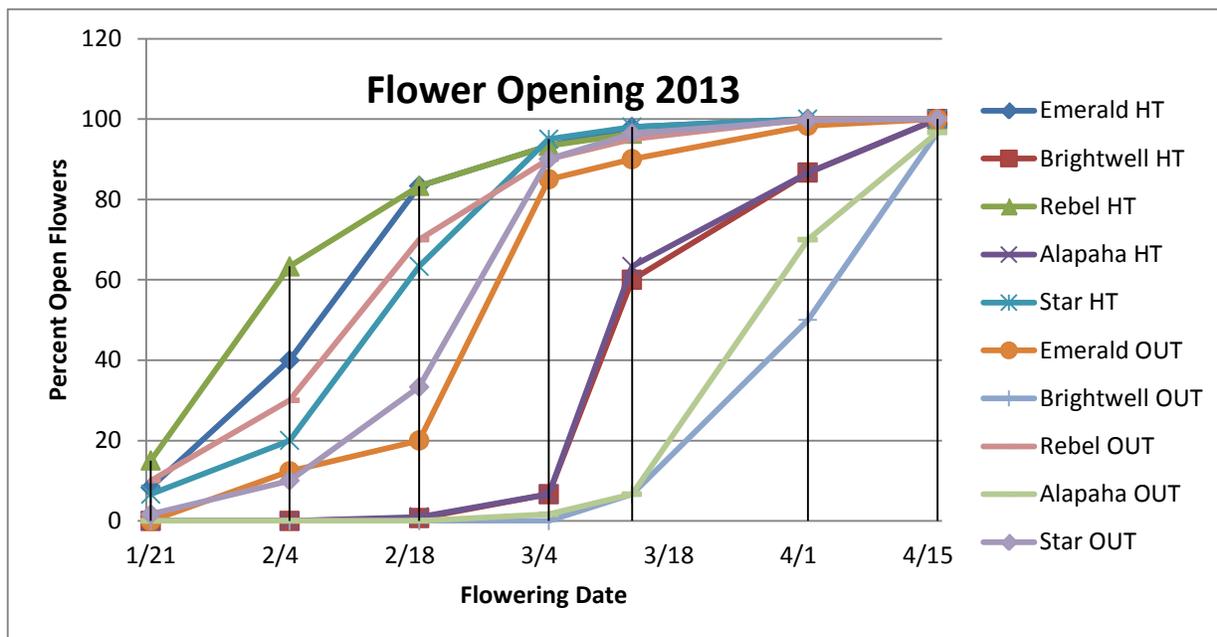
2. Price determined at \$24/flat 6 oz. cups.

3. Price determined at \$16/flat pint cups.

The 2012 – 2013 winter was mild but provided plenty of chill hours for the blueberries. February through March 2013 temperatures were above normal. In the high tunnel, the bloom period was extremely early this year with scattered blooms occurring in late January. A small hive of bumblebees was purchased and introduced into the high tunnel in early February (2/11/13). Flowering of the southern highbush varieties stretched over a 6 – 8 week period (Figure 3). ‘Emerald’ was the earliest blooming followed by ‘Rebel,’ then ‘Star.’

Blooming of the rabbiteye varieties began a month later than the southern highbush varieties and extended over an eight week period. Flowers on plants in the high tunnel opened at a faster rate than on plants outside the tunnel due to higher temperatures inside.

Figure 3. Blueberry flower opening dates, 2013.

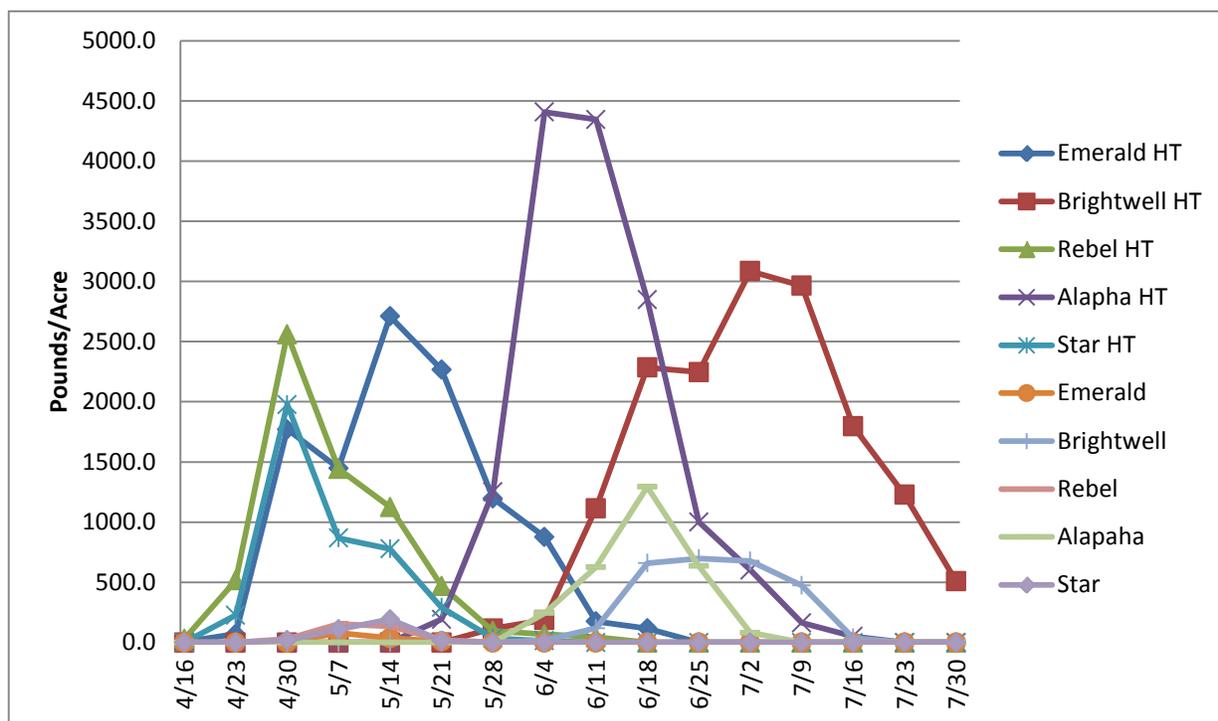


All blueberries inside the high tunnel had good fruit set. The plants outside the tunnel did not due a late season freeze. The grower/cooperator estimated he lost 80 – 90% of the southern highbush fruit in his commercial fields. The southern highbush cultivars inside the high tunnel began April 16, 2013 (Figure 4) and weekly thereafter. ‘Rebel’ was the earliest maturing variety followed by ‘Emerald’ (established 3 – 5 days later), then ‘Star’ a week after ‘Rebel.’

Harvest of southern highbush plots outside the high tunnel began 2 weeks later than in the high tunnel (4/30/13). Most first harvest fruit came off the ‘Rebel’ cultivar. Yields were extremely low due to the late-season freeze. Peak harvest dates for the plants grown inside the high tunnel were also about 2 weeks earlier than the outside plots.

Harvest patterns for the rabbiteye cultivars followed a similar pattern to the southern highbush varieties. Harvest of ‘Alapaha’ inside the high tunnel began 2 weeks (5/21/13 vs. 6/4/13) earlier than similar plots outside. ‘Brightwell’ was only about a week (5/28/13 v 6/4/13) earlier inside the high tunnel compared to plants outside the tunnel. Peak harvest dates followed the same pattern.

**Figure 4. Blueberry yield by harvest date, 2013.**



If you examine harvest pattern by month (Table 3) it is easier to see the shift in southern highbush blueberries grown in high tunnels versus those grown outdoors. For the ‘Emerald’ variety, 17% were harvested in May 2013 compared to none outside the tunnel. The ‘Rebel’ variety had nearly 49% of its total yield in the high tunnel in April 2013 compared to 9% outside. ‘Star’ produced over 50% of its total yield in the high tunnel in April compared to just over 6% outside. High yields in April 2013 are important since that is when the market prices are the highest.

For the rabbiteye varieties, yield of plants grown in the high tunnel were advanced into the month of May 2013 (Table 3); this puts them into a higher price range. Nearly 10% of the total yield of the ‘Alapaha’ variety grown in the high tunnel was harvested in May 2013. ‘Brightwell’ had very light production in May 2013. ‘Brightwell’ might be too late of a maturing variety to consider for use in a high tunnel. It would be more challenging to move it into earlier production.

**Table 3. Blueberry yield by monthly harvest, 2013**

<b>Cultivar</b>	<b>lb./A April</b>	<b>% Yield April</b>	<b>lb./A May</b>	<b>% Yield May</b>	<b>lb./A June</b>	<b>% Yield June</b>	<b>lb./A July</b>	<b>% Yield July</b>	<b>Total lb./ A</b>
Emerald HT	1,846	17.4	7,623	71.6	1,170	11.0	0	0	10,640
Emerald Out	0	0	124	100	0	0	0	0	124
Brightwell HT	0	0	116	0.7	5,832	37.6	9,582	61.7	15,531
Brightwell Out	0	0	0	0	1,494	55.7	1,189	44.3	2,683
Rebel HT	3,108	48.9	3,135	49.3	113	1.2	0	0	6,355
Rebel Out	29	8.6	308	91.4	0	0	0	0	337
Alapaha HT	0	0	1,444	9.7	12,603	84.8	815	5.5	14,861
Alapaha Out	0	0	0	0	2,799	97.2	82	2.8	2,881
Star HT	2,204	52.6	1,973	47.1	13	0.3	0	0	4,190
Star Out	19	5.7	316	94.3	0	0	0	0	335

Similar to the discussion of the economic influence for 2012, Table 4 shows the estimated income by month for 2013. For discussion purposes, the estimated price changes are completed on a monthly basis and the numbers used are average prices received by the grower/cooperator, as was used for 2012.

The result of the freeze in March 2013 on the southern highbush varieties that were outside the high tunnel as previously described in the yield data is highlighted when you look at the economic implications. ‘Emerald’ blueberries suffered a total economic loss for the April 2013 harvest. ‘Rebel’ and ‘Star’ grown outside only produced minor income. Protecting the southern highbush varieties with the high tunnel resulted in significant economic returns in April 2013 when the prices received were highest. This trend continued in the financial returns for May 2013.

The high tunnel advanced the harvesting of the rabbiteye varieties into May 2013 when the prices were good. The plants outside the tunnel produced no income in May 2013.

The economic advantage for high tunnel protection from late season freezes is clearly seen in the data in Table 4.

**Table 4. Estimated gross income by month, 2013.**

<b>Cultivar</b>	<b>\$/A April<sup>1</sup></b>	<b>% \$ April</b>	<b>\$/A May<sup>2</sup></b>	<b>% \$ May</b>	<b>\$/A June<sup>3</sup></b>	<b>% \$ June</b>	<b>\$/A July</b>	<b>% \$ July</b>	<b>Total lb./A</b>
Emerald HT	14,768	25.9	40,656	71.3	1,560	2.7	0	0	56,984
Emerald Out	0	0	661	100	0	0	0	0	661
Brightwell HT	0	0	619	2.8	7,776	35.6	12,776	58.5	21,832
Brightwell Out	0	0	0	0	1,992	55.7	1,585	44.3	3,577
Rebel HT	24,864	59.6	16,720	40.1	151	0.4	0	0	41,735
Rebel Out	232	12.4	1,643	87.6	0	0	0	0	1,875
Alapaha HT	0	0	7,701	30.1	16,804	65.7	1,086	4.2	25,591
Alapaha Out	0	0	0	0	3,732	97.2	109	2.8	3,841
Star HT	17,632	62.6	10,523	37.4	17	<0.1	0	0	28,172
Star Out	152	8.3	1,685	91.7	0	0	0	0	1,837

1. Price determined at \$36/flat 6 oz. cups.

2. Price determined at \$24/flat 6 oz. cups.

3. Price determined at \$16/flat pint cups.

The high tunnel is still in place at Great Southern Farms near Richton, MS. The grower/cooperator will continue to observe growth and production of the blueberry based in the high tunnel.

## Goals and Outcomes Achieved

The goal of this project was to determine cultural practices necessary for the off-season production of blueberries in Mississippi. Specifically MSU wanted to:

- 1) Determine production cycles of fresh market blueberries under high tunnels compared to open-field culture.

This goal was achieved since the above data showed that the harvest dates could be advanced for southern highbush varieties by two weeks and rabbiteye blueberry varieties by one to two weeks ahead of comparable plants grown in open-field culture. This two-week advantage can translate into an economic benefit due to higher early season prices.

2) Identify the most suitable 'low chill' varieties for the early market window.

Of the varieties evaluated in this study, none appeared to have an advantage over another for high tunnel production. However, the southern highbush varieties would be a better choice since they normally produce earlier crops than the rabbiteye varieties. The idea of evaluating the rabbiteye varieties was to push some of their 'higher yield capability' into the early market. This was somewhat achieved but more data is needed to accurately determine this. 'Alapaha' might have responded better than 'Brightwell,' but 'Brightwell' has greater yield potential than most rabbiteye blueberry varieties.

Information was provided to at least 102 growers at the 2011 MS Fruit and Vegetable Grower's Conference and the 2013 North MS Fruit and Vegetable Growers Conference. The project coordinator is continuing to present information from this research project at future meetings. Although a field day was not held, several blueberry growers have visited the site to learn and gather information.

## **Beneficiaries**

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Preliminary information from this project has been presented to at least 102 blueberry growers at Mississippi Fruit and Vegetable Grower's Conference in 2011 and North Mississippi Fruit and Vegetable Growers Conference in 2013. Results from this study are continually being presented to blueberry growers. It is hard to estimate how many people have benefitted as there have been several visits to the high tunnel site to learn and gather information. This site is beneficial so growers can make an informed decision on whether growing blueberries in high tunnels is an option for them.

## **Lessons Learned**

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One important lesson the grower/cooperator learned from this project was that if this high tunnel season extension production was adopted on a commercial scale, he would need a person specially dedicated to management of the high tunnel production system. This was not previously realized; labor was needed to frequently monitor the tunnels and adjust the openings in order to maintain ideal temperatures inside. The benefits of the high tunnel were also seen, including frost protection by the high tunnel and the high yield potential of growing in such a structure.

Both MSU and the grower learned that if blueberries are grown in high tunnels the plants will probably need trellising because of more vigorous growth in the high tunnel compared to outside the tunnel. Also, birds may be a contributing factor to damage of the blueberries; bird netting was installed to protect the crop inside the high tunnel when ends and sides were open for ventilation.

Overall, this project revealed that blueberries could be successfully grown in a high tunnel to increase earliness over similar plants grown without protection. Flowering and subsequent harvest could be advanced by two weeks for south highbush varieties and one to two weeks for rabbiteye varieties. Advancing the earliness further would require a higher level of management. A detailed economic analysis is needed to determine if high tunnels are feasible for the relatively small advance in early production.

Frost and freeze protection by the high tunnels was readily evident, especially in 2012 when several continuous days with below freezing nighttime temperatures destroyed about 90% of the grower/cooperator's southern highbush crop. If his crop had been inside a high tunnel, he would not have suffered this loss. Is the high tunnel economically comparable to over-head sprinklers for frost protection? Again, this is an economic decision.

At this time, no known blueberry growers have added high tunnels to their production. Since this project was originated, most blueberry growers have begun switching to machine harvesting instead of hand harvesting which would be needed in the high tunnel due to space constraints. This change was brought about by labor shortages and food safety issues.

## Contact Information

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## Additional Information

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Preliminary Information from the project has been presented to blueberry growers and other fruit growers at:

- Mississippi Fruit and Vegetable Grower's Conference in Vicksburg, MS November, 2011
- North Mississippi Fruit and Vegetable Growers Conference in Verona, MS February, 2013
- Information from this project will be posted at <http://mississippihightunnels.blogspot.com>.



Photo 1. Completed blueberry planting inside the high tunnel, April 2011.



Photo 2. Completed blueberry planting outside the high tunnel, April 2011.



Photo 3. Blueberry planting inside the high tunnel, April 2013.



Photo 4. Blueberry planting outside the high tunnel, April 2013.



'Emerald' highbush blueberry inside (L) and outside (R) high tunnel, April 23, 2013.



'Rebel' highbush blueberry inside (L) and outside (R) high tunnel, April 23, 2013.



'Star' highbush blueberry inside (L) and outside (R) high tunnel, April 23, 2013.



'Alapaha' rabbiteye blueberry inside (L) and outside (R) high tunnel, June 4, 2013.



'Brightwell' rabbiteye blueberry inside (L) and outside (R) high tunnel, June 4, 2013.

# FINANCIAL AIDE TO ESTABLISH TWO COLONIES OF BEES FOR 70 BEGINNER BEEKEEPERS

## Project Summary

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The Mississippi Beekeepers Association has witnessed a growing interest in beekeeping in the state. The public is becoming aware of the shortage of bees, both wild and domestic, due to diseases such as Colony Collapse Disorder and parasites. This increased awareness has led to the public wanting bees to pollinate their gardens and orchards. With the decline in wild and managed honey bee colonies, it is important that populations of honey bees be maintained to meet pollination needs. Honeybees are the most economically valuable pollinators of agricultural crops worldwide. They pollinate approximately 130 agricultural crops including fruit, vegetable, fiber, and nut crops.

The purpose of this project being implemented by the Mississippi Beekeepers Association (MBA) is to assist 70 beekeepers in establishing two hives of honey bees. Through this program, eligible beginning beekeepers are reimbursed for 50% of the costs incurred to purchase honey bee boxes, honey bees, and supplies necessary for two colonies. The need for the funding was to help combat the loss of bee colonies in the state by financially encouraging people to begin beekeeping and to follow up with workshops to educate them on how to manage and take care of their hives. The loss of beehives, both wild and managed, has occurred in drastic proportions in the U.S.

The project is a continuation of the following grants: SCBGP Farm Bill and SCBGP-FY2008, whereby the Mississippi Beekeepers Association utilized grant funds to conduct beekeeping workshops and provided a limited amount of financial aid to beginner beekeepers to assist in establishing their first beehive(s). This project continued to build upon previous grants as the need and interest of increasing the number of pollinators for our specialty crop industry grows. This grant has also greatly impacted the production of honey in our state.

## Project Approach

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Applications for financial aid were accepted and processed by the Mississippi Beekeepers Association on a first come, first serve basis. The applicants were notified of the status of their applications upon receipt. Their information including name, address, phone number, etc. was entered into a database. Once the applicant provided proof that he/she had established one or more hives and spent a minimum of \$360 on beekeeping equipment, bees for the hive(s), etc. he/she was notified that they had met the requirements and was mailed a check for \$180.

## Goals and Outcomes Achieved

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Through this grant, funding has been reimbursed for 70 applicants. The goal of this project was achieved by July 31, 2013, as 70 people had been provided the \$180 cost-share reimbursement to aid in establishing two colonies of bees. Since the beginning of the financial aid program in 2008, the Specialty Crop Grant has aided a total of 230 beginner beekeepers in hopes of expanding the industry and pollinating area specialty crops.

The goal of increasing membership in the Mississippi Beekeepers Association was also achieved. Since the onset of the block grant program, membership has doubled. Attendance for 2011 rose to 512 but fell in 2012 to 260; this however, is still greater than when the grant was initiated. Membership decline may possibly be due to the retirement of Harry Fulton and the decreased efforts of attaining new members. Dr. Jeff Harris has taken over responsibilities of the Mississippi Beekeepers Association in 2013, and membership is expected to increase.

The attendance at beekeeping workshops has also increased from 2008 (317) and 2009 (372) to 2010 (505), 2011 (624), and 2012 (145). The decline in attendance and number of workshops conducted in 2012 is also due to retirement of the project coordinator.

The program has continued to enhance the membership in the Mississippi Beekeepers Association and the communication/education of beginner and professional beekeepers. It has helped create an avenue of communication between beekeepers and professionals. The success of the program dictates continual funding if the block grant program continues.

## Beneficiaries

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The major beneficiaries have been the gardeners and farmers who operate near where the beginners have set up bee hives. Honey bees provide pollination for well over 100 food and fiber crops, some of which are entirely dependent upon honey bees. Legumes such as beans, peas and clovers, melons and other cucumbers, and fruits are very dependent on honey bees. As stated earlier the membership in the Mississippi Beekeepers Association has been enhanced since the onset of the program. Membership has more than doubled to over 300 and up to 500.

## Lessons Learned

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A significant number of people are interested in becoming beekeepers. Some need financial assistance, but all need a significant amount of education and hands on training in order to become efficient in the practice of beekeeping.

Applicants need to be provided information on where to purchase/acquire bees for hives and where to purchase beekeeping equipment. That information was provided to each applicant. Email communication offered MBA a great way to communicate and send such information.

Since 2008, over 307 applications have been received; however of these, over 100 applicants were never reimbursed because they did not follow up and show proof that they established a hive. A number of applications are pending, waiting potential funding for the next grant period. The reason for some applicants failing to comply, is that they often apply too late in the year to obtain bees for their hives or simply cannot find bees to place in hives. The supply of bees, either nuc (nucleus colony) hives or packaged bees, does not meet the demand. More commercial producers of bees are needed and hopefully the success of the program will inspire some beginner beekeepers to eventually become commercial beekeepers. Also, another reason is that after applicants attend a workshop and see the overall expense and what all is involved in maintaining and managing a beehive or for other reasons, they decide not to pursue it. They fail to notify us of their desire to not pursue the cost-share program.

More people, both young and old, continue to show interest in beginning beekeeping. The demand for this program remains as it has proved successful year after year. Funds have been allocated to continue this effort to increase MS honey production and pollination with the SCBGP-FY2013.

## Contact Person

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# ESTABLISHING MINT AS A NEW CASH CROP FOR MISSISSIPPI

## Project Summary

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The purpose of this project is to establish mints [peppermint (*Mentha x piperita* L.), Scotch spearmint (*M x gracilis* Sole), Native spearmint (*M. spicata*), and Japanese cornmint (*M. canadensis* L.)] as specialty crop cash crop for Mississippi. There is significant interest from Mississippi growers and essential oil broker companies to establish peppermint, spearmints, and Japanese mint production in the South. The essential oil industry is looking to expand production of peppermint and spearmints in the south. This offers a unique opportunity for Mississippi growers to enter the mint essential oil market.

Japanese cornmint is a subtropical essential oil crop grown in Asia and South America. The essential oil of Japanese cornmint is the source for production of crystal menthol, which is an important aromatic agent used in various industries. The US is a major importer and consumer of menthol and de-mentholized oil. Currently there is no production of Japanese cornmint in the US. MSU's previous research published in a refereed journal demonstrated that Mississippi would be an ideal location for establishment of Japanese cornmint, but also for peppermint and spearmints.

Three-year field studies conducted by MSU at Verona and one-year field study at the Delta Research and Extension Center clearly demonstrated these three mints can be successfully grown in Mississippi (Reference 3 articles published this year in *Agronomy Journal* (Zheljzkov et al., 2010a, 2010b, 2010c), and one paper published in 2009 in *HortScience* (Zheljzkov et al., 2009). MSU had essential oil broker companies coming in the last couple of years looking at mint plots, meeting with potential growers, and trying to establish a viable mint industry. Additional support was needed in order to expand demonstration plots and collect additional agronomic and chemical data needed by prospective growers and the essential oil companies. Additional research was also needed to establish optimum nitrogen (N) fertilization rates for mint production in different soils types across the state.

This project did not build upon previously funded projects with the SCBGP.

## Project Approach

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The objective of this research was to determine the effects of varying nitrogen (N) fertilizer rates on productivity, essential oil yield, and chemical composition of two mint varieties, 'Arvensis II' (*Mentha canadensis* L.) and Native Spearmint (*Mentha spicata*) essential oils.

Mint plantings were established at two locations in spring of 2011: NMREC in Verona, MS, and Westside Farms in Friars Point, MS. The fertilizer treatments evaluated in this research were

the nitrogen rates of 150, 200, 250, and 300 lbs N/ac at the two locations. The experimental design was a randomized complete block design with four replications. Plant dry weight, plant height, essential oil yield, and essential oil composition were measured and statistically analyzed. The N source was Urea (46-0-0). One half of the N for each treatment was applied in early spring and the other half was applied to field beds 7 days after the first harvest. Beds were formed with a standard 4-row bed-roller spaced 38 inches apart. Virus free mint plants were transplanted into the field plots using a wagon wheel transplanter with an in-row spacing of one foot. The plots consisted of 4 rows each 25 feet long in Verona and 4 rows 50 feet long in Friars Point. Irrigation was used at both locations with low flow drip tape utilized in Verona and flood irrigation at Friar’s Point. The irrigation was designed to apply approximately 1 inch/acre/week in the absence of rainfall. Harvesting was accomplished at initial flowering, and representative samples were weighed immediately and air dried for 5-7 days. Dried mint samples (8.82 ounces dried material), were steam distilled for 45 minutes for extraction of the essential oil. The essential oil samples were sent to the USDA National Center for Natural Products Research at the University of Mississippi.

The average oil yield of the variety, ‘Arvensis II,’ was 124 lb. oil/acre in Verona which was significantly higher than the oil yield from Friars Point, 85.2 lb. oil/acre (Table 1). The oil yield/acre for native spearmint was also higher for Verona, 89.8 lb. oil/acre compared to Friars Point, 36.8 lb. oil/acre.

‘Arvensis II’ plants generally were taller than native spearmint plants while both ‘Arvensis II’ and spearmint were taller in the trials in Verona compared to Friars Point.

Biomass yields at both locations were similar to previous reports from trials conducted in 2007 and in 2008 at Verona with the same cultivars. The dry weight of the plants was greater at Verona compared to Friars Point, and ‘Arvensis II’ provided greater biomass dry weight at both locations compared to native spearmint. The soil at the Friars Point site was very sandy compared to the soil at Verona which probably resulted in reduced biomass production.

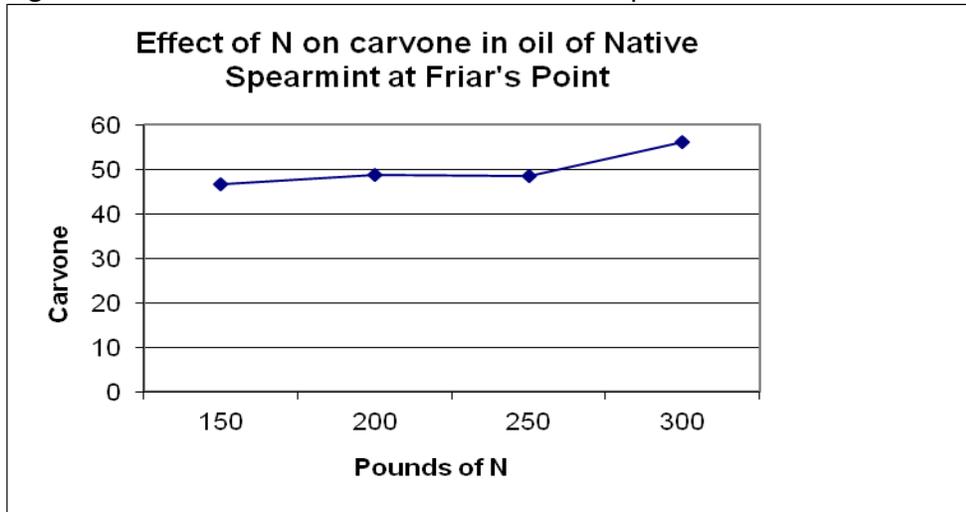
Table 1. Oil yield, dry weight and average plant height of the two varieties at the two locations.

Mint Type & Location	Oil Yield lb/acre	Dry Weight lb/acre	Average Plant Height inches
Arvensis II			
Verona	124.5a <sup>z</sup>	9,320a	42.5a
Friars Point	85.2b	6,350b	30.0b
Native Spearmint			
Verona	89.8a	6,970a	34.6a
Friars Point	36.8b	5,070b	23.7b

<sup>z</sup>Means compared by Fisher’s Protected LSD at  $P=0.05$ . Means in a column within a cell with the same letter do not differ at the 5% significance level.

The only significant effect of nitrogen on essential oil composition was on native spearmint at Friars Point where the 300 lb. N/acre rate had an effect on the concentration of carvone (Figure 1).

Figure 1. Effect of N on carvone in oil of Native Spearmint at Friar’s Point.



The concentration of carvone in native spearmint oil was greater at Verona compared to Friars Point, while menthone concentration was greater in ‘Arvensis II’ in Verona. In general, location and nitrogen fertilization did not influence the concentration of oil constituents (Table 2).

Table 2. Concentration of oil constituents as percent of total analyzed.

Mint Species and Location	Menthol %	Menthone %	Menthofuran %	Carvone %	Limonene %
Arvensis II					
Verona	60.4a <sup>z</sup>	7.6a	4.9a	1.3a	2.7a
Friars Point	53.9a	5.7b	4.9a	1.3a	2.7a
Native Spearmint					
Verona	0.1a	0.0a	0.0a	59.9a	10.8a
Friars Point	0.0a	0.0a	0.0a	50.0b	10.2a

<sup>z</sup>Means compared by Fisher’s Protected LSD at  $P=0.05$ . Means in a column within a cell with the same letter do not differ at the 5% significance level.

The people at Westside Planting Company provided timely and effective collaboration for this research project. They supplied land, equipment, irrigation, and labor to accomplish the planting, growing, and harvesting of the mint crop.

Overall, differing nitrogen fertilizer rates had little effect on mint biomass, oil yield, and oil composition in this trial. Based on these results, lower nitrogen fertilization will produce acceptable amounts of mint biomass and oil with lower fertilizer and environmental costs. The results suggest native spearmint and 'Arvensis II' Japanese cornmint can be viable crops for Mississippi and provide essential oils with desirable composition for industry usage. Menthol was the main oil constituent from 'Arvensis II' while carvone was the main oil constituent from native spearmint.

Overall, the average oil yield of 'Arvensis II' was greater than native spearmint in both locations and harvest dates. Nitrogen had some effect at Friars Point on the concentration of carvone in native spearmint oil. 'Arvensis II' plants were taller than native spearmint plants. Plant biomass yields at both locations were similar to previous reports from trials conducted in 2007 and in 2008 at Verona with the same cultivars. The dry weight of the plants was greater at Verona compared to Friars Point, and 'Arvensis II' provided greater dry weight yield per acre than native spearmint. Research also showed that high levels of nitrogen fertilization were not required for production of mint biomass and oil in this trial.

## Goals and Outcomes Achieved

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Mint plantings were established in two locations in Mississippi: one in northeastern Mississippi in a fertile silt loam soil, and the other in northwestern Mississippi in a well-drained sandy soil. Cultural activities such as crop establishment, weed control, irrigation, and pest control were accomplished in timely manners at both planting sites. Fertilizer treatments were applied to mint plantings at the two trial locations and harvests were accomplished at the appropriate times.

The objective of this research was to evaluate the effect of varying nitrogen fertilization rates on mint production in two different growing environments in Mississippi. Based on these results, lower nitrogen fertilization rates will produce comparable mint biomass and oil. The results from this project were presented at the Northeast MS Fruit and Vegetable Growers Conference in Verona, MS in February 2013. Also in February 2013, a poster presentation on mint production was held at the North MS Research & Extension Center Producer Advisory Council meeting. A presentation was also made at the 2013 American Society of Horticultural Science Conference on the research results from this project.

The farmer participating in the research project in Friars Point has planted 20 acres of mint on his farm.

## Beneficiaries

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MS farmers and mint industry representatives interested in planting mint in Mississippi directly benefited from this research. This research indicates that there are reasonable expectations for successful production of mint. One farmer has added 20 acres of mint as a result of this research and presentations were made to over 110 growers and conference attendees.

## Lessons Learned

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This research indicates that there are commercial possibilities in Mississippi for production of mint as an essential oil crop. Currently mint is grown largely in the northwestern U.S. so this could be a new agricultural opportunity for Mississippi.

Higher nitrogen fertilization rates for mint production were recommended by mint industry representatives to increase mint essential oil production. These recommendations were from the northwestern U.S. The results of this research indicate that high rates of nitrogen did not increase mint essential oil production compared to lower nitrogen rates.

## Contact

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## Additional Information

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Professional Presentation at 2013 American Society of Horticultural Science Meeting:  
Horgan, T., C. Sloan, C. Cantrell, D. Rowe, V. Zheljazkov. 2013. Mint in Mississippi Nitrogen Fertilizer Study. Abstract in Proceedings of the American Society of Horticultural Science.

Research papers on mint production prior to SCBGP:  
Zheljazkov, V.D., V.K. Cerven, C.L. Cantrell, and M.W. Ebelhar. 2009. Effect of N, location, and harvesting stage on peppermint productivity, oil content, and oil composition. HortScience. 44:1267-1270.

Zheljzakov, V.D., C.L. Cantrell, T. Astatkie, and M.W. Ebelhar. 2010, a. Peppermint Productivity and Oil Composition as a Function of Nitrogen, Growth Stage, and Harvest Time. Agronomy Journal 102:124-128.

Zheljazkov, V.D., C.L. Cantrell, T. Astatkie, and M.W. Ebelhar. 2010, b. Productivity, Oil Content and Composition of Two Spearmint Species in Mississippi. *Agronomy Journal* 102:129-133.

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# AN INTEGRATED APPROACH FOR MANAGING PYTHIUM ROOT ROT IN POINSETTIA PRODUCTION IN MISSISSIPPI

## Project Summary

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Pythium root rot, caused by *Pythium aphanidermatum*, is a serious disease in poinsettia production, the No. 1 greenhouse crop; US Studies have shown that as many as 70% of the *Pythium* isolates shipped in contaminated plugs are resistant to two of the major fungicides used to control it. Growers may therefore drench treat their crop and receive no benefit. The goal of this project was to integrate host plant resistance and biological control into poinsettia production so these losses can be reduced and conventional fungicide usage decreased. The disease is most prevalent when the potting mix is poorly drained resulting in saturated root mixes and temperatures that do not favor poinsettia growth. The pathogen attacks the plant below the soil surface and may extend up into the base of the stem. *P. aphanidermatum* causes the lower stems and roots to become brown or black, soft, water-soaked, and rotten. The cortical root tissue sloughs off leaving an exposed strand of inner vascular tissue. Symptoms often become apparent when poinsettia plants wilt and suddenly die. In plants that survive, the growth is often stunted, and wilting may occur when temperatures increase. Other symptoms may include premature flowering and defoliation. Once root infection occurs, plants quickly perish and the disease is difficult to control.

The objectives of this project were to conduct a cultivar evaluation to determine enhanced tolerance to Pythium root rot within commercially available poinsettia cultivars and evaluate the efficacy of biological control products (biofungicides) for control of Pythium root rot of poinsettia. The data will provide a base for alternative pythium management strategies which mitigates the threats of fungicide resistance and reduces usage of conventional fungicides. Information from these trials will be disseminated to Mississippi growers. Research and outreach activities from this project will help grower decision making in managing Pythium root rot in poinsettia. In the long term, this and other related projects will help promote IPM strategies to make greenhouse crop production more economically and environmentally sustainable.

This project did not build upon previously funded projects with the SCBGP.

## Project Approach

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Mississippi State University (MSU) implemented this project to integrate host plant resistance and biological control into poinsettia production. The three main objectives of the project were to 1) conduct a cultivar evaluation to determine enhanced tolerance to Pythium root rot within commercially available poinsettia cultivars, 2) evaluate the efficacy of biological control products (bio-fungicides) for control of Pythium root rot of poinsettia, and 3) develop

enterprise budgets on *Pythium* root rot management alternatives to assist growers' management decisions and disseminate results from the project to the growers in Mississippi.

In experiments one and two, 16 poinsettia cultivars were evaluated for sensitivity to *Pythium aphanidermatum*, the causal agent of *Pythium* root rot. Seven isolates of *P. aphanidermatum*, originating from poinsettia roots, were combined to make up the rice-infested inoculum (Figure 1). Twelve plants of each cultivar were potted into 15.2 cm azalea pots using Sunshine #1 Mix. The young plants were allowed to grow four weeks prior to inoculation with *P. aphanidermatum*.

Seven isolates of *P. aphanidermatum* originating from poinsettia roots, were combined to make up the rice-infested inoculum. To prepare the inoculum, dry, long grain white rice was autoclaved (120°C at 0.117 MPa) one hour on three successive days to ensure sterility. Seven day-old *P. aphanidermatum* cultures of each isolate growing on potato dextrose agar were combined (1/8 section of each culture) in 250 ml sterile distilled water and macerated for three minutes. The fungal slurry was poured into a 1.0 kg aliquot of sterile rice. The infested rice incubated for 48 hours at 30°C in the dark.

Three *P. aphanidermatum* inoculum densities: high = 0.6 g; medium = 0.4 g; low = 0.2 g; and a control (sterile rice at 0.2 g), were used to evaluate cultivar tolerance. Each poinsettia cultivar was replicated three times for each inoculum density level. Following the four week establishment period, the desired amount of infested rice was placed into the moist potting mix 2.5 cm from the stem and 2.5 cm deep. The poinsettias were fertigated daily to prevent drought stress and maintain appropriate fertility. Greenhouse temperatures ranged from 29-49°C and shade cloth covered the plants from 10 a.m. to 3 p.m. daily.

Visual plant health ratings were based on a scale of 1 to 7 where 1 = dead and 7 = healthy, no symptoms (Figure 2) and taken weekly. Results showed that plant health was not significantly different among inoculum densities one, two, or three weeks after inoculation with *P. aphanidermatum*. The average plant health rating (Figure 2) for inoculated poinsettias was 3.5 compared to the average plant health rating of 6.0 for non-inoculated poinsettias. It appears the low inoculum density of 0.2 g infested rice was sufficient to induce a response among poinsettia cultivars. However, plant health was significantly impacted when poinsettia cultivars were inoculated with *P. aphanidermatum* and rated three weeks post inoculation (Table 1). We identified five poinsettia cultivars out of 16 with acceptable tolerance to *P. aphanidermatum* three weeks after inoculation. Those cultivars included 1270, Polar Bear, Prestige Early Red, Prestige Red (commercial standard), and Solstice.

Figure 1. Rice inoculum used and some plants on the inoculation date.

	
<p>Pythium colonized rice grains used as inoculum.</p>	<p>Poinsettia plants at inoculation.</p>

Figure 2. Rating scale (1-7) used in trials.

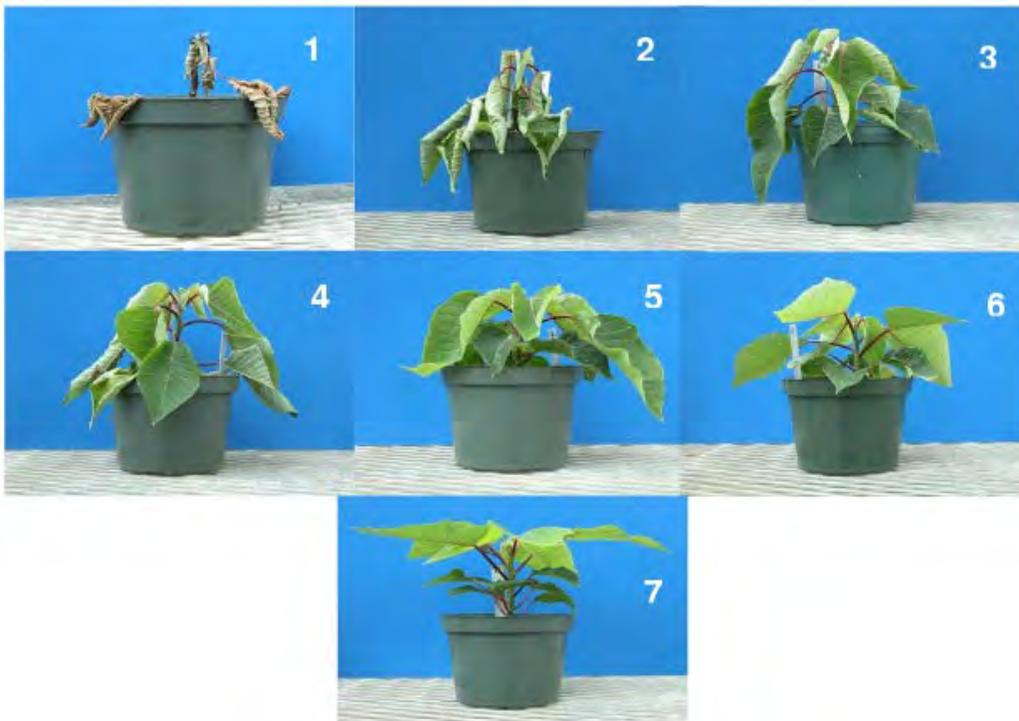


Table 1. The effect of *Pythium aphanidermatum* on plant health of commercially available poinsettia cultivars three weeks post inoculation.

Poinsettia Cultivar	Plant Health*			
	Exp. 1		Exp. 2	
	Mean	Significance	Mean	Significance
1055	2.4	de**	1.7	bc
1121	4.2	ab	3.7	ab
1188	3.4	bcd	1.7	bc
1270	5.3	a	4.3	a
Advent Red	4.1	ab	3.4	ab
Classic Red	3.1	bcd	3.2	abc
Freedom Early Red	2.6	cde	2.3	abc
Ice Punch	1.6	e	1.0	c
Jubilee Red	4.0	abc	1.7	bc
Polar Bear	4.6	a	4.3	a
Prestige Early Red	5.4	a	3.8	ab
Polly's Pink	4.2	ab	2.4	abc
Prestige Red	4.3	ab	4.6	a
Red Glitter	2.6	cde	2.2	abc
Solstice Red	5.1	a	3.9	ab
Tapestry	1.2	e	2.3	abc

\*Plant health based on a visual rating scale of 1 to 7 where 1 = dead and 7 = healthy. All cultivars inoculated 4 weeks after transplant.

\*\*Means within columns followed by the same letter are not significantly different according to Duncan's multiple range test for mean separation at P = 0.05. Cultivar means based on 12 replications per experiment.

This project also evaluated the efficacy of biological control products (biofungicides) for control of *Pythium* root rot of poinsettia (Experiment 3). The timings used are shown in Table 2.

Biological fungicides included:

- RS: RootShield® *Trichoderma harzianum* Rifia strain KRL-AG2,
- RM: RootMate® *Trichoderma virens* strain G-41 (BioWorks, Inc.),
- MS: Mycostop® *Streptomyces griseoviridis* Strain K61 (Verdera), and
- PS: Prestop® *Gliocladium catenulatum* Strain J1446 (Verdera).

Five poinsettia cultivars were used: Polar Bear, Prestige Early Red, Prestige Red, Solstice Red, and Ice Punch. There were three replicates with eight plants per replicate.

Table 2. Experimental timings utilized in Experiment 3.

<b>Receive and transplanting <u>June 12-15</u></b>	<b>1 week after transplanting, <u>June 19-22</u></b>	<b>3 weeks after transplanting <u>July 3-6</u></b>	<b>4 weeks after transplanting <u>July 10-13</u></b>	<b>8 weeks after transplanting <u>Aug 7-10</u></b>	<b>12 weeks after transplanting <u>Sept 4-7</u></b>
6 plants	Drench RS	Inoculate			
6 plants	Drench RM	Inoculate			
6 plants	Drench MS	Inoculate			
6 plants	Drench PS	Inoculate			
6 plants	NO Drench	Inoculate			
6 plants	NO Drench	No Inoculate			
6 plants	Drench RS	Inoculate	Drench RS		
6 plants	Drench RM	Inoculate	Drench RM		
6 plants	Drench MS	Inoculate	Drench MS		
6 plants	Drench PS	Inoculate	Drench PS		
6 plants	NO Drench	Inoculate	NO Drench		
6 plants	NO Drench	No Inoculate	NO Drench		
6 plants	Drench RS	Inoculate	Drench RS	Drench RS	
6 plants	Drench RM	Inoculate	Drench RM	Drench RM	
6 plants	Drench MS	Inoculate	Drench MS	Drench MS	
6 plants	Drench PS	Inoculate	Drench PS	Drench PS	
6 plants	NO Drench	Inoculate	NO Drench	NO Drench	
6 plants	NO Drench	No Inoculate	NO Drench	NO Drench	
6 plants	Drench RS	Inoculate	Drench RS	Drench RS	Drench RS
6 plants	Drench RM	Inoculate	Drench RM	Drench RM	Drench RM
6 plants	Drench MS	Inoculate	Drench MS	Drench MS	Drench MS
6 plants	Drench PS	Inoculate	Drench PS	Drench PS	Drench PS
6 plants	NO Drench	Inoculate	NO Drench	NO Drench	NO Drench
6 plants	NO Drench	No Inoculate	NO Drench	NO Drench	NO Drench

Plant height was a decent measurement of how well the plants were able to shake off the Pythium infection. Data analysis of this variable showed the primary main effects were cultivar and fungicide, but that there were significant interactions between drench time, fungicide, and cultivar.

Wilting in the most susceptible cultivar, Ice Punch, was evident three weeks after inoculation. By the final evaluation period, differences among treatments were evident (Figure 3).



Figure 3. Part of two replications near the final evaluation period.

The cultivar interaction came on drench time 8 when 'Prestige Early Red' switched its normal second place height with 'Prestige Red'. In all other cases the height order from tallest to least tall was Solstice Red > Prestige Early Red > Prestige Red > Polar Bear > Ice Punch. Prestige Early Red also switched places with Prestige Red between the July and October quality ratings (Appendix A and Table 3).

Table 3. Plant ratings by both cultivar and fungicide.

Cultivar Ratings						Fungicide Ratings					
July rating			October Rating			July rating			October Rating		
Waller	Mean	cult	Waller	Mean	cult	Waller	Mean	Fungicide	Waller	Mean	Fungicide
A	6.9	SR	A	6.5	SR	A	6.8	NDNI	A	6.8	NDNI
A	6.8	PR	B	5.9	PE	B	6.4	RM	B	6.4	RM
A	6.8	PE	C	5.5	PR	BC	6.4	RS	BC	6.4	RS
B	6.2	PB	D	3.5	PB	BCD	6.3	MS	BCD	6.3	MS
C	4.9	IP	E	2.4	IP	CD	6.2	ND	CD	6.2	ND
						D	6.0	PS	D	6.0	PS

The plant height interaction among fungicides arose from multiple sources. First, was the 'no drench, no inoculation' (NDNI) plant height for time 2 falling into the bottom cluster of heights. We need to look at the original measurement notes to make sure there was not a transcription

error for this group in this drench time. Secondly, Mycostop fell from its usual secondary cluster (just below NDNI) to the bottom in the last drench time.

Of the fungicide treatments, Mycostop, RootMate, RootShield performed in a similar cluster, though of the plants receiving only a single drench treatment, RootMate and RootShield outgrew other treatments. When drenches were applied at all time periods, there was no beneficial influence of fungicide. In the more *P. aphanidermatum* resistant cultivars, multiple drenches also seemed to result in plant heights with little to no difference from the non-drenched treatment. These differences were not as apparent in the plant ratings (Table 3).

Experiment 4 was a repeat of Experiment 3 (Table 2). The plants were obtained, transplanted, drenched, inoculated and drenched twice more. However, no wilting or other disease symptoms in the susceptible cultivars were observed. Dissection of some plants showed no infection.

Examination of leftover Pythium cultures showed typical hyphae, but no production of resting structures. It is postulated that the Pythium isolate used lost its pathogenicity in storage. New poinsettia plants are being obtained and propagated to test this. New isolates are also being collected from around the state.

Throughout this project, growers visited the trials, and tours were given during the annual Green Industry Conference in June, and Fall Garden Festival in October 2012. The greenhouse was open for visitors during normal business hours, and several growers stopped in during those times. In all, slightly over 100 growers or grower employees viewed the demonstration.

The significant contributions and role of project partners in the project:

- Drs. Henn, Bi, Tomaso-Peterson, and Gu designed and set up the experiments.
- Drs. Bi and Gu prepared the plant materials.
- Drs. Henn and Tomaso-Peterson prepared the inoculum.
- Drs. Henn and Bi hosted the field day and informal tours that showcased the studies being done under this grant.
- Drs. Henn, Bi, Tomaso-Peterson, and Gu prepared the progress reports and final report.

## Goals and Outcomes Achieved

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The three objectives of this project were to 1) to conduct a cultivar evaluation to determine enhanced tolerance to Pythium root rot with commercially available poinsettia cultivars, 2) evaluated the efficacy of biological control products (biofungicides) for control of Pythium root rot of poinsettia, and 3) develop enterprise budgets on Pythium root rot management alternatives to assist growers' management decisions and disseminate results from the project to the growers in MS. Objectives 1 and 2 have been met, although it would have been better to

have an additional replication of the biological fungicides. Objective 3 is ongoing; the data from these trials are being used to write an extension publication that will include a budget.

A set of poinsettia cultivars tolerant to infection by *Pythium aphanidermatum* has been identified. Some of the cultivars are long time standards, so an additional learning curve for the grower will not be necessary. Biological fungicides may help growers produce more vigorous poinsettias, but further work is needed to identify potential problems revealed by this study, especially pertaining to multiple drenches and plant growth and the variety/fungicide interaction.

Although the objectives were not long term, the clear results of the variety trial have triggered an effort to start a *Pythium aphanidermatum* trial for this upcoming spring. Screening of new poinsettia cultivars, especially white colored cultivars, will be the major intent of the trial. If successful, this may turn into a bi-annual project for grower advisory.

Growers have toured the trials and been exposed to some of the results at meetings. In November 2012, at the 2012 Mid-South Green Industry Conference, 12 growers attended the demonstration in addition to about ten landscapers, vendors, etc. Trials were open to visitors to the Crystal Springs Truck Crops Experiment Station and at the 2012 Fall Garden Fest where tours were held for growers and the public. Total attendance for the demonstrations and trial for 2012 was 112.

A press release was published on MSUCares at the start of the project in 2011, <http://msucares.com/news/print/agnews/an11/111201.html>; recommendations from this project have not been published at this time, they are in the process of preparing for future release. An article, "Efficacy of Non-conventional Fungicides for Control of Pythium Root Rot in Poinsettia (*Euphorbia pulcherrima*," was published in October 2012 in the *Journal of Mississippi Academy of Sciences*. As mentioned earlier, an Extension publication is in process and shall be published by late spring or early summer 2014 which will contain variety trial results, recommendations, and the budget; this article will also be published on MSUCares. An article will be published in the spring 2014 Mississippi Nursery and Landscape Association Newsletter.

Direct visits to poinsettia growers to discuss results and future research will continue. Visits have included growers with Natchez Trace, Vesley's Nursery, and Croom Nursery.

## Beneficiaries

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Beneficiaries of the project include new and existing greenhouse poinsettia growers in MS and surrounding states. More than 125 growers and gardeners have toured the research site over the life of the project.

Greenhouse growers have and will receive the most benefit from this work. They can select poinsettia cultivars less prone to disease caused by *Pythium aphanidermatum*, thereby insuring a crop is produced for sale, avoiding fungicide resistance issues (finding a fungicide that works against a resistant strain, perhaps trying as many as three different fungicides) and using fewer conventional fungicides. Secondary beneficiaries include chemical handlers and applicators who will handle fewer fungicides. The general public will benefit by receiving poinsettias with fewer pesticides. The general environment will benefit from less conventional pesticide use.

## Lessons Learned

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Poinsettia cultivars differ significantly in their reaction to *Pythium aphanidermatum*. A protocol that requires 6-8 weeks has been identified to help growers select poinsettia cultivars that they can be sure will make it to sale if a *Pythium aphanidermatum* infection were to occur.

Four to five poinsettia cultivars somewhat tolerant to *Pythium aphanidermatum* infection, including some standards, were identified in this trial alone.

Biological fungicides, especially in limited drenches, may help growers produce a more vigorous plant when challenged by *Pythium aphanidermatum*. These products may also provide help against other pathogens, such as *Rhizoctonia*. These findings may result in a long-term variety screening program for growers.

Fungal cultures can lose pathogenicity. A pre-trial prior to a major trial is probably warranted.

Despite being in a greenhouse situation, poinsettia production systems are complex, specifically that poinsettia cultivar, type of biological fungicide, and drench timings of the biological fungicides can interact with each other. Understanding these interactions is important.

## Contact

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# DEVELOPING COVER CROP MANAGEMENT SYSTEMS TO OPTIMIZE SUSTAINABILITY AND PROFITABILITY OF SPECIALTY CROP PRODUCTION IN HIGH TUNNELS

## Project Summary

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High tunnels are unheated greenhouse-like structures that provide a relatively low-cost modified environment for crop production. Growers use the tunnels to extend growing seasons, reduce environmental variability, increase yields, improve crop quality, and increase income. Cover crops are critical management tools in many sustainable soil-based systems. Cover crops have the potential to cut fertilizer costs, reduce the need for herbicides and pesticides, prevent soil erosion, conserve soil moisture, improve yields, and protect water quality. As many local growers are adopting high tunnel systems for season-extending production of high-value crops, the question is raised on whether cover crops can be integrated into high tunnels to maximize crop production and profit potential. While there has been extensive research on the use of cover crops in open field production systems, few studies have been conducted on how the use of cover crops in high tunnels will impact soil properties and crop production. The objective of this project is to investigate the potential of using cover crops to optimize crop production, soil health, and profit in high tunnels and deliver preliminary recommendations for integrating cover crops into high tunnel production practices in Mississippi.

This project is built on a previously funded project through the Specialty Crop Block Grant Program from FY2009, “Organic Production of Specialty Crops in High Tunnels.” This project complimented and enhanced the previous work by incorporating cover crops into high tunnel production systems; specifically, Mississippi State University evaluated the effects of different cover crops on soil fertility and crop production in high tunnels.

## Project Approach

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Replicated trials were conducted in two high tunnels located at the Mississippi State University Truck Crops Branch Experiment Station in Crystal Springs, MS. The high tunnels were placed in full sun and oriented from north to south. Each tunnel is 96 ft. long by 30 ft. wide. The soil was Loring silt loam.

The study was a randomized complete block design, where each high tunnel served as a block. Cover crops and cash crops were selected based on experience of the researchers and consultation with growers and extension personnel. Cash crops evaluated include tomato ‘Mountain Spring,’ broccoli ‘Marathon,’ and sunflower ‘Infrared Mix F1.’ Crops were tested for both spring and fall production. Vegetables and cut flowers were sown from seeds, and seedlings were grown in a greenhouse and transplanted into the high tunnels. Plants were grown using standard organic production practices.

All plants were grown on raised beds inside the high tunnels. Plastic mulch was used to cover the beds and plants were drip-irrigated based on plant need.

The three winter cover crops tested included: Annual ryegrass (*Lolium multiflorum* Lam.); Annual ryegrass + hairy vetch (*Vicia villosa*); and Biofumigant mustard blend Caliente 199 (*Brassica juncea* + *Sinapsis alba*). One summer cover crop sorghum-sudan, 'Sugar Grazer II,' was also included during the summer between spring and fall cash crops. Winter cover crops were sown in November with four treatments: Annual ryegrass (75 lbs/acre), Annual ryegrass (50 lbs/acre) + hairy vetch (31 lbs/acre), Caliente 199 mustard blend (10 lbs/acre), and no cover crop (control). Each treatment consisted of one fourth of one high tunnel divided from the middle of the high tunnel. After growing about three months in high tunnels, cover crops were cut and tilled into the soil. Based on soil tests, one locally produced, composted broiler litter (Currie Farms, Raleigh, MS) was selected to incorporate into the soil before transplanting, if needed.

Pests and diseases were scouted weekly. Vegetables were harvested once or twice every week (tomato) or at maturity (broccoli) and graded into marketable and cull grades. Produce in each grade were counted and weighed. Cut flowers were harvested once or twice every week using recommended practices; the data taken included stem length and the number of total and marketable stems. Plant growth, soil, and plant tissue samples were taken periodically during the growing season.

Results from this project indicated that in general, for sunflower cut flowers, the total number of stems was similar among all treatments, with plants grown in the mustard plot producing slightly less stems. Tomato and broccoli yields were similar in all cover crop treatments. The soil analysis data showed that prior to tilling the cover crops, soil nitrate concentrations in the top 20 cm were more than 50% higher in the no cover crop plot than in the cover crop plots. There was no difference among all plots in extractable P, K, Ca, Mg, Na, and soil organic matter prior to tilling the cover crops.

The significant contributions and role of project partners in the project:

- Drs. Bi and Evans built and set up all the experiments in the high tunnels.
- Dr. Bi was responsible for the cut flower experiments, while Dr. Evans was responsible for the vegetable experiments.
- Drs. Bi and Evans hosted high tunnel workshops, field days, and informal tours that showcased the studies being done under this grant.
- Drs. Bi and Evans presented the project results at local, regional, and national conferences.
- Drs. Bi and Evans prepared the progress reports and final report.

## Goals and Outcomes Achieved

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The goal of this project was to develop and deliver best management practices, based on local data and local conditions, focusing on integrating the use of covers crops in high tunnel production for specialty crops in Mississippi to benefit growers and consumers. We were able to achieve this goal during the project period. Three winter cover crops were tested: Annual ryegrass, Annual ryegrass + hairy vetch, and biofumigant mustard blend Caliente 199 (Siegers Seed) on both vegetable and cut flower crops. MSU collected yield and quality data on the tested crops, soil and plant nutrients, pest and disease, and environmental data. The findings and recommendations were delivered through field days, presentations, trainings, individual contacts, and conferences.

Proposed measurable outcomes included publications, a research and demonstration site, and increased awareness and adoption of the production practices recommended based on the results of this study. This project resulted in more than 1,000 direct contacts at field days and trainings, with many more indirect contacts and social media interactions. The project has directly or indirectly helped grow the number of high tunnels in the state from under 10 before 2009 to over 300 in 2012. Data from the project has been used in several grant applications and helped develop interstate research and outreach teams with members from Alabama, Mississippi, Louisiana, Texas, and Arkansas. The project increased the knowledge base of the research team and attendees at field days and workshops. The project helped us to advise clients on integrating cover crops in organic or conventional productions of vegetables and cut flowers using high tunnels in MS, including how to properly manage the biofumigant crop for maximum benefit. Team members have also presented high tunnel information on local, regional, and national conferences. MSU is preparing several publications that will be completed after the official end of the project period. These include peer-reviewed journal publications and experiment station bulletins.

We anticipated that the results from this project would lead to more support from other funding sources, leading to a stronger program in support of organic and conventional production of specialty crops in MS and serve the growing year-round market in the state. The project has been leveraged in several grant applications, including the USDA Organic Research and Education Grants and the USDA Specialty Crops Research Initiative.

**Quantifiable Impact:** as listed in the following Table.

Measurable impact	Expected results	Achieved results
The number of clientele reached by websites, presentation, workshop, news releases, popular articles, and field days.	1,000	Over 1,000
Conference presentations	3	5
Peer-reviewed journal publications	1	We anticipate publications in 2014
MAFES Bulletins	1	We anticipate publications in 2014
Grower adoption	10%	Based on grower feedback and extension questions into the office, growers are considering integrating cover crops into their high tunnel production.

Examples of the presentations related to this project include, but not limited to, the following:

Bi, G. W. Evans, and V. Cerven. 2013. Organic production of sunflowers in high tunnels. American Society for Horticultural Science (ASHS) Annual Conference. Palm Desert, CA. July 22-25, 2013. Attendance: 300.

Bi, G., Evans, W.B., Gu., M. and V. Cerven. 2012. Effects of cover crops on soil fertility and sunflower production in high tunnels. Southern Nursery Association (SNA) research conference/ Gulf States Horticultural Expo, Mobile, AL. January 18-20, 2012. Attendance: 150.

Bi, G., W. Evans, M. Gu, and V. Cerven. 2012. Effects of Cover Crops on Soil Fertility and Sunflower Production in High Tunnels. SNA Research Conference Proceedings. 57: 149-151.

Evans, W. B., G. Bi. M. Gu, and V. Cerven. 2012. High tunnel successes in Mississippi. Presented to the 5<sup>th</sup> Annual Small Farms Conference. Memphis TN. Sept. 15, 2012. Attendance: 300.

Evans, W.B. 2012. Organic and conventional high tunnel tomato production. Presented during the 2012 Alabama Fruit and Vegetable Growers Conference. Invited. Attendance: 60.

Evans, W.B. 2012. Vegetable production in high tunnels. Presented to the North Mississippi Vegetable Producers Conference. February, 2012. Attendance: 100.

Evans, W.B. and G. Bi. 2011. High tunnel workshop and walking tour. Presented during the 2011 Fall Flower & Garden Fest. Crystal Springs, MS. Oct. 2011. Attendance: 200.

Evans, W.B. and G. Bi. 2012. High tunnel walking tour. Presented during the 2012 Fall Flower & Garden Fest. Crystal Springs, MS. Oct. 2012. Attendance: 150.

Gu, M., G. Bi, and W. Evans. 2011. High tunnel field day. March 2011. Attendance: 200.

## **Beneficiaries**

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Beneficiaries of the project have included new and existing specialty crop growers in MS and surrounding states. More than 1,000 growers and gardeners have toured the research site over the life of the project. More than 100 NRCS and university staff members have toured and trained at the site. Knowledge gained from this project has supported invited trainings in Mississippi, Arkansas, and Alabama.

This project has also been influential in development of the new Bulldog Student Farm. Dr. Evans is working with the development team by providing information on high tunnel production techniques including information gleaned from the cover crop work done by Drs. Bi and Evans with this project. The farm's first course was offered in spring 2013 and involved significant work in high tunnels by the students. This project can claim some credit, perhaps 3-5%, for that effort through leveraged information.

## **Lessons Learned**

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Cover crops were fairly easy to establish in tunnels, but required irrigation for uniformity of germination and growth. Cover crops were effective at reducing soil nitrate levels between cash crops. Cover crop residue did not interfere with subsequent cash crop establishment. The biofumigant mustard must be cut and incorporated carefully for maximum benefit and to avoid worker safety issues due to fumes building up in the tunnels. Best practices include having the tunnel fully open when cutting and incorporating, not doing these tasks alone, and being prepared to pause while working and vacate the house if the fumes become strong. The cover crops grew much quicker in the tunnels than they do outside in the everyday environment, meaning cover crops will require fewer days to accumulate biomass and perform other functions in tunnels than under field conditions.

## Contact Person

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## Additional Information

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Photo #1. Sunflower 'Infrared Mix F1' grown in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS. Taking data on cut flowers.



Photo #2. Sunflower 'Infrared Mix F1' grown in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #3. Cover crops grown in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #4. Cover crops grown in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #5. Cutting cover crops in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #6. Cutting cover crops in the high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #7. High tunnels used for this study at Truck Crops Experiment Station in Crystal Springs, MS.



Photo #8. Field days at Truck Crops Experiment Station in Crystal Springs, MS.

# MISSISSIPPI SWEET POTATO MARKETING AND FOOD SAFETY EDUCATION CAMPAIGN

## Project Summary

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Through the execution of this project, the Mississippi Sweet Potato Council (SPC) expected to reach more consumers and produce buyers and thereby increase the sale of Mississippi sweet potatoes. The purpose of this proposed project was to: 1) continue to enhance the marketing/promotion of Mississippi sweet potatoes and 2) enhance food safety by educating growers and packers concerning “Good Agricultural Practices” and “Good Handling Practices” (GAP/GHP) with education and cost share of audits of some of the sweet potato packing facilities.

This funding built on market share gained through the efforts funded in the past by Specialty Crop Grants while also including the new aspect of food safety training. The SPC received SCBGP-Farm Bill and SCBGP-FY2009 funding to implement a marketing campaign. As a result of past Specialty Crop Grant Program projects, Mississippi sweet potatoes are starting to gain brand awareness and allegiance among consumers and some buyers. Marketing studies show brand awareness requires long term commitments over several years. With the current consumption trend ticking upward for sweet potatoes, it is vital that the marketing/promotion program is continued. The project was perfect to raise awareness and increase sales of Mississippi sweet potatoes. Each year more of the major sweet potato retailers who purchase Mississippi sweet potatoes are requiring food safety Good Agricultural Practices certification, making the need for a Food Safety Education Workshop very timely and important.

## Project Approach

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This project included five marketing and promotion activities and a food safety training workshop. A food safety training workshop was held February 16, 2011. The workshop had 47 sweet potato growers and packers in attendance. Over the course of this activity, four packing houses were GAP Certified. These four grower/packers have received the financial assistance reimbursement for the GAP/GHP audit as a result of the Food Safety Training.

Two radio spots were developed and aired twice per MSU baseball game during 40 games in the spring of 2011. They were aired on the Mississippi State Bulldog Sports network. This covered the state of Mississippi and provided limited coverage in Tennessee, Alabama, and Louisiana. Eighteen stations aired the radio commercials; the commercials were 30 seconds each.

The Mississippi Sweet Potato Council participated in the Produce Marketing Association’s Fresh Summit Trade Show in October 2011. The purpose of this activity was to promote Mississippi

sweet potatoes to domestic and international buyers. By exhibiting at the PMA Fresh Summit, Mississippi growers and shippers were part of a premier produce tradeshow. During the exhibition, contacts were made with new produce buyers searching for sweet potatoes. Six growers and two brokers attended the tradeshow as a result of the grant. Additional sales generated by contacts made at the tradeshow are estimated to be \$255,000. Sales should continue to be made in the future as a result of the contacts made at the show.

Trade publication advertisements were placed in the produce trade publication, "Produce News." Ad placements were purchased to run during the spring and fall of 2011. This publication provided nationwide circulation among produce buyers in efforts to enhance awareness of the Mississippi sweet potatoes. Four ads were placed in this publication, and as a result, two packing sheds surveyed after the advertising campaign reported sales increased by 10% during the 2012 Easter sale time period when compared to the sales from 2011.

A brochure was developed and printed for sweet potato recipes in addition to their nutritional information. A total of 40,000 brochures were printed in December 2012 and are still in distribution.

Two billboard advertisements were designed and placed to promote Mississippi sweet potatoes to consumers in Mississippi. Billboards were located in North Mississippi in high traffic areas.

USDA-NASS reports sweet potato sales were \$25,680,000 in 2009 and increased to \$73,440,000 in 2010, \$72,020,000 in 2011, and \$62,656,000 in 2012.

## **Goals and Outcomes Achieved**

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The goals of the project were: 1) to increase the pounds of sweet potatoes sold in Mississippi by at least 10% and 2) to increase the number of growers/packers GAP certified in Good Agricultural Practices.

Five activities were performed to address the first goal: exhibiting at the PMA Tradeshow, radio ads, recipe brochure, billboard ads, and the "Produce News," trade publication ads. Pounds of sweet potatoes sold increased from 1,265,000 in 2009 to 3,520,000 in 2012; the goal was exceeded.

A Food Safety Workshop was held to address the second goal. Forty-seven growers attended the workshop and four packing facilities were GAP certified as a result.

## Beneficiaries

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All 107 Mississippi sweet potato growers benefitted from the completion of this project. The Town of Vardaman, MS and the State of Mississippi benefitted from the economic activity generated from the increased sales of sweet potatoes. Sales of Mississippi sweet potatoes increased from \$25,680,000 in 2009 to \$62,656,000 in 2012. Four packing sheds benefited by becoming GAP certified as a result of this project.

## Lessons Learned

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As a result of completing this project, the MS SPC learned that the PMA tradeshow continues to be a very effective venue to make contact with buyers looking to buy Mississippi sweet potatoes. The radio ads airing during the non-holiday spring season was a very effective way to reach consumers. The recipe brochures were not as costly as first projected in the proposal and therefore, many more brochures were printed and distributed which allowed more consumers to be reached. Billboards are a long-term branding enhancement for the sweet potato industry and reach consumers on a daily basis. Trade publication ads specifically influenced buyers to purchase Mississippi sweet potatoes. The Food Safety Workshop was a great tool to reach growers and train them in food safety. Increasing the number of GAP certified packing operations increases sales to buyers requiring GAP certification. All of these activities impacted sales of sweet potatoes and increased significantly more than anticipated.

## Contact Person

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Mississippi Sweet Potato Council  
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## Additional Information

USDA-NASS data:  
Production per CWT:



**Quick Stats** [Home](#) [Recent Statistics](#) [Help](#)

Navigation History: [Data](#) Double click any cell below to filter the data by that item. Right click on column heading to pivot or hide columns. Save :: Spreadsheet :: Printable :: Map :: (5 rows)

Program	Year	Period	Geo Level	State	State ANSI	Commodity	Data Item	Domain	Domain Category	Value
SURVEY	2012	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN CWT	TOTAL	NOT SPECIFIED	3,620,000
SURVEY	2011	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN CWT	TOTAL	NOT SPECIFIED	4,163,000
SURVEY	2010	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN CWT	TOTAL	NOT SPECIFIED	3,800,000
SURVEY	2009	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN CWT	TOTAL	NOT SPECIFIED	1,265,000
SURVEY	2008	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN CWT	TOTAL	NOT SPECIFIED	3,354,000

Value of Production:



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Program	Year	Period	Geo Level	State	State ANSI	Commodity	Data Item	Domain	Domain Category	Value
SURVEY	2012	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN \$	TOTAL	NOT SPECIFIED	62,656,000
SURVEY	2011	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN \$	TOTAL	NOT SPECIFIED	72,020,000
SURVEY	2010	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN \$	TOTAL	NOT SPECIFIED	73,440,000
SURVEY	2009	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN \$	TOTAL	NOT SPECIFIED	25,680,000
SURVEY	2008	YEAR	STATE	MISSISSIPPI	28	SWEET POTATOES	SWEET POTATOES - PRODUCTION, MEASURED IN \$	TOTAL	NOT SPECIFIED	62,384,000

Billboard:



Sweet Potato Brochure:

**Sweet Cravings...**

**Sweet Potato Pie**

1 stick oleo, melted  
 2 cups cooked sweet potatoes  
 2 cups sugar  
 3 eggs  
 1 small can evaporated milk  
 1 teaspoon vanilla  
 1½ teaspoons cinnamon (optional)  
 2 pie shells

Mix potatoes, sugar and oleo well. Add other ingredients and mix well. Pour into pie shells. Bake one hour at 350 degrees. Makes 2 pies.

**Sweet Potato Puffs**

½ cup butter, softened  
 1 teaspoon vanilla  
 ½ cup cooked mashed sweet potatoes  
 2 Tablespoons sugar  
 1 cup flour  
 ½ cup ground toasted oats

Cream butter and sugar together. Add vanilla and sweet potatoes. Stir in flour and oats. Roll in small balls and place on cookie sheet. Bake at 300 degrees for 45 minutes. Sprinkle on powdered sugar while warm, if desired.

**Baked Sweet Potato**

Prick sweet potato with fork. Bake at 400 degrees for 40 to 50 minutes. Top with butter, cinnamon, or brown sugar.

*The World's Best Sweet Potatoes*

**Vardaman, Mississippi Sweet Potatoes**

No other sweet potato can compare to the ones we grow in Mississippi. We produce premium sweet potatoes that are bursting with flavor and freshness. The rich, fertile soils of North Mississippi make our sweet potatoes appealing inside and out.

Mississippi sweet potatoes have a melt-in-your-mouth taste and offer great nutritional value. Their great taste and rich color will make you crave more.

**Satisfy your cravings with Mississippi sweet potatoes!**



**Mississippi Sweet Potato Council**  
 P. O. Box 100 • Vardaman, MS 38878  
 662.769.7300  
[www.mssweetpotato.org](http://www.mssweetpotato.org)

**Sweet Potato Cravings**

RECIPES TO SATISFY YOUR CRAVINGS  
 for  
**Vardaman, Mississippi Sweet Potatoes**



**Healthy Cravings...**

**Glazed Sweet Potatoes**

½ cup orange marmalade  
 ½ teaspoon salt  
 ½ teaspoon cinnamon  
 6 sweet potatoes (small whole), cooked or canned

Melt marmalade in a pan over low heat. Stir in cinnamon and salt, and then add sweet potatoes. Cook over low heat, turning sweet potatoes several times, until they are well coated and most of marmalade is absorbed, about 6 minutes.

**Roasted Sweet Potatoes**

2 lbs. sweet potatoes, peeled and cut crosswise into ¾ inch thick rounds  
 ¾ cup unsweetened apple juice  
 2 Tablespoons dried cranberries  
 ¼ teaspoon ground allspice  
 pinch of salt

Preheat oven to 350 degrees. Arrange slices in a single layer in a roasting pan. To the apple juice, add dried cranberries and ground allspice. Pour juice mixture over sliced sweet potatoes. Cover with foil and bake 30 minutes or until the sweet potatoes are fork tender. Uncover; turn the potatoes. Bake, uncovered, turning once halfway through baking, until the juice thickens, about 20 minutes. Sprinkle with salt.

**Salad Cravings...**

**Sweet Potato Salad**

4 cups shredded raw sweet potato  
 1 medium apple, unpeeled and chopped  
 ½ cup chopped pecans  
 ¾ cup mayonnaise  
 2 Tablespoons lemon juice  
 2 Tablespoons sugar  
 ¼ teaspoon salt  
 ¼ teaspoon pepper

Combine sweet potatoes, apple and pecans; stir well. Combine remaining ingredients in another bowl and pour over potato mixture. Stir well. Cover and chill. 6-8 servings

**Tossed Sweet Potato Salad**

½ cup low-fat cottage cheese  
 1 Tablespoon plain low-fat yogurt  
 1 Tablespoon Dijon mustard  
 ½ teaspoon balsamic vinegar  
 ½ teaspoon sugar  
 2 cups cooked ham, cut into thin strips  
 2 cups cooked sweet potatoes, peeled and diced  
 2 large stalks celery, thinly sliced

Blend the first 5 ingredients in a blender or processor at high speed for about 20 seconds. Place ham, sweet potatoes and celery in bowl. Pour dressing over and toss gently to mix. 4 servings

**Grilled Cravings...**

**Sweet Potatoes on the Grill**

Wrap medium-size sweet potatoes individually in heavy duty aluminum foil. Place on grill, about 5 inches from coals. Cook approximately 45 minutes, until tender.

**Easy Grilled Sweet Potatoes**

Slice sweet potato lengthwise into ¼ inch thick slices. Brush with olive oil. Place on grill. Cook, turning once. Remove when tender.

**Honey Grilled Sweet Potatoes**

2 large sweet potatoes, halved lengthwise  
 2 Tablespoons butter, softened  
 garlic salt and pepper to taste  
 2 teaspoons honey

Cut two pieces of heavy-duty aluminum foil; place a potato half on each. Spread cut side with butter. Sprinkle with garlic salt and pepper. Top each potato with another half. Fold foil over potatoes and seal tightly. Grill, covered, over medium-hot heat for 30 minutes or until tender, turning once. To serve, fluff potatoes with a fork and drizzle with honey.

*Compliments of the Mississippi Sweet Potato Council*  
 For more recipes, go to [www.mssweetpotato.org](http://www.mssweetpotato.org)

# STONE COUNTY SPECIALTY CROP OUTREACH AND TRAINING WORKSHOPS

## Project Summary

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The purpose of the project, implemented by the Mississippi Coastal Plains Resource Conservation & Development Council, Inc. (MCPRC&DC), was to provide an opportunity for current local producers to utilize a new commercial kitchen to create value added products and job opportunities as well as encourage new producers to utilize their resources for new specialty crop production in the area. This project would potentially compliment the new commercial kitchen facility in the area as well as create new job opportunities. Job creation and development of value-added products in the new kitchen facility were the full focus of the project. Both goals were very timely during the current economic conditions in the community.

This project did not build upon previously funded SCBGP projects.

## Project Approach

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On March 10, 2011, an Entrepreneur and Gardening Workshop was held; 15 participants were present in addition to 4 speakers. Agenda items included business development and financial management for small businesses and opportunities and assistance available through the Small Business Development Office for South Mississippi. The other portion of the event included local gardening and specialty crop production techniques that had been successful in the area in hopes to encourage others to try production of specialty crops as a potential job opportunity. Speakers included MSU Extension specialists, the business director from South Mississippi Planning and Development, Mississippi Development Authority, and a local successful specialty crop producer.

In June 2011, the council hosted a High Tunnel Field Day that was attended by 80 producers and potential producers. This workshop detailed the development and production of a high tunnel and production potential as well as cost-share assistance available. Speakers included representatives from MSU Extension, USDA NRCS, and local retailers for irrigation and construction materials. They each detailed tasks involved in high tunnel construction and production as well as answering questions from potential producers.

On August 18, 2011, there were 16 participants that attended a Marketing and Nutrition workshop geared to introduce consumers to local producers of specialty crop items. Speakers were local experts from MSU Extension and local medical professionals. This workshop encouraged the development of more specific focused workshops in the spring of 2012 to provide peer to peer influence for production ideas and marketing ideas.

A Mississippi Market Ready Workshop was held in July 2012 in Biloxi, MS. This full one-day workshop educated 20 participants in marketing of products and they were able to network with other producers in the area. Other partners in this workshop included Harrison County Soil and Water Conservation District, Mississippi State University Extension, and MSU Research. The Mississippi Market Ready Workshop was an excellent opportunity for producers and potential producers to network, receive information on marketing strategies and resources available, and how to use existing marketing tools to sell their specialty crop products, improve their markets, and make assessments of market demands and how to meet those demands locally. This was the last workshop that came to fruition as other workshops were planned, but failed to materialize.

The approach was to research with existing producers and consumers their needs in the specialty crop area and provide workshops and training as needed in the areas targeted by these producers. The plan involved five current producers and a goal for establishing five new producers. However, council staff changed drastically in April 2011, December 2011, and again in November 2012 to the point that there was not a sufficient staff available to implement the project as planned; funds were relinquished back to the State Department of Agriculture.

## Goals & Outcomes Achieved

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The council utilized the grant to organize and host four workshops:

1. On March 10, 2011, a total of 15 participants and four speakers gathered for an Entrepreneur and Gardening Workshop. The feedback was very positive and the potential for future workshops appeared to be successful. This was planned as an introduction to the program and used to gather feedback for the need for future workshops. Items requested to be covered included more information on fruit production, winter garden crops, and value-added products using the local commercial kitchen.
2. In June 2011, the council hosted a High Tunnel Field Day that was attended by 80 producers and potential producers. It was an excellent opportunity for networking with existing and new producers in the area. This field day yielded four new high tunnel owner/operators that would begin production the following season.
3. On August 18, 2011, there were 16 participants that attended a Marketing and Nutrition workshop geared to introduce consumers to local producers of specialty crop items. Speakers were local experts from MSU Extension and local medical professionals. This workshop encouraged the development of more specific focused workshops in the spring of 2012 to provide peer to peer influence for production ideas and marketing ideas.
4. On July 29, 2012, the council co-sponsored a MS Market Ready Event in Biloxi, MS. There were 20 participants that had a great opportunity to network with each other as well as learn about marketing opportunities available to assist existing and new specialty crop businesses. The presenters were from Mississippi State University

Agricultural Economic Department and Food Science Department. Many on-line resources were shared and promotional opportunities offered by MDAC were made available to producers and potential producers as well.

Projected outcomes were achieved for the events completed. There were a total of 131 participants in the four workshops completed which far exceeded any expectations originally planned. There were four new high tunnels constructed as a result of the workshops which created four new specialty crop producers in the area; however, no follow-up events were planned or completed. Unfortunately, these four workshops were planned to be a catalyst for future workshops; however, since no staff members were available to complete any future workshops, the final goal was never met.

## **Beneficiaries**

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There were 131 individuals that benefitted from information provided during the events completed. There were four new high tunnels constructed as a result of the workshops. The economic impact potential from those alone was a minimum of four new jobs created to give four families potential additional income. These producers would also provide more locally grown foods in the area that would provide a better, more affordable food to area residents. The information from the local gardening expert and MSU Extension specialists also provided timely, economical ideas for all individuals and producers to benefit from growing specialty crops on a small scale.

## **Lessons Learned**

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The workshops completed revealed the need and desire of local producers and potential producers for the planned projects. Each workshop that was held had very positive feedback for the need for additional information and training. An unexpected outcome was the interest in construction of high tunnel structures. When the grant was written very little was known in the area, but this grant enabled a tremendous opportunity to educate producers on alternative production methods.

The main problem and delay with this grant was the change in personnel and the ability for the council to adjust in a timely manner. The Council truly saw the potential benefit for the projected goals, but was unable to meet those expectations. Council staff changed drastically over the course of this grant period: in April 2011, December 2011, and again in November 2012. This caused tremendous delays as there was not sufficient staff available to implement the project as planned; funds were relinquished back to the State Department of Agriculture.

## Contact Person

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# OAKLEY TRAINING SCHOOL GARDEN PROJECT

## Project Summary

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The obesity rate for children in Mississippi is the highest in the nation. The number of children overweight and/or obese was at such an alarming rate that, in 2006, the Mississippi Legislature instructed the Department of Education to develop a wellness curriculum for use by each school district and established rules and regulations for districts to follow in implementing the curriculum.

Studies of children have repeatedly shown that disruptive and even violent behavior can be dramatically altered simply by changes to their diet. Evidence shows that children who are physically active and fit tend to perform better in the classroom, and daily physical education does not adversely affect academic performance. In fact, over the years, poor eating and lack of physical education has been consistently linked to anti-social behavior, aggression, and even juvenile crime. The purpose of the Oakley Youth Opportunity Garden Project was to expose juveniles detained at the facility to the benefits of healthy eating and healthy living. It was also our hope that this project would serve as a model for other secured facilities throughout the state.

The Attorney General's Office sponsored a site visit to Multnomah County (Portland), Oregon Juvenile Justice Center for local and state juvenile justice stakeholders involved in the Annie E. Casey Foundation Juvenile Detention Alternatives Initiative. In Multnomah County (Portland), Oregon, a garden project was implemented as an alternative to detention. The garden project had tremendous success in Multnomah County. In conjunction with the garden project, Multnomah County also changed the daily dietary menu for youth incarcerated. This change resulted in less disruptive altercations among youth and less confrontations between youth and staff because of behavioral outbursts. During this time, the Oakley Youth Opportunity Center felt this was a great opportunity and tool to utilize in rehabilitating juveniles detained at the facility.

This project did not build upon previously funded SCBGP projects.

## Project Approach

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### Year one:

On June 15, 2011, Attorney General Jim Hood, then Department of Human Services Executive Director, Don Thompson, and then Superintendent of Education, Tom Burnham, announced a new joint effort, the Oakley Youth Development Center Garden Project. During the official unveiling, youth showcased the beginning results of their work, by picking the first crop from the garden. The first crop included okra, tomatoes, squash, peppers, blueberries, and melons.

The Partnership for a Healthy Mississippi and the Mississippi Department of Education provided training to students on nutrition and healthy eating and living. Since many of the students were not detained at the facility for an extended length of time, no physical outcomes, such as change in weight were able to be measured.

Initially, there were three garden plots identified to use for the project and soil samples were taken from each plot. Mississippi State University Extension Service with assistance from the Rankin County Cooperative Extension Service processed the soil samples and provided the facility with results and feedback. Results were analyzed and recommendations were given based on the pH levels of the soil and fertilizer needs to make the plot successful. Recommendations were also provided for insect control once crops had established. The facility decided to utilize only one of the selected garden plots. This plot was near one of the greenhouses located on campus. This made it convenient to house the plants until students could actually plant them in the garden. The facility began preparing the garden by bush hogging and tilling the plot. Mr. Bryant, the Career and Technical Education teacher, instructed students on the operation of the manual garden equipment, such as: tillers, garden hoes, and other small garden tools.

During this first year, students sold crops to staff and others, making \$244.75 that was put back into the project to purchase needed items. In addition, the crops yielded enough food to feed 62 students a day for approximately 12 weeks.

### **Year Two:**

During the second year, students played a major role in selecting the types of specialty crops to plant. Students planted and harvested greens, lettuce, onions, cabbage, peas, squash, cucumbers, green and yellow peppers, banana peppers, tomatoes, watermelons, and egg plants. Students were engaged and took pride in their work, especially a watermelon that weighed more than 50 pounds!

The youth were trained from the state approved curriculum for Custodial Caretaker as advised by the Partnership for a Healthy Mississippi. Mr. Bryant used his 30 years of agriculture experience, the Custodial Caretaker Curriculum, and internet resources pertaining to nutrition and healthy growing and eating to teach his students how to grow and care for specialty crops. Students were instructed on the planting and growing process, from the planting, nourishing, cultivating, and harvesting stages. The main focus of the class was to demonstrate to students the benefit of growing healthy non-pesticide crops.

Students participating in the garden project selected a specific crop as a project to care for and grow from the seedling stage to the harvesting stage. The greenhouse was used to begin the growing process. Seedlings were planted in the greenhouse and were transplanted once they established. The garden instructor guided the students throughout this entire process.

Students were so involved; they competed against one another to see whose crop produced the highest yield.

The crops yielded enough food to feed approximately 75 students, in addition to some staff. This also necessitated the need to purchase a freezer to store the excess food. In addition, the facility purchased much needed supplies, such as, a tiller, planter, cultivator, and field trimmer.

### **Year Three:**

Unfortunately, excessive rain destroyed approximately 75% of the spring 2013 crops. However, the students began replanting as soon as the weather permitted. Crops harvested included collards, turnip and mustard greens, cabbages and onions. The students also began cultivating peach and apple fruit trees and were maintained in the greenhouse until they matured for planting outside.

The Partnership for a Healthy Mississippi and Mississippi Department of Education provided excellent and valuable training to students. The students were asked about their eating habits and knowledge on basic nutrition. At the end of the training session, the students were given a quiz to determine if they retained the knowledge. The students participated in a short exercise activity relating to various daily body movement exercises that would promote a healthy lifestyle.

The students also took a field trip to Alcorn State University to learn about land-grant institutions and to gain a better understanding about gardening from a global perspective. They were able to visit the research center, extension service, and other interesting areas around campus. The highlight of the trip was the information they received about how much the world economy depends on colleges and universities for research on the food that we eat daily. The students got an opportunity to eat in the university cafeteria, which they thoroughly enjoyed. Youth participated in another field trip to Crystal Springs, MS where they toured the Mississippi State University Truck Crops Experiment Station. The students experienced some of MSU's research projects first-hand of growing specialty crops in greenhouses, high tunnels, and various other production methods. The students learned how the research at these universities supports all growers in MS.

A comprehensive report documenting the project was created and published with the grant funds. This report will be shared with other youth secured facilities as a potential project that aids in the well-being of the youth.

The partners have played a major role in the success of the garden project. A representative from each partner agency was in attendance during the unveiling of the garden project. The partners included: Office of the Attorney General; Mississippi Department of Human Services-Division of Youth Services; Partnership for a Healthy Mississippi; Mississippi Department of Education; Mississippi Department of Agriculture and Commerce; Mississippi State University Extension Services; and Hinds County Sheriff's Office. All partners have worked closely together

to make this garden project a success. The Mississippi Department of Education, Office of Healthy Schools assisted cafeteria staff and students in learning about the different crops raised and the different nutritional options in preparing food. The Partnership for a Healthy Mississippi and Mississippi Department of Education provided healthy eating and healthy living presentations and trainings to the youth. The Mississippi State Extension Services played a vital role in testing the soil and assisting the staff and students in selecting the right crops. The Hinds County Sheriff's Office assisted in making needed equipment available for use in maintaining the garden.

## Goals and Outcomes Achieved

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Students gained and increased their knowledge of agriculture through the Mississippi Department of Education's Custodial Caretaker Curriculum, training sessions provided by the Partnership for a Healthy Mississippi, field trips made to Alcorn State University and the MSU Truck Crops Experiment Station, and the actual hands-on care of the garden.

While the Oakley Youth Development Center is located a large agricultural plot, the land was never utilized to produce vegetables for the facility until the Garden Project was implemented. The project got off to a slow start due to limited resources. Therefore, the benchmark set was from the crop yield from the first year. During the first year (2011), students planted only six crops including: okra; tomatoes; squash; peppers; blueberries; and watermelons. The blueberries did not produce a crop, as it typically takes two-three years for blueberry bushes to yield berries. However, the okra, tomatoes, squash, peppers, and melons produced enough to feed 62 students for approximately 12 weeks. In the second year (2012), students increased the number of crops to 11 including: greens; lettuce; onions; cabbage; peas; squash; cucumbers; peppers; tomatoes; watermelons; and eggplant. This represented an 83% increase in the number of crops planted. The crops yielded enough to feed 75 students; this represented a 21% increase in the number of students feed with the crops planted. During the third year (2013), the excessive rain destroyed approximately 75% of the spring crops, so this had an impact on the amount of food yielded from the crops. The students were able to harvest the greens, cabbages and onions. They also added two additional crops, peach and apple fruit trees. These were maintained in the greenhouse until the appropriate planting time. The progress from the third year could not be calculated due to the timing of the harvest and the lack of control over the weather. The target to increase the number of crops by 10% was achieved from 2011 to 2012 as planned.

The second goal was to increase the student knowledge of healthy eating and living through the work of this project. When the initial benchmark was established, the length of time each student would be detained at the facility was not taken into consideration. While there are students at the facility year round, they may not be there the entire year; it is often different student throughout the year. The Partnership for A Healthy Mississippi and the Mississippi Department of Education were not on the campus fulltime, so when they came to conduct

activities, the same students were often not in attendance. However, each student attending the different activities was given a post-test to test their knowledge of what was presented. Students taking the post-test demonstrated comprehension of the materials presented. Over the three year period, 40 students participated in the Garden Project. Through the Custodial Caretaker Curriculum and presentations from the Partnership for a Healthy Mississippi and Mississippi Department of Education, students gained knowledge on every aspect of gardening and the impact growing healthy non-pesticide foods has on their lives.

The outcome measures were not defined as long term; however, we feel certain that those youth participating in the project will take what was learned and apply it to their everyday life. The students sold crops to staff and others, generating income that was put back into the project to maintain existing crops and for planting crops in the upcoming growing season. In addition, the crops yielded enough food to feed 62 students a day in for approximately 12 weeks in 2011 and 75 students in 2012.

Staff at the facility reported that students participating in the gardening and the healthy eating and living exercises showed improvement in their aggressive behavior and they experienced fewer disruptions while being detained.

The only baseline data that is evident for this project is that the youth did not have an outlet such as gardening, prior to implementing this project. While the Oakley campus is on a beautiful and spacious parcel of land, it was not being utilized for the purpose of gardening. Prior to participating in the project, youth did not have a structured knowledge of gardening and the impact foods have on your body both physically and emotionally. Through the structured learning environment created by the implementation of the Custodial Caretaker Curriculum and activities provided by the Partnership for a Healthy Mississippi and the Mississippi Department of Education, students were able to advance their knowledge of eating healthy and living healthy.

## **Beneficiaries**

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The youth and staff at the Oakley Youth Development Center benefited the most from the project. The benefits gained by students included learning healthy living and healthy eating habits; learning how to plan and execute goals; accepting responsibility; learning the concept of entrepreneurship; learning how to operate tools properly; and being able to transfer the knowledge learned at the facility to their communities when they return. The 40 students participating in the garden project not only learned how to cultivate and harvest specialty crops properly but also exhibited less aggressive behavior.

The students and staff expressed the following testimonials regarding the project:

- “I have really enjoyed working in the garden. Working in the garden has influenced me in planning to start my own garden when I return home.”

- “I feel that the garden project at Oakley was a life experience. It taught me how important it is to know how to grow your own food.”
- “I feel that agriculture and horticulture is a big part of life. Planting fruits and vegetables is like seeing a child at birth and seeing it grow up to be a mature adult.”
- “We at the cafeteria enjoyed the fresh fruits and vegetables from the garden.”
- “We had the sweetest and best watermelons during the growing season. We hated when the season ended.” (Director of Food Services)
- “I am well pleased with the affect that the garden project had on my student’s wiliness to learn about gardening. They have learned how the food chain affects our economy.” (Mr. Bryant, Custodial Caretaker Instructor).

The Oakley Youth Opportunity Center also benefited by saving them money in food costs. The Center reported it saved approximately \$5,000.00 in food costs due to the amount of food harvested from the garden. The food was enough to serve 75 students and staff at various times throughout this grant period.

## Lessons Learned

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A concern with operation of a garden project at this secured facility was the lack of weekend security staff for the students to work the garden after normal work hours. At the Oakley Youth Opportunity Center, the Custodial Caretaker Instructor only worked during the weekday hours. The weekend staff had a limited knowledge of gardening and could not assist the students. As a result, there was very little gardening completed on the weekends.

The project itself had a positive impact on participating youth. It provided them with a sense of pride and accomplishment. The students become so involved and the amount of produce harvested was unexpected, and contributed substantially to the meals at the facility.

Overall, the goal of the Oakley Youth Opportunity Center Garden Project was attained. The Oakley Youth Opportunity Center houses approximately 65 youth. Due to the state requirements, costs, and resources, most assuredly, these are youth with the most serious offenses. Typically, these youth require intense rehabilitation. The garden project was a means to supplement the mandatory rehabilitative services provided by the facility for some of these youth by providing them with an alternative outlet. Through the garden project, 40 youth participated in healthy behavioral modification programs, healthy eating programs, and exercise programs. They were involved in every aspect of the gardening process; they unknowingly applied educational tools, such as math, science, reading, and astronomy in planning and maintaining the garden. This project has given them valuable skills, which will benefit them when they return to their communities and could lead to employment and being productive citizens. The success of the project at the Oakley Youth Opportunity Center has led

to the nearby center, Rankin County Youth Detention Center, to replicate the project in its detention facility.

## Contact Person

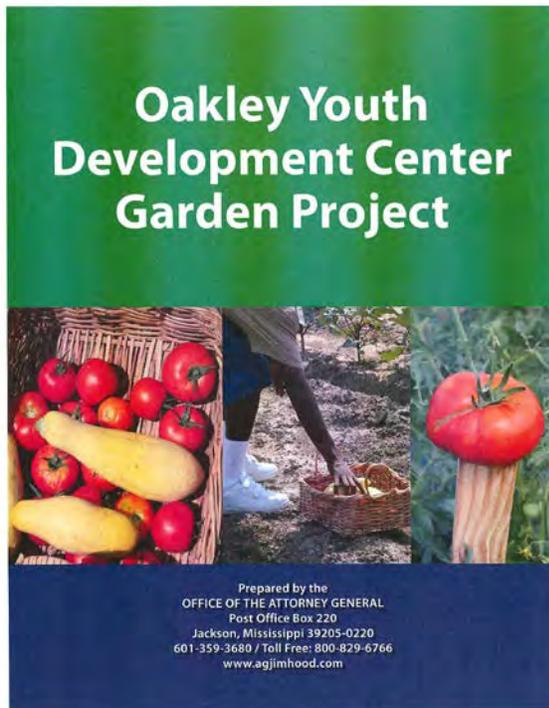
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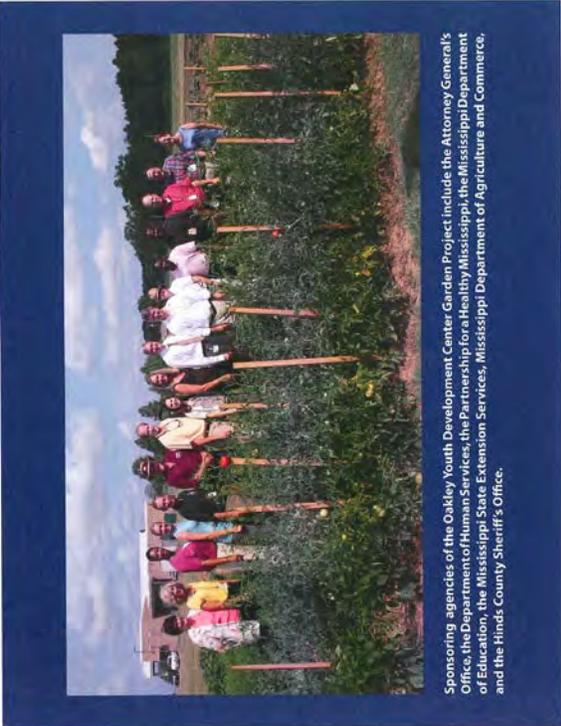
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## Other Information

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Guide created to disperse to other juvenile detention centers:





Sponsoring agencies of the Oakley Youth Development Center Garden Project include the Attorney General's Office, the Department of Human Services, the Partnership for a Healthy Mississippi, the Mississippi Department of Education, the Mississippi State Extension Services, Mississippi Department of Agriculture and Commerce, and the Hinds County Sheriff's Office.

## THE BEGINNING

On July 16, 2010, The Office of the Attorney General submitted a grant application to the Mississippi Department of Agriculture and Commerce in response to a funding announcement through the Specialty Crop Block Grant Program. The purpose of the grant would be to implement a garden project at the Oakley Youth Development Center. On October 26, 2010, the Department of Agriculture and Commerce awarded the Office of the Attorney General a \$17,300.00 grant to implement a garden project at the Oakley Youth Development Center.

The Oakley Youth Development Center provides institutional care to delinquent juveniles committed to the Mississippi Department of Human Services, Division of Youth Services. It is located in Hinds County, Mississippi near Raymond. It is Mississippi's only state funded detention facility for delinquent youth committed to the State's custody.

The idea of a garden project at the Oakley Youth Development Center came about after staff with the Office of the Attorney General and other local and state level juvenile justice stakeholders participated in a site visit to Multnomah County (Portland), Oregon Juvenile Justice Facility. This site visit was made possible through a grant with the Annie E. Casey Foundation Juvenile Detention Alternatives Initiative (JDAI). In Multnomah County (Portland), Oregon, a garden project was implemented as an alternative to detention. The garden project has been a tremendous success in Multnomah County. In conjunction with the garden project, Multnomah County also changed the daily dietary menu for youth detained. This change resulted in less disruptive altercations among youth and less confrontations between youth and staff because of behavioral outbursts. Multnomah County continues to prove that healthy eating and healthy living can modify behaviors.

The Office of the Attorney General knew it would take a collaborative effort to make the garden project a success, so it called upon other state agencies to commit to the project. Those that signed on as partners of the project were the Mississippi Department of Human Service Division of Youth Services, Partnership for a Healthy Mississippi (PHM), Mississippi Department of Education, Mississippi Department of Agriculture and Commerce, Mississippi State Extension Services, and Hinds County Sheriff's Office.



## THE PROJECT PURPOSE

Studies of children have repeatedly shown that disruptive and even violent behavior can be dramatically altered simply by changes to diet. Evidence shows that children who are physically active and fit tend to perform better in the classroom, and daily physical education does not adversely affect academic performance. In fact, over the years, poor eating and lack of physical education has been consistently linked to anti-social behavior, aggression and even juvenile crime.

According to a report released by the Robert Wood Johnson Foundation, the obesity rate for children in Mississippi is the highest in the nation. The number of children overweight and/or obese was at such an alarming rate that, in 2006, the Mississippi Legislature instructed the Department of Education to develop a wellness curriculum for use by each school district and establish rules and regulations for districts to follow in implementing the curriculum. The Oakley-Williams School is under the Division of Youth Services School District, which is a school district approved by the Department of Education as an accredited non-public school serving boys and girls in separate programs. It too was required to adhere to the requirements of the wellness curriculum.

The Garden Project would expose juveniles detained at the Oakley Youth Development Center to the benefits of healthy eating and healthy living. Youth would realize the benefits of healthy eating and healthy living on their physical and psychological well-being through a facility-based hands-on process of selecting, planting, cultivating, growing and harvesting their own specialty crops. In addition, it was our hope that this project would serve as a model for other secured facilities throughout the state.

STATE OF MISSISSIPPI

JIM HOOD  
ATTORNEY GENERAL

**State Leaders Join Forces to Implement Garden Project at Oakley**  
June 15, 2011

(JACKSON, MS) – Attorney General Jim Hood, Department of Human Services (MDHS) Executive Director Don Thompson and Superintendent of Education Tom Burtrick have joined forces with a host of other partners to implement a garden project for students at the Oakley Training School in Raymond.

As a result of the project, also sponsored by the Partnership for a Healthy Mississippi, Mississippi State Extension Services and the Hinds County Sheriff's Office, it takes place for members of the press-media TODAY at 10am at the garden site on the grounds of Oakley Training School in Raymond.

Through the garden project, students are given the opportunity to contribute in a gardening experience from start to finish. They will participate in behavior modification programs to encourage healthy eating and living, learn how to add fresh vegetables to their diet and see the importance of exercise for their overall health and well-being. The staff at Oakley is overseeing the garden project and incorporating the curriculum into the youths' studies.

"The youth are involved in this every step of the way," said Attorney General Hood. "They have decided what crops to grow and they have the responsibility of planting, cultivating and harvesting what they grow." This first crop includes okra, tomatoes, squash, peppers, blueberries and melons.

"The Mississippi Department of Human Services is delighted to partner with the Attorney General's office, the Department of Education and our other community partners to bring the principles of gardening and the importance of healthy eating to the students at Oakley," said MDHS Executive Director Don Thompson.

The broad collaboration of state partners is key to the success of the project and is providing funding, staff information on gardening basics, educational publications and curriculum on healthy eating and living, planting supplies and soil testing.

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## YEAR ONE



The Office of the Attorney General entered into a Memorandum of Understanding with the Mississippi Department of Human Services, Division of Youth Services to implement the garden project at Oakley Youth Development Center. On June 15, 2011, Attorney General Jim Hood, then Department of Human Services Executive Director Don Thompson and then Superintendent of Education Tom Burnham announced a new joint effort, the Oakley Youth Development Center Garden Project. During the official unveiling, youth showcased the beginning results of their work, by picking the first crop from the garden. The first crop included

okra, tomatoes, squash, peppers, blueberries and melons.

The Mississippi Partnership for a Healthy Mississippi and the Mississippi Department of Education provided training to students on nutrition and healthy eating and living. Since many of the students are not detained at the facility for an extended length of time, no physical outcomes, such as, change in weight were measured.

Initially, there were three garden plots identified to use for the project. Soil samples were taken from the plots. The Mississippi State Cooperative Extension Services, with assistance from the Rankin County Cooperative Extension Services processed the soil samples and provided the facility with results and feedback. They analyzed the results and provided recommendations as to PH Levels and fertilizer needs. They also provided recommendations on the control of insects on the crops once they were at the proper stage of growth.

The facility decided to utilize only one of the selected garden plots. This plot was near one of the greenhouses located on campus. This made it convenient to house plants until students could actually plant them in the garden. The facility began preparing the garden by bush hogging and tilling the plot. Mr. Bryant, the Career and Technical Education teacher, instructed students on the operation of the manual garden equipment, such as, tillers, garden hoes, and other small garden tools.

During this first year, students sold crops to staff and others, making \$244.75 that was put back into the project to purchase needed items. In addition, the crops yielded enough food to feed 62 students a day for approximately 12 weeks.



## YEAR THREE

Unfortunately, excessive rain destroyed approximately 75% of the Spring crops. However, the students began replanting as soon as the weather permitted. They were able to harvest the collard, turnip and mustard greens, cabbages and onions. They decided to plant peach and apple fruit trees, which were maintained in the greenhouse until they could be planted.

The Partnership for a Healthy Mississippi and Mississippi Department of Education provided an excellent and valuable training to students. The training was very interactive. The students were asked about their eating habits and knowledge on basic nutrition. At the end of the training session, the students were given a quiz to determine if they retained the knowledge. The students also participated in a short exercise activity relating to various daily body movement exercises that would promote a healthy lifestyle.

The students took a field trip to Alcorn State University to learn about land-grant institutions and gain a better understanding about gardening from a global perspective. They were able to visit the research center, extension service and other interesting areas around campus. They saw the swine research lab and other animals on campus that the University is doing research on. The highlight of the trip was the information that they received about how much the world economy depends on colleges and universities doing research on the food that we eat daily. The students got an opportunity to eat in the university cafeteria, which they thoroughly enjoyed.



## YEAR TWO



During the second year, students planted and harvested greens, lettuce, onions, cabbage, peas, squash, cucumbers, green and yellow peppers, banana peppers, tomatoes, watermelons, and egg plants. One of their proudest crop items was a more than 50 pound watermelon. The students played a major role in selecting the types of crops to plant.

Mr. Bryant, the Career and Technical Education Instructor, used his 30 years of agriculture experience, the Custodial Caretaker Curriculum, and internet resources pertaining to nutrition and healthy growing and eating to teach his students how to grow and care for crops. Students were instructed on the planting and growing process, from the planting, nourishing, cultivating and harvesting stages. The main focus of the classes was to demonstrate to students the benefit of growing healthy non-pesticide crops.

Students participating in the garden project selected a specific crop as a project to care for and grow from the seedling stage to the harvesting stage. The greenhouse was used to begin the growing process. Once the seed in the greenhouse matured enough to be transplanted into the garden, the students transplanted that crop to the garden plot. The garden instructor guided the students through this entire process. They competed with each other to determine whose crop would produce the highest yield.

The crops yielded enough food to feed approximately 75 students, in addition to some staff. This also necessitated the need to purchase a freezer to store the excess food. In addition, the facility purchased much needed supplies such as a tiller, planter, cultivator and field trimmer.

## TESTIMONIALS

Various students and staff made comments pertaining to their experiences with the garden project. The comments from students include, but are not limited to, the following:

- “I have really enjoyed working in the garden. Working in the garden has influenced me in planning to start my own garden when I return home.”
- “I feel that the garden project at Oakley was a life experience. It taught me how important it is to know how to grow your own food.”
- “I feel that agriculture and horticulture is a big part of life. Planting fruits and vegetables is like seeing a child at birth and seeing it grow up to be a mature adult.”



The comments from staff included, but not limited to, the following:

- “We at the cafeteria enjoyed the fresh fruits and vegetables from the garden.”
- “We had the sweetest and best watermelons during the growing season. We hated when the season ended.” (Director of Food Services)
- “I am well pleased with the affect that the garden project had on my student's wiliness to learn about gardening. They have learned how the food chain affects our economy.” (Mr. Bryant, Custodial Caretaker Instructor)

## SUMMARY



Those students working in the garden enjoyed it so much that they influenced other students on campus to get involved and learn the art of gardening. There were 40 students, eight females and 32 males that participated in the three-year project. The benefits gained by students included learning healthy living and healthy eating habits; learning how to plan and execute goals; accepting responsibility; learning the concept of entrepreneurship; learning how to operate tools properly; and being able to transfer the knowledge learned at the facility to their communities when they return.

There were some obstacles to having the garden project at a secured facility. The lack of weekend security staff for the students to work the garden after normal work hours would usually be an issue. At the Oakley Youth Opportunity Center, the Custodial Caretaker Instructor only works during the weekday hours.

The weekend staff had a limited knowledge of gardening and could not assist the students. So, there was very little gardening done on the weekends.

Overall, the goal of the Oakley Youth Opportunity Center Garden Project was attained. The Oakley Youth Opportunity Center houses approximately 65 youth. Because of the state requirements, costs, and resources, most assuredly, these are youth with the most serious offenses. Typically, these youth require intense rehabilitation. The garden project was a means to supplement the mandatory rehabilitative services provided by the facility for some of these youth by providing them with an alternative outlet.

According to a report by the Annie E. Casey Foundation, 50% to 80% of youth released from juvenile detention facilities are rearrested within two to three years, even those who were not serious offenders prior to their commitment. Youth who end up confined in secured facilities suffer some of the worst odds of long-term success of their peers.

Through the garden project, 40 youth participated in healthy behavioral modification programs; healthy eating programs, and exercise programs. They were involved in every aspect of the gardening process; they unknowingly applied educational tools, such as, math, science, reading, and astronomy in planning and maintaining the garden. They will take with them valuable skills, which will benefit them when they return to their communities and could lead to employment.

### Oakley students show green thumbs

By Jennifer E. Galen  
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**RAYMOND** — Jalapeno and tomatoes are hanging from vines, squash and okra are visible and a couple of melons are growing.

This garden isn't the work of a farmer or homemaker. It's the project of students at Oakley Training School near Raymond.

Some juvenile offenders at Oakley now are growing the vegetables they and other juveniles eat at the training school.

A gardening project is included as part of Oakley's vocational training program, state Department of Human Services Executive Director Dan Thompson said.

DHS oversees the training school, which houses 62 males and five females in separate areas.

"They volunteer for it,"



The garden at Oakley Training School.

Thompson said of the roughly six students participating in the project. "It teaches them about horticulture."

Three of the students who took part in the first garden project learned with enrollment Wednesday when officials, including Thompson and state Attorney General Jim Hood, unveiled the project.

But the students weren't allowed to talk to the media or have photos taken because of privacy concerns.

The attorney general's office received a \$17,500 grant from the state Department of Agriculture and Commerce for the three-year gardening project.

Gloria Sabers, who wrote the grant proposal for the attorney general's office, said the grant money will be used primarily to purchase seeds for the garden.

If the gardening project proves successful, it could be expanded to produce vegetables for sale to the public, Thompson said.

Hood said the program is significant in that it teaches young people how to grow and nourish things.

The students plant, cultivate, grow and harvest the crop.

The Clarion Ledger  
June 16, 2011



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Project made possible by the Mississippi Department of Agriculture and Commerce Specialty Crop Block Grant Program.

# THE USE OF ERICOID MYCHORIZAL FUNGI ON BLUEBERRIES TO INCREASE UPTAKE OF SOIL NUTRIENTS

## Project Summary

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This research project was initiated to generate data on the effect of Ericoid Mychorizal Fungi (EMF) on soil nutrient uptake of rabbiteye blueberry plants inoculated with EMF and grown with and without inorganic fertilizers. The rationale was that such data may assist the blueberry industry in MS in producing high yield of high quality blueberries with minimal input of inorganic fertilizers. In addition, low input costs will result in increased economic returns.

This research was timely for the blueberry industry in Mississippi because costs of inorganic fertilizers are high, therefore reducing net economic return for growers. The use of Ericoid Mychorizal Fungi would reduce such costs and give growers an economical advantage. In addition, mychorizal fungi are environmentally friendly. Furthermore, there is a growing dependency for organically produced blueberries and Ericoid Mychorizal Fungi would aid in mineral uptake, thus reducing the need for inorganic fertilizers.

This project did not build upon previously funded Specialty Crop Block Grant projects.

## Project Approach

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Three-year old rabbiteye blueberry plants of 'Tifblue' and 'Climax' were used in the study. Plants inoculated with EMF were grown with and without inorganic fertilizer at four locations: Data collected included: amount of root colonization by EMF; plant growth; nutrient uptake; and fruit yield. In addition, efforts to educate growers and farm managers, workshops and on-site visits were conducted in conjunction with scheduled field days and grower meetings.

Rabbiteye varieties of 'Tifblue' and 'Climax' were purchased from area nurseries in Mississippi. The EMF was propagated and cultured in the laboratory. Initial inoculation of the fungi was conducted on blueberry plants in their containers in 2011; leaf samples from all plants were taken and sent to the soil testing laboratory at MSU for mineral analysis. Land for transplanting was prepared in the four locations in Mississippi: Verona, MS; USDA/ARS in Poplarville, MS; Crystal Springs, MS; and Lorman, MS.

Plants were fertilized with triple thirteen fertilizer at all locations at the rate of 30 pounds of actual nitrogen per acre. Mature blueberry leaf samples from all locations were sampled in April 2012 for foliar analysis and sent to the MSU soil testing laboratory.

Blueberry plants were hand weeded and irrigated as needed. Leaf samples were taken monthly and sent to the MSU soil testing lab for mineral analysis. Root samples were monitored for the

growth of mychorizal fungi. A new method to quantify and to identify the fungi was initiated. Plants were harvested at two locations; Crystal Springs and Verona and berry yields were recorded. Harvest in Verona was on June 29 and July 13, 2012. The results from Verona showed that the mychorizal fungi treatments did not influence mineral uptake as compared to the control. In examining the roots for fungi, no fungi was detected on the mature plants.

Fruit growers were introduced to the project at the following meetings and field days:

- Verona, February 15, 2013 – Fruit growers meeting
- Verona, February 21, 2013 – Producers advisory meeting
- Raymond, February 26, 2013 – Producers advisory meeting
- Biloxi, February 25, 2013 – Commodity advisory council meeting
- Carrolton, March 19, 2013 – Fruit and vegetable meeting

Activities from May 2013 through August 2013 involved measuring plant growth in Crystal Springs and determining growth index ( $GI = \pi(w/2)^2 \times H = \text{height}$ ). Statistical analysis was conducted using SAS, Analysis of variance and LSD test to determine difference between treatment means. Results are listed in table 1. In addition, in Poplarville, sample plants from each treatment were uprooted and fungal growth expressed as a rating (1=no colonization, 5=full colonization) was determined. Results are listed in Table 2. Furthermore, leaf samples for mineral analysis were collected from Verona and sent to the soil testing laboratory, MS State University.

Table 1. The influence of mycorrhizal treatment on plant growth index of ‘Climax’ and ‘Tifblue’ blueberry, Crystal Springs, August 30, 2013.

Treatment <sup>x</sup>	Climax G.I.	Tifblue G.I.
OM <sup>y</sup>	137,935 a	255,587 a
PE	100,177 b	248,334 a
OM + PE	109,487 b	241,086 ab
Control	121,207 b	230,600 b

x OM=oidcodendron maius; PE=pezizella ericae; OM + PE = oidiendron maius + pezizella ericae

y Means in columns with the same letter do not differ significantly according to the LSD test, p=.05.

Table 2. The influence of mycorrhizal fungi treatment on ‘Climax’ and ‘Tifblue’ Blueberries on root fungi rating, Poplarville, August 2013.

Treatment	Climax			Tifblue		
	Whole Plant	Roots	Fungi Root Rating	Whole Plant	Roots	Fungi Root Rating
1	Yes	yes	5	Yes	Yes	5
2	Yes	Yes	3	Yes	Yes	5
3	Yes	Yes	4	Yes	Yes	3
4	yes	Yes	1	No	yes	1

Fungi root rating: 1= no colonization; 5= full colonization

Activities completed were analysis of nutrient uptake as influenced by the mycorrhizal fungi at four locations. In addition, plant growth and fruit yield were also recorded. Results on the above mentioned parameters are listed as follows.

Nutrient Uptake:

In 2012, in Poplarville, Iron (Fe) and Zinc (Zn) of ‘Climax’ were increased by oidcodendron maius (OM). The remaining treatments had no effect. In 2013, in Poplarville, Nitrogen (N) and sulfur (S) in ‘Tifblue’ were increased by oidcodendron maius (OM) plus Pezizella ericae (PE) and Phosphorus (P), Zn (zinc) and Copper (Cu) were increased by OM.

In Crystal Springs (2012), nitrogen (N) in ‘Climax’ was increased by all treatments (OM, PE, and OM+PE). In addition, Iron (Fe) was increased by PE, and Mg and boron (Bo) were increased by OM. In ‘Tifblue,’ nitrogen (N) was increased by OM. Cu was increased by all fungal treatments and Mg was increased by PE.

In Verona (2012), in ‘Climax,’ OM increased potassium (K), but decreased Ca, Mg, Mn, and B. In addition, Ca, Mg, Sulfur, Fe, and boron were decreased by PE. In addition, PE also increased P.

At Alcorn, 2012, OM increased Fe compared to the control and the remaining treatments had no effect.

Total Fruit Yield:

Crystal Springs: OM+PE increased total fruit yield of ‘Tifblue’ blueberry compared to the control. However, OM or PE alone decreased yield. Total fruit yield of ‘Climax’ was increased by PE. The remaining treatments had not effect.

The fungal treatments did not influence total fruit yield at Poplarville, MS, Verona, MS, or Alcorn State University.

### Growth Index

Growth Index ( $GI = \pi(w/2)^2 \times H$ ) as a measure of plant growth was taken on plants grown in Crystal Springs, results indicated that OM increased GI of 'Climax' and the remaining treatments had no effect. The GI of 'Tifblue' was increased by OM and PE.

### Root Colonization:

The amount of root colonization by EMF at Poplarville, MS was taken as a visual rating of 1-5 with 5 being complete colonization and 1 being no colonization. All plants treated had visual amounts of fungi compared to the control. The actual accomplishments which include the results reported above are consistent with the goals established for the reporting period.

A propagation method was developed for culturing the fungi. The inoculation method was modified to treat the plants in pots and then transplanted to the fields. This was the first time that inoculated blueberry plants have been studied under field conditions. In addition, data showed that nutrient uptake was cultivar dependent, and in some cases treatment dependent. However, in most instances, mineral uptake by the plants was enhanced by EFM. In addition, total fruit yield was increased in Crystal Springs and GI was increased in Poplarville, indicating the beneficial effects of the fungi.

## **Goals and Outcomes Achieved**

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The main goal of providing a cost-effective production system for the production of high quality blueberries using EMF is a long term goal. However, progress towards achieving this goal has been made; increased nutrient uptake by blueberry plants using EMF was achieved and reported. In addition, yield was not affected and plant growth was enhanced. There were no negative effects of EMF on blueberry production. The reduction in fertilizer and fertilizer application resulting in a cost-effective (cost savings associated with fertilizer use) blueberry production system is also long term and should be investigated, since yield was not decreased by EMF.

Through this project, 300 people have benefited through presentations, field days, and demonstrations, however, there are no reported growers that have adopted our findings in their blueberry production practices. On farm demonstrations to encourage use of EMF should be beneficial to encourage and show growers the benefits of EMF. Presentations of results will continue to be disseminated and research will hopefully find resources to continue.

## **Beneficiaries**

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Blueberry growers in MS will benefit from the findings of this project. Enhanced mineral uptake by the blueberry plants due to EMF will reduce the need for inorganic fertilizer and, thus result in increased economic returns for growers. In addition, the methodology developed to

propagate and inoculate field grown plants will benefit personnel involved in blueberry orchard management.

The number of people benefited through presentations, field days and demonstrations were 300. Presently, growers have not adopted our findings in their blueberry production practices. On farm demonstrations to encourage use of EMF should be beneficial to encourage and show growers the benefits of EMF.

## **Lessons Learned**

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This project was overly ambitious in that four locations were used for study. This increased the amount of labor required and labor wages were not included in the grant. However, it was determined that responses to EMF varied based on location, most likely due to the soil type and pH. Also, more than three years data would be required and would strengthen the project, since it took one year to propagate the fungi, inoculate the plants, and for the EMF to grow and proliferate on the plants roots. In addition, seminars and workshops were difficult to conduct since conclusive evidence of benefits from the EMF fungi was not available during the early stages of the project.

## **Contact Person**

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Dr. Frank B. Matta, Professor  
Mississippi State University  
662-418-9416  
[fmatta@pss.msstate.edu](mailto:fmatta@pss.msstate.edu)

# MS FARM TO SCHOOL

## Project Summary

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The Mississippi Department of Agriculture and Commerce (MDAC) and the Mississippi Department of Education (MDE) have effectively collaborated to supply locally produced fruits and vegetables into Mississippi schools since 2002. In 2012, the two agencies took the initiative to take the Farm to School program one step further, by incorporating a media event with the Governor and Commissioner of Agriculture to increase the educational awareness of the program. The response from the program was greatly received. Both MDAC and MDE publicized the 2012 Farm to School Week and the availability of resources to educators on the MDAC website, [www.farmtoschoolweek.org](http://www.farmtoschoolweek.org).

Mississippi has an increasing population of obese children and adults; many of which are not acquiring the daily recommended servings of fruits and vegetables. According to the National Farm to School Network, schools with a Farm to School program have seen an increase in children's participation in school meal programs and consumption of fruits and vegetables. The website developed at MDAC features various educational efforts and materials for educators and cafeteria personnel to incorporate into their Farm to School Week celebration and all year long. In order to build upon previous years, it is important to continue the educational efforts of the importance of fruits and vegetables.

The Farm to School program also increases marketing opportunities for local farmers. If there is a demand from local school systems to supply healthy options for lunch by including fruits and vegetables, this could potentially add to our state's specialty crop acreage and therefore increase Mississippi's specialty crop industry.

This project did not build upon previously funded SCBGP projects; however, MDAC was awarded a FY2013 Specialty Crop Grant that seeks to provide grants to schools interested in growing their own garden and will also provide additional funds, if needed, to print and develop additional posters or other materials. The 2013 Specialty Crop Grant will essentially build upon this project.

## Project Approach

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During the 2013-2014 school year Mississippi Farmers will be supplying schools with butterbeans, sweet potatoes, blueberries, cucumbers, collard greens, southern peas, eggplants, grape tomatoes, cucumbers, strawberries, Satsumas, and bell peppers. This is a total of twelve different specialty crops that will be consumed by school children all across the state. MDAC sought to increase the educational awareness of these particular Mississippi specialty crops by creating colorful and educational posters featuring these crops. MDAC worked with a graphic

designer to create eleven posters: one generic poster that included a variety of MS grown specialty crops and the other ten were educational posters featuring collard greens, eggplant, grape tomatoes, Satsumas, sweet potatoes, strawberries, butter beans, cucumbers, bell peppers, and blueberries. While MDAC worked with the designer for the posters, MDAC also sent out information at the beginning of September 2013 to all food service directors/child nutrition directors about Farm to School Week. The posters were detailed in this letter and available upon request, with other resources also available on the [www.farmtoschoolweek.org](http://www.farmtoschoolweek.org) website. A total of 73 school districts and schools requested posters for their classrooms or lunchrooms; over half of the posters, 5,176, have been dispersed. MDAC and MDE continue to hear appreciation of the posters and how they have been used to educate students of MS produce.

MDAC and MDE held joint meetings to discuss plans for the 2013 MS Farm to School Week, which was October 7-11, 2013. Plans were finalized to have a celebration on October 8, 2013 in the Vicksburg-Warren School District at Sherman-Avenue Elementary School. Four of our MS growers that supply MS schools with produce spoke to eight first grade classrooms. Also in attendance was the Commissioner of Agriculture and Commerce, MS Senate Agriculture Committee Chairman, MS House Agriculture Committee Vice-Chairman, and several officials from the City of Vicksburg.

The classes that hosted the special guests during MS Farm to School Week were given a set of posters for their classroom to learn about MS grown produce and students were also given bookmarks featuring MS produce. These classes were also given a pre- and post- test; the test was geared towards first graders to test their knowledge of fruits and vegetables grown in Mississippi.

A brochure was also created for both growers and schools. Information is detailed on how each party interested in the Farm to School program can get started. These brochures have been distributed to meetings and workshops around the state.

## **Goals & Outcomes Achieved**

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This pilot program proved to be successful at Sherman-Avenue Elementary School in Vicksburg, MS. The teachers and students were grateful for the opportunity to host Farm to School Day event during MS Farm to School Week, October 7-11, 2013.

The classrooms hosting Mississippi farmers took surveys the week before the Farm to School Week and again after Farm to School Week to assess their knowledge of produce discussed throughout the week. The target was to increase knowledge of educational awareness of the participating classes by 30%. The goal was exceeded; 90-95% of the first graders showed improvement and were able to distinguish which specialty crops were grown in Mississippi from those that are not grown in Mississippi.

## **Beneficiaries**

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A total of 73 school districts and schools request posters for their classrooms or lunchrooms; over half of the posters, 5,176, have been dispersed. Even though more students were impacted than one per poster, it is estimated that at least 5,176 students learned something from the Farm to School posters because many only put up one in the school. The Farm to School website was available for teachers and food service directors to download educational materials and resources all throughout the fall of 2013.

## **Lessons Learned**

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The Farm to School pilot program with Sherman Avenue Elementary School proved to be very successful. MDAC hopes to use this to further enhance the Mississippi Farm to School Program. Well over half of the posters printed, 5,176 have been distributed to schools all across the state. These posters provide a colorful representation and educational resource of the produce grown by our state's farmers and consumed by MS children. There have been several requests for more posters featuring other produce; hopefully, the variety of produce available for schools will also grow and MDAC can increase educational efforts to include a broader range of MS grown fruits and vegetables. The brochures have also been a useful tool for those interested in the Farm to School program; they have been distributed at workshops held by MDAC, MSU, and MDE, to further increase the voice and awareness of this program

## **Contact Person**

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Susan Head  
Mississippi Department of Agriculture and Commerce  
601-359-1196  
[susan@mdac.ms.gov](mailto:susan@mdac.ms.gov)

# Additional Information

## Farm to School Brochure:



**Products**

In recent years, Mississippi farmers have provided bell peppers, bushberries, butternut, cooled greens, cucumbers, eggplant, tomatoes, winter peas, zucchini, and sweet potatoes to schools across the state. Additional produce is always open for consideration!

**Educational Resources**

Education is a key component to the Farm to School program. Society is becoming increasingly health conscious from agricultural practices, and it is our mission to educate students on where their food comes from and how it arrives on their plate. Here's one idea!

Educational Resources can be found on the Mississippi Department of Agriculture and Commerce website: [www.mda.ms.gov](http://www.mda.ms.gov)

**Farm To School Week**

The first full week of October was designated as Mississippi Farm to School Week by the Mississippi Legislature. Schools across the state participate in a variety of farm to school activities and strive to use produce from local farmers.

**Farm to School Contacts**

MISSISSIPPI DEPARTMENT OF AGRICULTURE & COMMERCE  
Mississippi Department of Agriculture and Commerce  
Market Development Division  
601-359-1159

MISSISSIPPI DEPARTMENT OF EDUCATION  
Ensuring a bright future for every child  
Mississippi Department of Education  
Office of Child Nutrition  
601-576-4980

MISSISSIPPI STATE UNIVERSITY  
EXTENSION SERVICE  
Mississippi State University Extension Service  
662-325-2155

**Mississippi Farm to School**  
Mississippi Grown. Mississippi Good.

MISSISSIPPI DEPARTMENT OF AGRICULTURE AND COMMERCE  
COURTNEY WELLS, MARKET DEVELOPMENT  
WWW.MARKETMAKER.MSSTATE.EDU | WWW.MDA.MS.GOV



**What is Farm to School?**

The Mississippi Farm to School program was introduced to encourage the serving of locally-grown and locally-produced agricultural products in school meals and to recognize the substantial economic and health benefits of serving locally-grown foods.

The program supports local farmers by creating additional marketing opportunities and avenues in which they can sell their product(s).

**What are the benefits?**

Benefits of the Farm to School program include:

- Supporting both local and state economies and development;
- Increasing market opportunities and avenues for growers;
- Increasing volume and varieties of fruits and vegetables offered in school lunchrooms;
- Increasing consumption of fruits and vegetables among students;
- Developing relationships between schools, parents, and farmers; and
- Increasing knowledge of agriculture, food, and nutrition.

**For growers:**

**How can I participate?**

Farmers can participate in Farm to School by:

- Supplying produce to the DoD Fresh Fruit and Vegetable Program**  
For more than a decade, the Mississippi Department of Agriculture and Commerce (MDAC) and the Mississippi Department of Education (MDE) have worked in conjunction to assist growers wishing to participate in the Department of Defense (DoD) Fresh Fruit and Vegetable Program. This is a statewide purchasing program administered by the two agencies. School districts place orders for produce throughout the year, and MDAC works with the growers to ensure the produce is delivered to the appropriate distributor. The distributor is then responsible for delivering the produce to the schools. Farmers are required to obtain Good Agricultural Practices/Good Handling Practices (GAP/GHP) certification in order to participate in this program.
- Working directly with local school districts**  
Growers can also work directly with the local school district's food purchasing director or nutrition director. This is a great way for growers on a smaller scale to get produce into local school systems!

**Things to consider:**

Register your farm with Mississippi MarketMaker at [www.marketmaker.msstate.edu](http://www.marketmaker.msstate.edu); schools and other potential customers will know what you have to offer. Typically, growers are responsible for transporting the produce from the farm to the school or food distributor. Growers should be prepared to discuss produce availability, feasibility, and seasonality with food purchasing directors or nutrition directors.

**For schools:**

**How do I purchase produce for my school?**

Schools can participate in one of two ways:

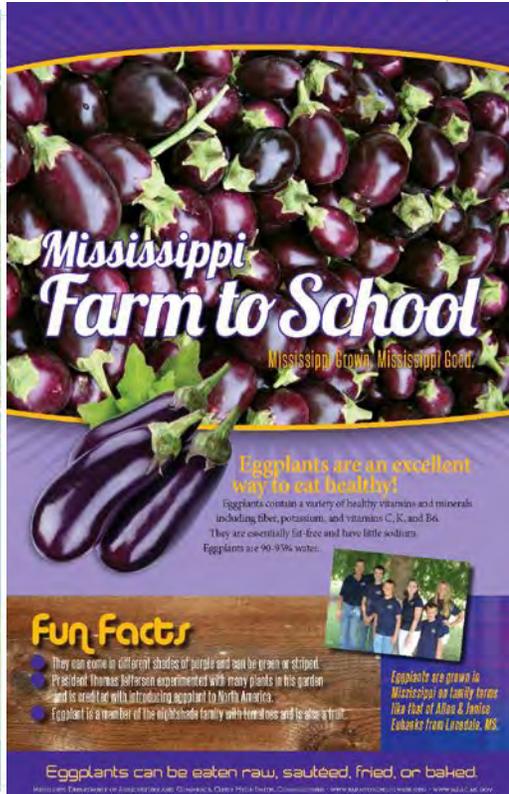
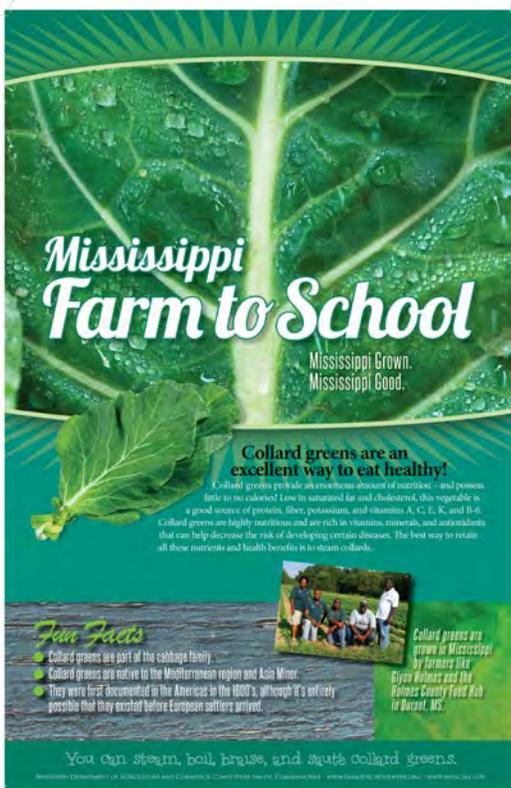
- Schools participating in the Department of Defense (DoD) purchasing program can choose to purchase fresh fruits and vegetables from Mississippi farmers. If there is something you do not see on the DoD purchasing guide, but you wish to order, take a look at Mississippi MarketMaker [www.marketmaker.msstate.edu](http://www.marketmaker.msstate.edu) to search for produce from local growers.
- School purchasing directors or nutrition directors can also work directly with growers to acquire fresh fruits and vegetables. Take a look at Mississippi MarketMaker [www.marketmaker.msstate.edu](http://www.marketmaker.msstate.edu) to search for produce from local growers. Please keep in mind that not all produce is available for the entire school year.

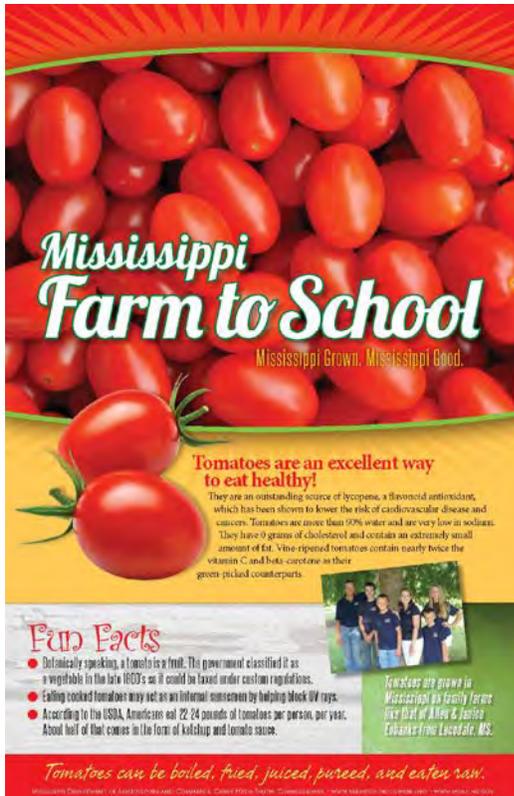
**Procurement**

Schools and other organizations that wish to procure locally-grown, minimally-processed products should keep in mind that USDA regulations do require schools to use good procurement practices under the National School Lunch and Breakfast Programs. While there are provisions made for geographic preferences, quotes for purchases under \$150,000 and formal solicitation for purchases over \$150,000 are required.

For more information regarding procurement requirements, please feel free to contact the Office of Child Nutrition at 601-576-4980. Organizations may also visit [www.marketmaker.msstate.edu](http://www.marketmaker.msstate.edu) to view a sample procurement template.

Farm to School Posters:





# Mississippi Farm to School

Mississippi Grown. Mississippi Good.

**Tomatoes are an excellent way to eat healthy!**

They are an outstanding source of lycopene, a flavonoid antioxidant, which has been shown to lower the risk of cardiovascular disease and cancers. Tomatoes are more than 90% water and are very low in sodium. They have 0 grams of cholesterol and contain an extremely small amount of fat. Vine ripened tomatoes contain nearly twice the vitamin C and beta carotene when green-picked counterparts.

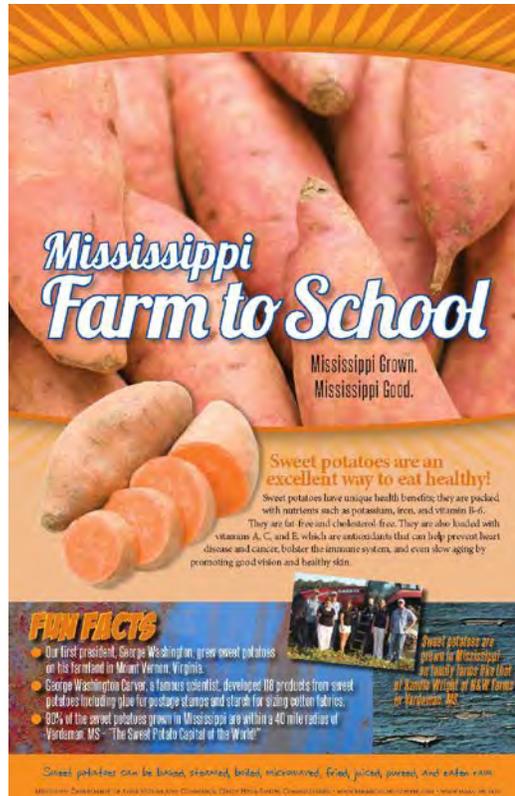
**Fun Facts**

- Definitely speaking, a tomato is a fruit. The government classified it as a vegetable in the late 1800's so it could be taxed under custom regulations.
- Eating cooked tomatoes may act as an informal sunscreen by helping block UV rays.
- According to the USDA, Americans eat 22-24 pounds of tomatoes per person, per year. About half of that comes in the form of ketchup and tomato sauce.

Tomatoes are grown in Mississippi on family farms like that of Allen & Janice Yokavakis from Lumberton, MS.

Tomatoes can be boiled, fried, juiced, pureed, and eaten raw.

MISSISSIPPI DEPARTMENT OF AGRICULTURE AND FORESTRY, COMMERCE, CHILDREN'S FUTURE, COMMUNITY, ECONOMIC DEVELOPMENT, ENVIRONMENTAL QUALITY, FOOD SAFETY AND INSPECTION SERVICE



# Mississippi Farm to School

Mississippi Grown. Mississippi Good.

**Sweet potatoes are an excellent way to eat healthy!**

Sweet potatoes have unique health benefits; they are packed with nutrients such as potassium, iron, and vitamin B-6. They are fat-free and cholesterol-free. They are also loaded with vitamins A, C, and E, which are antioxidants that can help prevent heart disease and cancer, bolster the immune system, and even slow aging by promoting good vision and healthy skin.

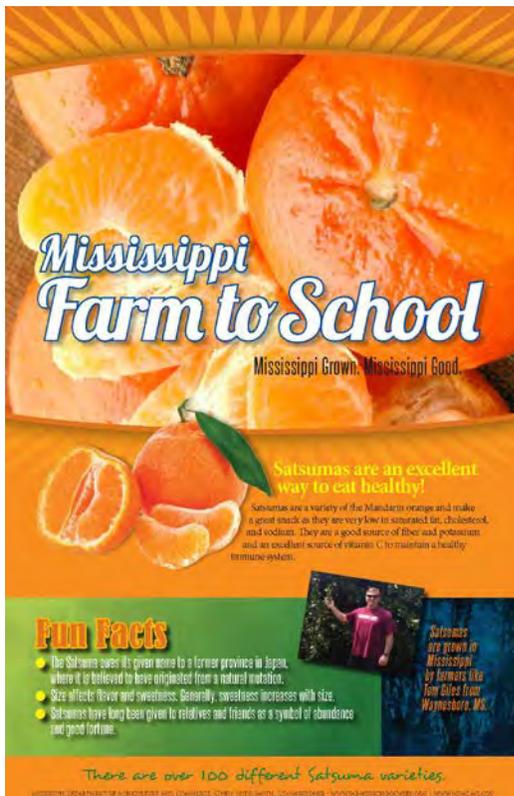
**Fun Facts**

- Our first president, George Washington, grew sweet potatoes on his farm in Mount Vernon, Virginia.
- George Washington Carver, a famous scientist, developed 80 products from sweet potatoes including glue for postage stamps and starch for sizing cotton fabrics.
- 80% of the sweet potatoes grown in Mississippi are within a 40-mile radius of Vicksburg, MS - "The Sweet Potato Capital of the World!"

Sweet potatoes are grown in Mississippi on family farms like that of Allen & Janice Yokavakis from Lumberton, MS.

Sweet potatoes can be baked, steamed, broiled, microwaved, fried, juiced, pureed, and eaten raw.

MISSISSIPPI DEPARTMENT OF AGRICULTURE AND FORESTRY, COMMERCE, CHILDREN'S FUTURE, COMMUNITY, ECONOMIC DEVELOPMENT, ENVIRONMENTAL QUALITY, FOOD SAFETY AND INSPECTION SERVICE



# Mississippi Farm to School

Mississippi Grown. Mississippi Good.

**Satsumas are an excellent way to eat healthy!**

Satsumas are a variety of the Mandarin orange and make a great snack as they are very low in saturated fat, cholesterol, and sodium. They are a good source of fiber and potassium and an excellent source of vitamin C to maintain a healthy immune system.

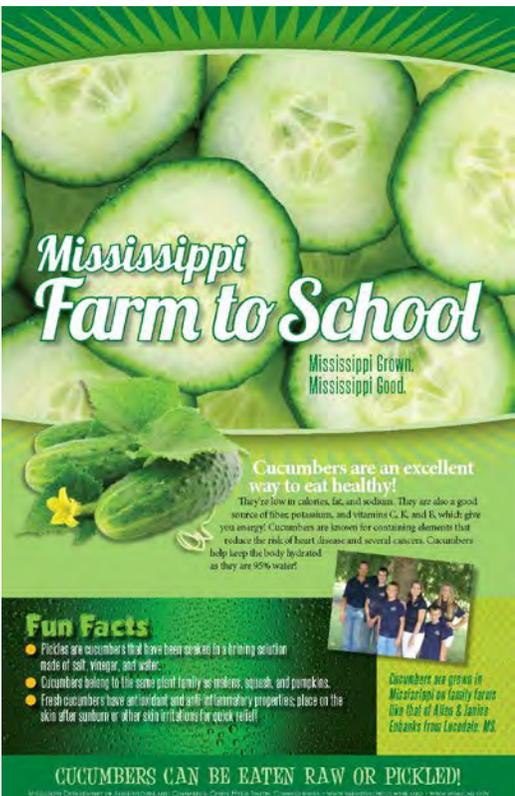
**Fun Facts**

- The Satsuma was first given name to a former province in Japan, where it is believed to have originated from a natural mutation.
- Size affects flavor and sweetness. Generally, sweetness increases with size.
- Satsumas have long been given to relatives and friends as a symbol of abundance and good fortune.

Satsumas are grown in Mississippi by farmers like Tom Giles from Waynesboro, MS.

There are over 100 different Satsuma varieties.

MISSISSIPPI DEPARTMENT OF AGRICULTURE AND FORESTRY, COMMERCE, CHILDREN'S FUTURE, COMMUNITY, ECONOMIC DEVELOPMENT, ENVIRONMENTAL QUALITY, FOOD SAFETY AND INSPECTION SERVICE



# Mississippi Farm to School

Mississippi Grown. Mississippi Good.

**Cucumbers are an excellent way to eat healthy!**

They're low in calories, fat, and sodium. They are also a good source of fiber, potassium, and vitamins C, K, and E, which give you an edge! Cucumbers are known for containing elements that reduce the risk of heart disease and several cancers. Cucumbers help keep the body hydrated as they are 95% water!

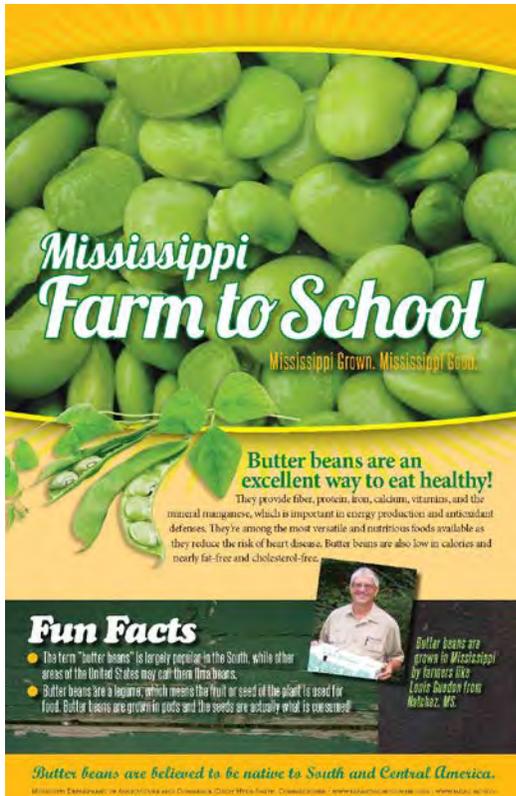
**Fun Facts**

- Pickles are cucumbers that have been soaked in a brining solution made of salt, vinegar, and water.
- Cucumbers belong to the same plant family as melons, squash, and pumpkins.
- Fresh cucumbers have anti-inflammatory and anti-irritation properties; place on the skin after sunburn or other skin irritations for quick relief!

Cucumbers are grown in Mississippi on family farms like that of Allen & Janice Yokavakis from Lumberton, MS.

**CUCUMBERS CAN BE EATEN RAW OR PICKLED!**

MISSISSIPPI DEPARTMENT OF AGRICULTURE AND FORESTRY, COMMERCE, CHILDREN'S FUTURE, COMMUNITY, ECONOMIC DEVELOPMENT, ENVIRONMENTAL QUALITY, FOOD SAFETY AND INSPECTION SERVICE



# Mississippi Farm to School

Mississippi Grown, Mississippi Good.

**Butter beans are an excellent way to eat healthy!**  
 They provide fiber, protein, iron, calcium, vitamins, and the mineral manganese, which is important to energy production and antioxidant defenses. They're among the most versatile and nutritious foods available as they reduce the risk of heart disease. Butter beans are also low in calories and nearly fat-free and cholesterol-free.

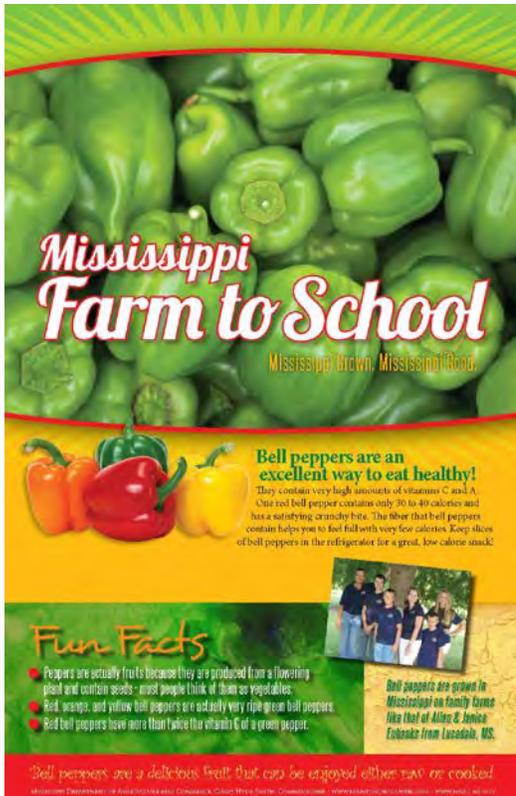
**Fun Facts**

- The term "butter beans" is largely popular in the South, while other areas of the United States may call them lima beans.
- Butter beans are a legume, which means the fruit or seed of the plant is used for food. Butter beans are grown in pods and the seeds are actually what is consumed.

*Butter beans are grown in Mississippi by farmers like Curtis Darden from Natchez, MS.*

**Butter beans are believed to be native to South and Central America.**

Mississippi Department of Agriculture and Forestry, 2010. Photo credit: USDA/ARS, www.mississippi.gov



# Mississippi Farm to School

Mississippi Grown, Mississippi Good.

**Bell peppers are an excellent way to eat healthy!**  
 They contain very high amounts of vitamins C and A. One red bell pepper contains only 30 to 40 calories and has a satisfying, crunchy bite. The fiber that bell peppers contain helps you feel full with very few calories. Keep slices of bell peppers in the refrigerator for a great, low-calorie snack!

**Fun Facts**

- Peppers are actually fruits because they are produced from a flowering plant and contain seeds - most people think of them as vegetables.
- Red, orange, and yellow bell peppers are exactly very ripe green bell peppers.
- Red bell peppers have more than twice the vitamin C of a green pepper.

*Bell peppers are grown in Mississippi on family farms like that of Allen & Janice Finkbeiner from Lucedale, MS.*

**Bell peppers are a delicious fruit that can be enjoyed either raw or cooked.**

Mississippi Department of Agriculture and Forestry, 2010. Photo credit: USDA/ARS, www.mississippi.gov



# Mississippi Farm to School

Mississippi Grown, Mississippi Good.

**Strawberries are an excellent way to eat healthy!**  
 Strawberries are packed with antioxidants and phytochemicals to boost the immune system, reduce the risk of cancer, and help stay healthy younger. They're also a good source for heart health, the digestive system, and maintaining a healthy weight.

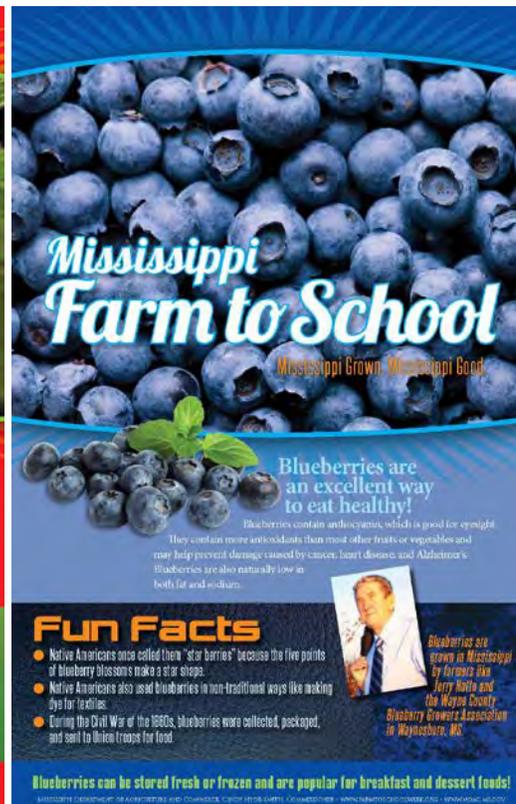
**Fun Facts**

- On average, there are about 200 seeds in each strawberry.
- The American Indians were already eating strawberries when the Colonists arrived. The crushed berries were mixed with cornmeal and baked into a strawberry bread. After trying this bread, the British developed their own version of the recipe and Strawberry Shortcake was created.
- Once for some, strawberries have more vitamin C than citrus fruit.

*Strawberries are grown in Mississippi on family farms like that of Alan & Jenise Eubanks from Lucedale, MS.*

**As a member of the rose family, strawberries are the only fruit with seeds on the outside rather than the inside.**

Mississippi Department of Agriculture and Forestry, 2010. Photo credit: USDA/ARS, www.mississippi.gov



# Mississippi Farm to School

Mississippi Grown, Mississippi Good.

**Blueberries are an excellent way to eat healthy!**  
 Blueberries contain antioxidants, which is good for eyeight. They contain more antioxidants than most other fruits or vegetables and may help prevent damage caused by cancer, heart disease, and Alzheimer's. Blueberries are also naturally low in both fat and sodium.

**Fun Facts**

- Native Americans once called them "star berries" because the five points of blueberry blossoms make a star shape.
- Native Americans also used blueberries in non-traditional ways like making dye for textiles.
- During the Civil War of the 1860s, blueberries were collected, packaged, and sent to Union troops for food.

*Blueberries are grown in Mississippi by farmers like Jerry Holtz and the Wayne County Blueberry Growers Association in Waynesboro, MS.*

**Blueberries can be stored fresh or frozen and are popular for breakfast and dessert foods!**

Mississippi Department of Agriculture and Forestry, 2010. Photo credit: USDA/ARS, www.mississippi.gov

# EDUCATIONAL BEEKEEPING PROGRAMS 2011-2013

## Project Summary

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The specific purpose of the project, implemented by the Mississippi Beekeepers Association was to provide educational opportunities for beekeepers. The shortages of honeybees, both wild and domestic, have been attributed to diseases and parasites. The need of educational workshops and materials are needed to increase the knowledge and support beginner beekeeping to meet pollination needs of crops across Mississippi. The public's awareness of the decline in bee population has spurred an increase of beginner beekeeping interest to pollinate their gardens and orchards. It is pertinent that populations of honey bees be maintained as they are the most economically viable way to pollinate agricultural crops.

This program allowed for the MBA to secure professional speakers of beekeeping management to maintain the quality and integrity of this workshop. The practice of beekeeping requires extensive knowledge and hands on training to master the intense management necessary to maintain viable colonies; new diseases and unknown causes of population decline (CCD) make beekeeping a challenge.

This project does build upon previously funded Specialty Crop Block Grant projects, from years FY2007 and FY2009. This project is a continuation of the FY2009 SCBGP; funds for FY2009 project were allocated for educational workshops for beekeepers and proved to be a success all across the state. Demand for continuing this program prompted the submission and acceptance of this FY2010 grant project.

## Project Approach

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Workshops listed in the table below show the attendance and topics discussed at each event. Five workshops were held during 2011 and one workshop was held during 2012. Due to the retirement of Harry Fulton, no spring or summer workshops were held in 2012 except for the annual workshop held in conjunction with the Mississippi Beekeepers Association annual convention. Several out-of state quest speakers were invited to speak at the workshops and annual meetings to ensure the quality of the program.

Date/ Location	Attendance	Topics
April 7, 2011** Jackson, MS	175	Beginners workshop. Some of the topics included: managing hives to optimize small hive beetle damage, low budget beekeeping, bee management 101, the beekeepers calendar, how and when to get bees. Field exercise topics included: the art of beekeeping, importance of honey bee population control in the hive and how to judge a colony's strength, feeding bees, and finding queens/making splits.
May 13-14, 2011** Jackson, MS	130	Some of the topics included: basic bee biology, honey plants and honey flows, getting started in beekeeping, swarm management, nucs vs. packages, keeping bees alive, managing small hive beetles, and diseases of concern. Hands-on field exercise topics included: how to work bees, types of equipment for bee hives, basics of bee rearing, and honey harvesting and processing, requeening/how to find queens, queen rearing-final steps, finding the queen and requeening.
June 3-4, 2011** Verona, MS	72	Some of the topics included: basic bee biology, nectar flows and food sources for bees, getting started in beekeeping, spring management/swarm prevention, small hive management, harvesting, handling, and processing honey, honey marketing, fall/winter management, hive pest and diseases, IPM for beekeeping, and feeding/nutrition for bees. Hands-on field exercise topics included: how to work bees, types of equipment for bee hives, basics of queen rearing, making splits and requeening, how to start new hives, surveying and treating for mites, and queen rearing-final steps.
June 16-17, 2011 Columbia, MS	102	Some of the topics included: basic bee biology, honey flows and food sources for bees, getting started in beekeeping, queen rearing basics, small hive management, bee compatibility plants, spring management, IPM for bees, nucs vs. packages, diseases of concern, mite control, and feeding bees. Hands-on field exercise topics included: how to work bees, types of equipment for bee hives, honey bee trapping, how to trap/treat for SHB,

		splitting hives, surveying and treating for mites, equipment needs for collecting bees, and finding queens an requeening.
October 28-29, 2011 Gautier, MS	138	Beginners workshop. Some of the topics included: making bee equipment, living with small hive beetles, what's involved in purchasing, picking up and/or delivering a hive of bees, a nuc, a queen, or package of bees, nucs vs. packages, and making candles, soaps, an cosmetics with honey and beeswax.
October 26-27, 2012 Mississippi State University	145	Both beginning and experienced workshops. Topics included: bee colony health, nutrition, current research of reducing the levels of agricultural chemicals that accumulate in combs to improve colony health, controlling for pests, parasites, diseases, by using integrated pest management, economic impact of beekeeping industry, seasonal management, swarming biology and queen rearing.
<b>TOTAL</b>	<b>762</b>	

*\*\* Workshop funded partially by both Specialty Crop Block Grant Program – FY2009 and FY2010*

A management booklet titled “Small Hive Beetle,” was created and printed as a collaborative effort between MBA and MSU Extension to educate beekeepers on the growing problem of the Small Hive Beetle. This was distributed to beekeepers at workshops, local club meetings, and other events upon request.

“Beekeeping in Mississippi” was a booklet created and printed to teach new beekeepers general practices in beekeeping. This educational resource is provided for participants at workshops, meetings of local bee clubs, and available upon request.

A recipe book, “Golden Treasures Recipes” was developed and distributed to increase the awareness of honey and its benefits. It was distributed at the Mississippi State Fair, local club meetings, promotional events, and available upon request.

In addition to workshops, MBA members also spoke to various children groups at schools and libraries to educate them on the importance of bees and beekeeping.

## Goals and Outcomes Achieved

This grant trained a total of 762 beekeepers on beekeeping basics. Since 2008, the total number of beekeepers trained from this program is 1,956. The increased average attendance

at workshops indicates a continued and expanding interest in starting beekeeping in ages 10 and up. A raise of hands at the workshops continues to show that 30% to 50% of attendees do not have bee hives and want to get started.

The goal to increase attendance at workshops and increase the number of beekeepers by 450 for 2011 has been achieved; this information is evidenced in the table below.

Year	Workshop Attendance	No. of workshops	Avg. Attendance
2008	317	4	63
2009	372	4	93
2010	505	5	101
2011	617	5	121
2012	145	1	145

The goal of increasing membership in the Mississippi Beekeepers Association was also achieved. Since the onset of the block grant program, membership has doubled. Attendance for 2011 rose to 512 but fell in 2012 to 260; this however, is still greater than when the grant was initiated. Membership decline may possibly be due to the retirement of Harry Fulton and the decreased efforts of attaining new members.

Educational materials for beginning beekeepers were created, printed, and distributed at workshops and meetings. MBA members also spoke to children groups at schools and libraries to reach a variety of audience members.

The original proposal aimed for four workshops for years 2011-2013. After the retirement of Harry Fulton in 2012 and due to the popularity of the workshops, the budget was exhausted earlier than anticipated and the goals and outcomes were achieved as planned.

## Beneficiaries

Extensive declines in wild and domestic honey bee populations over the past ten years has diminished the pollination of many homegrown and commercially grown food crops. The efforts and funding provided by this grant have without a doubt helped increase the number of honeybees available to pollinate crops. In 1972, the USDA determined that one colony of honey bees provided \$2,000 in pollination benefit; therefore any increase in bee population is a great benefit to Mississippi and educational is necessary to ensure the success of colonies. Of the 1,963 people attending workshops over several grant years, an estimated 800+ have become new beekeepers with one or more hives. Specifically, this grant has reached and educated an estimated 762 attendees from meetings and workshops.

The average production per hive in Mississippi over the last four years is approximately 100 pounds according to the USDA National Agricultural Statistical Service. The 800+ hives has increased honey production an estimated 80,000 lbs. per year.

## Lessons Learned

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A significant number of people are interested in becoming beekeepers; some seek financial assistance, but all need the proper education and hands-on training in order to become efficient and successful in the practice of beekeeping. The workshops implemented from this project provided an avenue to achieve the necessary training and education.

A number of workshops have been conducted throughout the multiple grant years, several years of experience has determined that different levels of workshops, such as advanced level workshops, must be conducted every 2 years in order to improve efficiency of our state's beekeepers.

It was also determined that attendees are willing to pay a registration fee; however, financial assistance is needed to help pay for speakers who come from other states. From the grant prospective, the cost per attendee over the course of the grant was \$14.44. The need for out-of-state speakers results in a higher cost per participant.

## Contact

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# CONDUCTING HIGH TUNNEL CONSTRUCTION WORKSHOPS IN MISSISSIPPI

## Project Summary

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The purpose of this project was to build several high tunnels while training people about high tunnel construction methods and materials. The continuing value of this project beyond the grant period is that those who learned the methods demonstrated could use that information to build more high tunnels in the future and raise specialty crops which can be sold through local farmers markets and other marketing channels. The increasing interest in high tunnels for specialty crop production especially with the initial USDA-NRCS cost share program. Producers have mentioned the high tunnel construction and implementation is intimidating and would benefit greatly from construction workshops.

This project focused on training specialty crop producers on how to construct a single-bay high tunnel for specialty crop production. This project built upon two previously funded Specialty Crop Block Program Grants (SCBGP) titled “Investigation of Best Management Practice for Specialty Cut Flower Production in Mississippi” and “Investigation of Different High Tunnel Systems for Specialty Cut Flower Production in Mississippi”, and related research and outreach activities. While these projects have been very beneficial in researching the production aspect of growing cut flowers in high tunnels, this project will be vital to educating growers how to properly construct a high tunnel.

## Project Approach

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Several activities were performed to carry out the mission of this project. Each high tunnel was very unique in construction design and served useful for the diverse clientele.

A High Tunnel Construction Field Day was conducted in Holmes County in cooperation with the new Alliance for Sustainable Agricultural Production at their demonstration farm several miles outside of Goodman, Mississippi. About 100 people participated in this hands-on workshop in which they actually assembled the frame for one high tunnel. This tunnel is being put to use in growing crops that are sold throughout local direct marketing channels.

A high tunnel was also built in south Mississippi in Poplarville. Construction of the Poplarville tunnel was used as part of a farmer open house in early October 2012. That tunnel will continue to be used in the future for grower trainings.

Two tunnels were also delivered to the Bulldog Student Farm in December 2012. The purchase process for these tunnels is being incorporated into the teaching and training program for both the student farm and the personnel on the grant. Lessons learned have included planning and

specification, vendor relations, and the logistics of delivery in the context of farm production planning. The tunnels are on skids and can be moved and are small enough that they will move with human power, rather than tractor power needed to move larger tunnels.

Dr. Mengmeng Gu was the original PI and authored the Extension publications and initiated the website. Dr. Bill Evans assisted with high tunnel purchasing and construction projects, and also took over the high tunnel website following the departure of Dr. Gu. Dr. Christine Coker is managing the high tunnel in Poplarville. Dr. Snyder finished the project as PI in 2012, managed the budget, and wrote the reports.

## **Goals and Outcomes Achieved**

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The goal of providing three high tunnel construction workshops was accomplished. Over 90 (the target) producers experienced the high tunnel construction workshop and gained valuable information to share with other producers as well. The largest attendance was at the High Tunnel Construction Demonstration Workshop in Holmes County where they learned construction techniques by participating in the hands-on demonstration.

A high tunnel was constructed in Poplarville, MS. This was used as part of a farmer open house in early October 2012, and will continue to be used in the future for grower trainings. There were no written evaluations from the coastal Mississippi workshops, but the verbal response from participants had very positive reviews. Well over 50% of the participants did not know what a high tunnel was or what it was used for prior to the workshop. Several participants expressed interest in learning more about utilizing high tunnels for season extension of specialty crops.

The two tunnels at the Bulldog Student Farm at Mississippi State University will be part of the curriculum and training for students for years to come. A learning/doing/planting session is planned for March 2013 as part of the first course taught at the farm. At the session, students will learn about tunnel construction, among other things. This course is a joint project between the Plant and Soil Sciences Department and the Department of Landscape Architecture, between 15 and 20 students will enroll in the first semester class. The tunnels will be used to teach crop management and as part of planned field days and open houses. The site will be open to the public and growers and prospective growers will be encouraged to visit the site and learn about construction and production of the high tunnels. There was no evaluation of the workshops from the high tunnels due to the delay of installation past the grant period. The North MS tunnel includes students, growers, and faculty in extension, teaching, and research all participating and learning together. In terms of impact, the installation effort results in grower/student interaction, a full and oversubscribed class in undergraduate horticulture, and it will form a large part of the initial foundation of the new student farm at Mississippi State.

Several Extension publications and a website were created for this project. These are as follows:

- **P2595 High Tunnel Suppliers:** <http://msucares.com/pubs/publications/p2595.pdf>
- **IS1674 High Tunnel or Greenhouse?:** <http://msucares.com/pubs/infosheets/is1674.pdf>
- **P2635 Metal Quonset High Tunnel Construction Costs:**  
<http://msucares.com/pubs/publications/p2635.pdf>
- High Tunnel Crop Production Project Website:  
<http://msucares.com/crops/hightunnels/news.html>

## Beneficiaries

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The beneficiaries of the programs implemented in this grant were the specialty crop growers who participated in the three construction workshops. The first workshop included over 100 people who took part in hands-on construction of a high tunnel. This was far larger than anticipated in the planning phase. The second and third workshops had fewer people but the value learning about high tunnel construction and production methods will continue for years as more growers visit the tunnels, ask questions, and learn about producing specialty crops in the high tunnels. However, an exact estimate of the dollars of value gained for each event is impossible.

While it is impossible to extract financial data from each of the producers who were the beneficiaries of this grant, it is clear from the responses, that the producers were very appreciative of the programs offered and would make excellent use of the information provided to them through these programs.

## Lessons Learned

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This project proved useful for specialty crop growers across the state of Mississippi. The goals of the project were met and it is clear from the responses, that the producers were very appreciative of the programs offered and would make excellent use of the information provided to them through these programs. The activities from this project will continue to host workshops well into the future, especially the ones constructed on the MSU campus, as it will be a learning project for students, faculty, staff, and visitors. The result of this project will provides education and long-term use and will impact a far greater population than originally planned.

## Contact Person

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# **PUBLIC RELATIONS CAMPAIGN TO PROMOTE BUYING LOCAL SPECIALTY CROPS**

## **Project Summary**

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Less than two percent of the public is actively engaged in production agriculture today. Many people are three or four generations removed from the farm and consequently have less of an appreciation for the benefits of a locally-produced food source. A well-designed, professional campaign is needed to educate the public about the benefits of agriculture in general. The Farm Families of Mississippi (FFM) campaign addresses many of the issues that have been identified through surveys that the public is misinformed about or needs further information. The Specialty Crops Grant Program was identified as a way to educate the public about the benefits of buying locally produced foods which was one of the identified messages of the overall campaign.

This specialty crop promotion project was designed to run in concert with another public relations effort being run by the Farm Families of Mississippi. The larger project is the Ag Image Campaign for all agriculture. The specialty crop promotional effort was specifically directed to promote buying locally produced specialty crops. Many of these small specialty crop growers cannot afford the high cost of a media campaign. With this campaign, however, the specialty crops had their own TV spots, radio spots, and billboards that had the same look and feel of the larger campaign but targeted specialty crops. This specialty crop promotion was the only portion of the overall campaign promoting specialty crops. This project is not built on a previously funded Specialty Crop Block Grant Program project.

## **Project Summary**

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Both of the TV spots promoting the availability of specialty crops ran in equal rotation with the rest of the spots in the Farm Families of Mississippi campaign. They ran on WLBT and WAPT in Jackson and on WLOX in Biloxi. These spots generally ran during morning, noon, and evening news programming, and the spots also ran during a few TV shows that fit the demographics. Approximately 500 TV spots featuring specialty crops were run. In addition to the paid TV ads, specialty crops were featured on several cooking segments at no charge.

The radio spots ran on the SuperTalk radio network statewide. This network of nine stations multiplied the coverage tremendously. For every spot ran, it was played on nine stations for a fraction of the cost of doing that individually. The specialty crop ads were run well over a thousand times.

There were eleven billboards that featured a specialty crop that were displayed in Jackson and on the Gulf Coast.

The FFM contracted with Market Research Insight to do the scientific survey to measure the impact of the campaign. They surveyed the public just prior to the campaign to get a baseline number and then again immediately following the campaign. The survey results show that the ads had the desired effect on consumers. A 9% increase was measured for individuals who usually try to find and buy locally grown specialty crops, that population increasing from 69% in March 2011 to 78% in May 2011. Those recalling the specialty crop ads responded at 84% trying to find and buy locally grown crops compared to 72% trying to find and buy local crops for those who did not recall the ads.

When asked to name benefits of buying and consuming locally grown crops, it is clearly evident that the advertising program influenced two major category responses. Especially, the increase, from 31% in March to 52% in May for the response that buying locally grown specialty crops helps the local economy and keeps money local is a very significant change. In addition, responses increased from 35% to 39% for the response locally grown crops are fresher and healthier.

When asked to name specialty crops, the top four responses were sweet corn, sweet potatoes, pecans, and honey. These were the exact four crops that we featured in our ads.

Farm Families of Mississippi is a group of approximately 75 agricultural organizations, companies, and individuals committed to educate and improve the image of agriculture among the state's consumers and the list is still growing. This is not just a one-year project. The partners in this organization, spearheaded by the Mississippi Farm Bureau, have committed to an ongoing, multi-year campaign. To influence public perception, a consistent, sustained communication program is required and should keep in focus the long-term goal of creating positive public perception of agriculture in Mississippi.

## **Goals and Outcomes Achieved**

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The goal of the project was to raise the level of awareness among the public about the benefits of buying locally produced specialty crops. By raising awareness, the demand for these specialty crops will potentially enhance the viability and profits for the farmers producing them. TV spots and billboards were used in the Jackson and Gulf Coast media markets and radio spots were used statewide. The goal was to obtain at least a 10% increase in the awareness of the benefits of specialty crops. When asked to name benefits of buying and consuming locally grown crops, it is clearly evident that the advertising program influenced two major category responses. Especially, the increase from 31% in March to 52% in May for the response that buying locally grown specialty crops helps the local economy and keeps money local is a very significant change. A 9% increase was measured for individuals who usually try to find and buy locally grown specialty crops.

## Beneficiaries

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The groups that will benefit from this public relations effort will be the local farmers that raise these specialty crops and market them locally. Mississippi is the number two sweet potato producer in the nation with over 100 farmers growing sweet potatoes on approximately 20,000 acres. There are more than 2,000 acres of sweet corn produced in Mississippi by approximately 40 growers with most of the crop being consumed locally. Mississippi ranks between 23<sup>rd</sup> and 25<sup>th</sup> in the nation in honey production and produces about from 1.1 to 1.5 million pounds of honey each year. Mississippi contains between 14,000 and 16,000 acres of pecan orchards and thousands of yard trees. Orchards range in size from 25 to 500 acres. Pecans are sold directly to consumers, accumulators, or by mail-order.

While they don't have sales figures from all of the local farmers, the increase in the awareness of the benefits of buying locally produced foods should increase local sales especially when you combine that with the responses from the survey showing that the public realizes that buying locally helps the local economy. The benefits of an advertising campaign fade with time if it is not continued. Long term economic impact of a project such as this will be continued as long as the advertising campaign continues.

## Lessons Learned

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An interesting insight came in the second week of the campaign. The project coordinator received a phone call from a lady in Carthage, MS, who had seen one of the specialty crop TV spots on honey and wanted to know where she could buy locally produced honey. She was put in touch with a local producer. The interesting thing about this call was that she really had to work to find out the right person to call since Farm Bureau was not mentioned in the spot at all. That shows that she liked the message and was very motivated to find out more about it.

The Mississippi Farm Bureau and the Farm Families of Mississippi feel like this was a very worthwhile campaign because it showed that the public really does want to buy locally produced food and understands the benefits of doing that. The challenge is reminding them of it enough so that they are motivated to take the extra step to find and purchase the locally produced food. The Mississippi Farm Bureau and the Farm Families of Mississippi will continue this program with funds provided through the FY 2011 Specialty Crop Block Grant Program.

## Contact

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## Additional Information

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To see the TV spots, go to the URLs listed below.

<http://www.youtube.com/user/FarmBureauMS#p/u/3/k6Bd-z90xrY>

<http://www.youtube.com/user/FarmBureauMS#p/u/4/KD6P4-t9z2I>