



Mississippi Department of Agriculture and Commerce

Specialty Crop Block Grant Program-Farm Bill FY2012

**Final Performance Report
Agreement # 12-25-B-1470
Submitted 12-18-2015**

PROGRAM CONTACT

**Susan Head, Grants Management and Marketing Specialist
Market Development Division
121 North Jefferson Street
Jackson, MS 39201
Phone: (601) 359-1196
Email: susan@mdac.ms.gov**

INTRODUCTION

The Mississippi Department of Agriculture and Commerce (MDAC) was awarded \$282,041.69 in funding for the Specialty Crop Block Grant Program-FB (SCBGP-FB) in September 2012. MDAC has partnered with five organizations to implement 11 projects to enhance the competitiveness of specialty crops throughout the state. The final project report for “Public Relations Campaign to Promote Buying Local Specialty Crops” was approved in the First Annual Report. The final reports for, “Reniform Nematode Implicated in Sweet Potato End Rot: the key to economic losses?”, “Mississippi Sweet Potato Promotion/Marketing Campaign,” and, “Developing Targeted Direct Marketing Strategies for Mississippi Specialty Crop Producers Using Regional Consumer Market Research,” were approved in the second annual report. The remaining final reports are located at the beginning of this document for review.

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CONDUCTING CULTIVAR AND TIMING TRIALS TO SUPPORT CUT FLOWER & VEGETABLE GROWERS

Project Summary

The purpose of this project is to support basic cut flower, culinary herb, and vegetable cultivar trials led from the MAFES Truck Crops Branch in Crystal Springs. This project has allowed Mississippi State University (MSU) to evaluate dozens of cultivars and share that information with growers and university personnel across the state and region. Replicated cultivar trials were conducted on more than ten crops in high tunnels and in fields. More than 200 people viewed one or more of the replicated trials and nearly 4,000 viewed the annual non-replicated demonstration plots in the Fall Flower & Garden Fest site, plots that were partially supported by this project. MSU surveyed growers in Mississippi and other states to assess their needs for cultivar trials using a self-directed “dot” survey that allowed participants to suggest up to four crops and two traits for evaluation. It can be anecdotally documented that there has been increased use of some of the lettuces, beans, zinnias, and carrots that were recommended from the trials, as well as an increase in cilantro production on several farms in central Mississippi. MSU made some cultivar trial data available through the Auburn University online trial reporting site and through the American Society for Horticultural Science. More reports are being developed for completion after the project period ends. Beneficiaries of the project include growers, university personnel, chefs, and students. Lessons learned include that growers want trial data, we need to carefully plan trials and data collection, quality handling leads to quality produce being grown, and that results and efforts associated with this sort of relatively simple project can end up woven into the fabric of the food system in the area.

This project did not build on previously funded SCBGP projects.

Project Approach

A series of cultivar trials in were conducted over the life of the project in high tunnels and in open fields. In total, more than fifteen trials were conducted. Most occurred at the MSU Truck Crops Branch in Crystal Springs, but some occurred at farm fields in Meadville, Goodman, and Jackson. Growers, seed industry personnel, and extension personnel were consulted about types and timing of trials, as well as for specific cultivar and standards to use in the trials. Observations were also collected from single-replicate, guard plots, and demonstration trials. This project piggybacked off the Fall Flower & Garden Fest demonstration trial, which contained over 400 vegetable, herb and cut flower cultivars for each year of the trial (See Additional Information 3).

We tested zinnias, snap dragons, celosia, lisianthus, dianthus, and sunflowers in replicated plots in high tunnels during the first year of the project. These were set out with three or four replicates. We tested cilantro, leaf lettuce, Asian greens and carrots for three years in high tunnels. We tested snap beans, cilantro, pumpkins, and strawberries in replicated field studies. We tested cilantro, snap beans, lettuce, Asian greens, and strawberries at on-farm sites. During the final year of the project, we developed a needs survey to learn more about what crops growers needed cultivar testing on and what characteristics they wanted tested, such as taste or disease tolerance. This survey was IRB approved and presented to growers at the Southern Sustainable Agriculture Working Group, the Central Mississippi Producer Advisory Council meeting and two other group settings. At Southern SAWG, thirty participants took the survey. The most requested crop for testing was tomatoes (n=12), followed by winter squash (n=8), summer squash (n=7) and kale (n=5). Interestingly, no recipients asked for collard or mustard trials, and only one asked for turnips, all traditional southern crops. Disease and pest resistance was the top trait requested for study by participants. All others (taste, postharvest keeping, yield, consumer preference, and concentration of harvest) received similar numbers of responses (See Additional Information 1).

Trial data collected included yield, shape and size, quality, sugar concentration, and color appropriate for each crop. We analyzed replicated results using appropriate statistical techniques for each data set. Results were presented at grower and scientific meetings. Results of some trials were published in regional cultivar bulletins, as well. For trials presented at the American Society for Horticultural Science's Southern Region meeting, there were no significant differences in "baby", mature, or total yield among the Asian greens crops tested. Mature lettuce yields differed, with cvs. Magenta, Green Star and Ridgeline making up the top performing group, and Razes, Freckles, and Breen making up the lesser yielding group, with significant statistical overlap among performance groupings. All marketable carrot yields were similar among the cultivars tested. Economic analysis of the yields indicated that carrots produced the least return per square foot and per square foot per day, lettuce produced the most.

As proposed, the project was jointly managed by Drs. Evans and Bi. Dr. Bi coordinated the flower trials, Dr. Evans the vegetable trials. Dr. Evans reviewed budgets. Both prepared manuscripts and made presentations for the trials they led.

Goals and Outcomes Achieved

New cultivar adoption: Since we began reporting, we can document new plantings of zinnia Benary's Giants; lettuce cv. Nevada, New Red Fire, and Two Star; and cilantro cv. Santo, among others. Our recent snap bean trial has led to a host grower planning to grow green snap bean cv. Bravo in 2016, by far his favorite and indeed the top performer our trial at his site. We are still preparing reports, so for now we have not reached the target of one adopting grower for each cultivar recommended. However, we have several growers using Benary's Giant zinnias

and Santo cilantro, as well as Nevada lettuce, so our average adoption rate may be close to or perhaps exceed one grower per trial. We also have more growers adopting some of the crops we tested. We cannot document cultivar adoption for these growers, but we can say that our work has led to several growers starting to raise Asian greens. The vegetable cultivars being adopted have been sold by growers at the state farmers market, other farmers markets, and to several restaurants in the Jackson area. We used surveys at one series of grower field days to document changes in attitudes and information level about the importance of crop selection, timing and cultivar. More than 80% of growers attending the field days reported increase knowledge and that seasonal planning for crops and cultivars would be more important in their future work.

Presentations and publications are listed in Additional Information 2. Additional reports and presentations are being drafted and are planned for the post-project period, so the final measurements of goal attainment cannot be made at this time. We know from meetings and discussions with growers that this funded effort has resulted in some changes in cultivar selection by growers.

Beneficiaries

Mississippi vegetable and cut flower growers benefitted from these trials. Attendees at on-farm and research station field days saw cultivars first hand or were taught about them. For each year, more than 100 people toured the Crystal Springs high tunnel trials. More than 50 people attended each Alliance for Sustainable Agricultural Production (ASAP) training in Holmes County. More than 300 high school and university students, growers, USDA NRCS, extension and other stake holders attended six different events at the farm site in Jackson. The audience for the on-line cultivar bulletins is not known at this time but we may be able to ask the host institution for page view counts. We used Twitter to share trial progress and that has helped us build a following of more than 450 people for that outreach effort (@npkveg). The host farm in Jackson realized returns of over \$4,000 annually from adopting new lettuce and herb cultivars. We were not able to quantify any other of the impacts from other beneficiaries. We did see anecdotal evidence that the cultivar training did help open new markets (e.g. restaurant sales) for several of our more active stakeholders. One host farm said that the economic benefit may not be easily measured because so much of what they learned resulted in a change in business planning and execution for which a dollar figure will not be known. Lastly, the faculty and staff at the station gained experience in the production and evaluation of several crops that had not been formally evaluated here before, including cilantro, Asian greens, and several cut flowers. The work has helped facilitate budding relationships with five high school agriculture programs, two high school culinary programs, and several chefs interested in sourcing unique and high-quality products.

Lessons Learned

There were several lessons learned by the project staff. It was reinforced that we should plan to plant more trials than we hope to finish. Weather, heat, and flooding wiped out several of the trials. We were not able to complete the proposed organic trials do to labor and time constraints, but have plans to carry on some of that work with other funds after the project period ends.

We learned that growers do want cultivar trial information but the needs in Mississippi are very diverse, making it hard to conduct just a few trials and satisfy a large number of growers. We sometimes planned more trials than we had labor to harvest efficiently. We confirmed to ourselves and were able to show others that cultivar selection and time of planting are two critical and fairly inexpensive ways to greatly increase yield and efficiency in flower and vegetable production. Our survey has confirmed that many direct market growers seem to want information on taste as much or more than they want information on yield.

Our staff was also trained on unfamiliar commercial vegetable and cut flower production techniques, including proper harvest and post-harvest handling. Seeing things like snap dragons bend to the light in just a few hours or lettuce stay fresh longer when handled with best practices are things only working with the crops can teach. This sort of training will help the industry grow because we have improved our skills needed to gather good data for them.

Lastly, because our work has trickled into the community of Jackson and surrounding areas, it has, if indirectly, helped plant some seeds for good nutrition and access to fresh produce. We did not directly do that work with this project, but being able to work with growers and others to show what a good cultivar, grown with proper care, can do, will allow area growers to produce more fresh food and will impact school farms and the area farm-to-school programs, too.

Contact Person

William B. Evans
Mississippi State University
601.892.3731
Bill.evans@msstate.edu

Additional Information

1. Publications and Presentations:

Barickman, T.C., B. Evans, C. Miles, R. Brown, and R. Arancibia. 2015. Environment and production system influence fresh cilantro yield and quality in a five state trial. Presented to the Amer. Soc. Hortic. Sci. Ann. Mtng., New Orleans, LA.

Evans, W.B., S. Reynolds and A. McCain. 2014. High tunnel cultivar trials: Yield and potential Returns for Three Spring Crops. So. Reg. Amer. Soc. Hortic. Sci. Ann. Mtng. Oral Presentation.

Evans, W.B., S. Reynolds, P. Hudson, and A. McCain. 2015. High tunnel Asian greens cultivar trial, 2013. Vegetable and fruit variety trials. Auburn Reg. Bul. 31, p. 34-36.

2. Surveys and Research Instruments:

Grower Survey of cultivar trial needs:



What Do You Want in Vegetable Cultivar Trials?

W.B. Evans
Mississippi State University Truck Crops Branch
Crystal Springs, Mississippi
bill.evans@msstate.edu

PLEASE READ: Participation in this research survey is completely voluntary. The purpose of the study is to determine what crops and traits growers would like tested in vegetable variety trials. No data, other than the state color dots, will be collected or retained about any participant or those choosing not to participate. The resulting data will be retained by Mississippi State University and the PI, and may be analyzed and presented in part or in whole at scientific meetings or as part of a manuscript for paper or electronic publication. Participation indicates consent and permission to use the data provided in presentations and publications. Questions related to the project and participation should be directed to the PI, Dr. William (Bill) Evans at bill.evans@msstate.edu.

THIS POSTER IS DESIGNED TO ALLOW GROWERS TO SHOW US WHAT THEY WANT FROM VARIETY TRIALS. WE HAVE PROVIDED A LIST OF VEGETABLES GROWN IN THE SOUTHEAST. WE ASK THAT FARMERS PARTICIPATE IN THE POSTER SURVEY BY SELECTING THREE CROPS THAT THEY FEEL ARE IMPORTANT TO GET VARIETY TRIAL DATA ON. WE THEN ASK WHAT DATA, BESIDES YIELD, WOULD BE OF MOST VALUE TO KNOW. THE SPECIFIC INSTRUCTIONS FOR PARTICIPATING AND COMPLETING THE SURVEY ARE IN THE YELLOW BOX BELOW. PLEASE BE SURE TO READ THAT AND ALL OF THE RED TEXT BEFORE PARTICIPATING.

WHO SHOULD PARTICIPATE: FARMER ATTENDEES, BUT JUST ONE PERSON PER FARM OR FAMILY.

WHO SHOULD NOT PARTICIPATE: NON-FARMER ATTENDEES, UNIVERSITY AND INDUSTRY PERSONNEL. We want data from farmers only, please.

PLEASE NOTE: Children (minors) may assist adults in placing dots, but are not permitted to be the actual survey participant. To fully protect participants and the data, please do not record or photograph the poster or participants taking the survey.

Purpose of the Research: The purpose of the study is to determine what crops and traits growers would like tested in vegetable variety trials.

INSTRUCTIONS FOR COMPLETING THE SURVEY:

- Please take one strip of dots from the box labeled with the state that you are from. Use **four** of these dots to mark crops that you need or want more variety trial information for. Place one dot next to each of up to four crops. As you make your choices, consider all aspects of what a variety trial can be: yield, disease and pest tolerance, concentration of yield, taste, profitability, etc. USE TABLE 1, right.
- In addition to yield, what other information would be good to get from variety trials? Place a dot next to **two** of the categories below that you hope public variety trials can address for you. USE TABLE 2, right.

Table 1. Crop Selection. Place one dot next to up to four crops that you want more cultivar trials done on.

Crop	Yes, I want more trials of this (vote with one dot on up to four crops)
Artichoke	
Asian Greens (choi, etc.)	
Beans, Dry edible	
Beans, Faba	
Beans, Lima	
Beans, Snap	
Beets	
Broccoli	
Brussels Sprouts	
Cabbage	
Carrots	
Cauliflower	
Collards	
Corn, Sweet	
Cucumbers	
Edamame (soybean)	
Eggplant	
Flowers, Edible	
Garlic	
Gourds	
Herbs	
Kale	
Leeks	
Lettuce	
Melons, Cantaloupe	
Melons, Specialty	
Melons, Water	
Mustard	
Okra	
Onions	
Peas, English	
Peas, Southern	
Peppers, Hot	
Peppers, Sweet	
Potatoes, Irish	
Potatoes, Sweet	
Pumpkins	
Radishes	
Spinach	
Squash, Summer	
Squash, Winter	
Tomatoes	
Turnips	

Table 2. Characteristics to test. Place one dot next to up to two characteristics that you want tested for in trials.

Characteristic	Selections
Concentration of harvest	
Consumer preference	
Disease and pest resistance	
Nutritional content	
Post-harvest keeping ability	
Taste	

3. 2014 Fall Flower and Garden Fest Vegetable Cultivar List:

Crop	Cultivar
Bean, Bush	Green Crop
Bean, Bush	Hialeah
Bean, Bush Lima	Blue Lake
Bean, Bush Lima	Crockett
Bean, Bush Lima	Dixie Speckled Butterpea
Bean, Bush Lima	Eastland
Bean, Bush Lima	FordHook 242
Bean, Bush Lima	Henderson
Bean, Bush Lima	Jackson Wonder
Bean, Bush Lima	Thorogreen
Bean, Bush Snap	Blue Lake Bush
Bean, Bush Snap	Capitano
Bean, Bush Snap	Carson
Bean, Bush Snap	Dragon Tongue
Bean, Bush Snap	Jade 2
Bean, Bush Snap	Kentucky Wonder
Bean, Bush Snap	Mascotte
Bean, Bush Snap	Maxibel
Bean, Bush Snap	Pencil Pod Black Wax
Bean, Bush Snap	Provider
Bean, Bush Snap	Romano Purpiat
Bean, Bush Snap	Royal Burgundy
Bean, Bush Snap	Taylor
Bean, Bush Snap	Tongues of Fire
Bean, Edamame	Lanco
Bean, Edamame	Moon Cake
Bean, Fava	Broad Windsor
Bean, Fava	Sweet Loraine
Bean, Runner	Scarlet Runner
Beet	Baby Beat
Beet	Boldor
Beet	Detroit Dark Red
Beet	Merlin
Beet	Red Ace
Broccoli	Apollo Hybrid
Broccoli	Catskill
Broccoli	Coronada Crown Hybrid
Broccoli	Green Magic

Broccoli	Imperial
Broccoli	Mix
Broccoli	Pacman
Broccoli, Raab	Sorrento
Brussel Sprouts	Churchill
Brussel Sprouts	Franklin
Cabbage	Alcosa
Cabbage	Blue Vantage/Bravo
Cabbage	Caraflex
Cabbage	Charleston Wakefield
Cabbage	Deadon
Cabbage	Early Jersey Wakefield
Cabbage	Gonzales
Cabbage	Green Boy
Cabbage	Lynx
Cabbage	Megaton
Cabbage	Red Express
Cabbage	Red Jewel
Cabbage	Solid Blue
Cabbage	Storage #4
Carrot	Atlas
Carrot	Purple Haze
Carrot	St. Valery
Cauliflower	Amazing
Cauliflower	Bishop
Cauliflower	Candid Charm
Cauliflower	Cheddar
Cauliflower	Cloud
Cauliflower	Graffiti Hybrid
Cauliflower	Orange Burst
Cauliflower	Veronica
Cilantro	Advanced Turbo II
Cilantro	Advanced Turbo II
Cilantro	Leisure
Cilantro	Leisure
Cilantro	Marino
Cilantro	Marino
Cilantro	Santo
Cilantro	Santo
Cucumber	Calypso

Cucumber	De Bourbonne
Cucumber	General Lee
Cucumber	Harmonie
Cucumber	Lemon
Cucumber	Marketmore
Cucumber	Pioneer
Cucumber, Pickling	Saladmore Bush
Cucumber, Slicer	Talladega
Cucumber, Slicer	Thunderbird
Eggplant	Amadeo
Eggplant	Black Bell II
Eggplant	Calliope
Eggplant	Casper
Eggplant	Fairy Tale
Eggplant	Galine
Eggplant	Gretel
Eggplant	Nadia
Eggplant	Ophelia
Eggplant	Raja
Greens, Beet	Bulls Blood
Greens, Collard	Blue Max
Greens, Collard	Bulldog
Greens, Collard	Flash
Greens, Collard	Georgia Green
Greens, Collard	Georgia Southern
Greens, Collard	Morris Heading
Greens, Collard	Tiger
Greens, Collard	Top Bunch
Greens, Collard	Vates
Greens, Endive	Rhodos
Greens, Mustard	Florida Broadleaf
Greens, Mustard	Golden Streaks
Greens, Mustard	Green Wave
Greens, Mustard	Red Giant
Greens, Mustard	Ruby Streaks
Greens, Mustard	Southern Giant Curled
Greens, Mustard	Spicy Green
Greens, Radicchio	Indigo
Greens, Radicchio	Palla Rossa Special
Greens, Turnip	All Top
Greens, Turnip	Golden Ball
Greens, Turnip	Purple Top White Globe

Greens, Turnip	Rapa Di Milano Coletto
Greens, Turnip	Royal Crown
Greens, Turnip	Shogoin
Greens, Turnip	Tokyo Cross
Greens, Turnip	Topper
Greens, Turnip	White Lady
Kale	Kale Mix
Kale	Kale Mix
Kale	Maribor
Kale	Nero Di Toscana
Kale	Red Russian
Kale	Red Ursor
Kale	Toscana
Kale	Wild Garden Kale
Kohlrabi	Early Purple Vienna
Kohlrabi	Kossak
Kohlrabi	Mix
Leek	Lincoln
Lettuce Romaine	Paris Island Cos
Lettuce, Butter head	Buttercrunch
Lettuce, Head	Sierra
Lettuce, Leaf	Salad Bowl
Lettuce, Romaine	Green Forest
Lettuce, Romaine	Red Romaine
Melon	Plum Granny
Melon	Snow Leopard
Melon, Cantaloupe	Athena
Melon, Cantaloupe	Sugar Cube
Melon, Honeydew	Dolce Nectar
Melon, Specialty	Lambkin
Melon, Specialty	Tigger
Okra	Clemson Spineless 80
Okra	Cow Horn
Okra	Eagle Pass
Okra	Emerald
Okra	Jing Orange
Okra	Star of David
Onion	Ishikura
Pea, Snap	Blaushokker
Pea, Snap	Cascadia
Pea, Snow	Golden Sweet
Pea, Snow	Sweet Horizon

Pea, Southern	Big Boy
Pea, Southern	Big Red Ripper
Pea, Southern	Calico Crowder
Pea, Southern	California Blackeye
Pea, Southern	Colossus
Pea, Southern	Creek Crowder
Pea, Southern	Dixielee
Pea, Southern	Knuckle Purplehill
Pea, Southern	Louisiana Quick Pink
Pea, Southern	Mackey Pea
Pea, Southern	Mississippi Pinkeye
Pea, Southern	Ozark Razorback
Pea, Southern	Peking Black Crowder
Pea, Southern	Piggolt Pea
Pea, Southern	Pinkeye Top Pick
Pea, Southern	Rouge Et Noir (Red and Black)
Pea, Southern	Speckled Purple
Pea, Southern	Tohono O'odham
Pea, Southern	Whipporwill, Steele's Black
Pea, Southern	White Acre
Pea, Southern	Queen Anne
Pea, Southern Cream	Mississippi Cream
Pea, Southern Cream	Pinkeye Purple Hull - BVR
Pea, Southern Cream	Top Pick
Pea, Southern Cream	Zipper Cream
Pea, Southern Crowder	Black Crowder
Pea, Southern Crowder	Brown Crowder Top Pick
Pea, Southern Crowder	Mississippi Purple Brown Crowder
Pea, Southern Crowder	Mississippi Silver
Peanut	Carolina Black
Peanut	Carwile's Virginia
Peanut	Tennessee Red Valencia
Pepper, Bell	Big Bertha
Pepper, Bell	Chablis
Pepper, Bell	Giant Marconi
Pepper, Bell	Gourmet Rainbow

	Blend
Pepper, Bell	Gypsy
Pepper, Bell	Intruder
Pepper, Bell	King Arthur
Pepper, Bell	Sweet Bell Mix
Pepper, Bell	Sweet Bell Mix
Pepper, Bell	Tequilla
Pepper, Chile	Passilla Bajio
Pepper, Hot	Beaver Dam
Pepper, Hot	Cajun Belle
Pepper, Hot	Fish
Pepper, Hot	Ghost (Bhut Jolokia)
Pepper, Hot	Habenero Orange
Pepper, Hot	Hot Paper Lantern
Pepper, Hot	Jalapeno M
Pepper, Hot	Numex Easter
Pepper, Hot	Purple Flash
Pepper, Hot	Purple Jalapeno
Pepper, Hot	Super Thai
Pepper, Hot	Sureno
Pepper, Hot	Tiburon
Pepper, Ornamental	Medusa
Pepper, Spice	Hot Pepper Mix
Pepper, Spice	Hot Pepper Mix
Pepper, Spice	Hot Pepper Mix
Pepper, Sweet	Biscayne
Pepper, Sweet	Camelot Hybrid
Pepper, Sweet	Carmen
Pepper, Sweet	Mama Mia Giallo
Pepper, Sweet	Pimiento Elite Hybrid
Pepper, Sweet	Super Heavy Weight
Pepper, Sweet	Sweet Bell Mix
Pepper, Sweet	Wisconsin Lakes
Pumpkin	Munchkin
Pumpkin	Sanchez
Pumpkin, Extra Large	Big Max
Pumpkin, Extra Large	Cronus
Pumpkin, Extra Large	Full Moon
Pumpkin, Extra Large	Goosebumps
Pumpkin, Extra Large	New Moon
Pumpkin, Large	Porcelain Doll
Pumpkin, Large	ProGold 510
Pumpkin, Medium	Blue Doll

Pumpkin, Miniature	Fairy Tale
Radish, Daikon	Bravo
Radish, Daikon	Miyshige
Radish, Garden	Cherriette
Radish, Garden	Rivoli
Radish, Icicle	White Icicle
Rutabaga	Helendor
Rutabaga	Joan
Rutabaga	Laurentian
Rutabaga	Tweed
Spinach	Bloomsdale
Spinach	New Zealand
Squash Winter Spaghetti	Vegetable Spaghetti
Squash Zucchini	Black Beauty
Squash Zucchini	Cocozelle
Squash Zucchini	Dark Green
Squash Zucchini	Poquito
Squash Zucchini	Tigress
Squash, Summer	Fortune
Squash, Summer	Oneball
Squash, Summer	Super Pick
Squash, Summer	Yellow Crook Neck
Squash, Summer Scallop	Flying Saucer
Squash, Summer Scallop	Sun Burst
Squash, Summer Yellow Crook	Cougar
Squash, Summer Yellow Crook	Cube of Butter
Squash, Summer Yellow Straight	Cheetah
Squash, Winter	Bush Delicata
Squash, Winter	Jumbo Pink Banana
Squash, Winter Acorn	Royal Ace
Squash, Winter Acorn	Table Queen
Squash, Winter Acorn	Taybell PM
Squash, Winter Butternut	Buttercup Burgess
Squash, Winter Butternut	Chieftain
Squash, Winter Butternut	Waltham Butternut

Squash, Winter Kabocha	Sweet Mama
Sweet Potato	B-14
Sweet Potato	B63
Sweet Potato	Bonita
Sweet Potato	Cent
Sweet Potato	Covington
Sweet Potato	O'Henry
Swiss Chard	Bright Lights
Swiss Chard	Electric Neon Blend
Swiss Chard	Lyon
Swiss Chard	Peppermint
Tomato, Determinate	Amelia
Tomato, Determinate	Bella Rosa
Tomato, Determinate	Carolina Gold
Tomato, Determinate	Celebrity
Tomato, Determinate	Defiant
Tomato, Determinate	Djena Lee's Golden Girl
Tomato, Determinate	Fantastico
Tomato, Determinate	Fletcher
Tomato, Determinate	Prime Beef Goliath
Tomato, Determinate	Rossa Sicilian
Tomato, Indeterminate	Arkansas Traveler
Tomato, Indeterminate	Betterboy
Tomato, Indeterminate	Big Beef
Tomato, Indeterminate	Brandywine
Tomato, Indeterminate	Chef's Orange Choice
Tomato, Indeterminate	Home Slice
Tomato, Indeterminate	Indigo Blue Berries
Tomato, Indeterminate	Jelly Bean
Tomato, Indeterminate	Marriage Big Brandy
Tomato, Indeterminate	Marriage Genuine
Tomato, Indeterminate	Nature's Bites

Tomato, Indeterminate	Red Pear
Watermelon	Bush Sugar Baby
Watermelon	Distinction
Watermelon	Faerie F1
Watermelon	Jubilee II
Watermelon	Lemon Krush

Watermelon	Melody
Watermelon	Moon and Stars
Watermelon	Orchid Sweet Hybrid
Watermelon	Royal Sweet
Watermelon	Sangria
Watermelon	Shiny Boy

USING SHADE CLOTH FOR SUMMER PRODUCTION OF SPECIALTY CROPS IN HIGH TUNNELS

Project Summary

High tunnels are unheated greenhouse-like structures that provide a relatively low cost modified environment for crop production. Due to the relatively modest inputs required and potentially high profitability, high tunnels are rapidly emerging as a desirable system for many specialty crop producers. Growers use the tunnels to extend growing seasons, reduce environmental variability, increase yields, improve crop quality, and increase income. Unlike most greenhouses where the environment is controlled automatically, high tunnels usually do not have heating and cooling systems. The microclimate in a tunnel is strongly influenced by the outside environment. For example, the air temperature inside the tunnel can rise to a hazard level on a sunny and warm day even in the spring if the sides are not open for ventilation. On the other hand, the internal air temperature of a tunnel at night under clear skies, without heat preservation practices, such as the use of thermal screens, can be lower than the external air temperature due to thermal radiation losses. Plant growth and development halt when temperatures decrease below the base temperature or increase to above the optimum temperature. One of the biggest challenges for high tunnel production in the south is the high temperatures during summer. The objective of this study, implemented by Mississippi State University (MSU), was to investigate the potential of using shade cloth with different colors to modify the microenvironment in high tunnels and evaluate their impact on crop growth.

Seven different types of shade cloth were tested, including Aluminet, ChromatiNet Red, ChromatiNet Gray, ChromatiNet Blue, ChromatiNet Pearl/White, Black, and White. All the shade clothes were rated to provide 50% shade. One treatment without shade cloth was also included as a control. Over the course of this project, vegetables including lettuce 'Two Star' and 'New Red Fire' and cut flowers including zinnia 'Benary's Giant Mix', Sunflower 'Teddy Bear', and snapdragon 'Potomac Red' were evaluated. Plants were grown in three high tunnels in central Mississippi. Results indicated that both presence and type of shade were influential. Soil, air, and leaf temperatures were all influenced by shade cover, and were consistently lower under shade than in the unshaded control. There were also observed differences in plant growth, cut flower stem numbers and stem length, lettuce yield, growth index, leaf area, and even lettuce taste under different color shade. The project's activities and results were shared during high tunnel workshops, field days, and at the Fall Flower & Garden Fest. In addition, results from this project have been presented at local and regional trainings and regional and national conferences.

This project did not build on previously funded SCBGP projects.

Project Approach

Replicated trials were conducted in three high tunnels located at Mississippi State University Truck Crops Branch Experiment Station in Crystal Springs, MS. The high tunnels were placed in full sun and oriented 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 with 3 replications. Each high tunnel serves as a replication. There were 14 frames in each high tunnel, 7 for cut flowers and 7 for vegetables. Each frame was covered with one type of shade cloth. There was also a control plot without shade cloth for each crop in each high tunnel. Seven different types of shade clothes were selected, including Aluminet, ChromatiNet Red, ChromatiNet Grey, ChromatiNet Blue, ChromatiNet Pearl/White, Black, and White. All the shade clothes provide 50% shade. Crops evaluated were selected based on experience of the researchers and in consultation with growers and extension personnel, including lettuce 'Two Star' and 'New Red Fire', zinnia 'Benary's Giant Mix', Sunflower 'Teddy Bear', and snapdragon 'Potomac Red'. Vegetables and cut flowers were sown from seeds, and seedlings were grown in a greenhouse and transplanted into the high tunnels. All plants were grown on raised beds inside the high tunnels. Shade clothes were installed right after transplanting. Each piece of shade cloth was 14 ft. long and 12 ft. wide, and installed on a metal frame (10 ft. long, 4 ft. wide, 5 ft. tall) with no shade cloth covered on the north side and about 1 ft. off the ground on the other three sides. There was 10 ft. of space between each shade cloth plot. Each bed was covered with black plastic mulch with drip irrigation. Irrigation was supplied as needed through the drip tape. Plants were fertigated twice a week with 200 ppm N from Peter's 20-10-20.

Pests and diseases were scouted weekly. Vegetables were harvested at maturity 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, and the data taken included stem length and the number of total and marketable stems. Plant growth, leaf, soil, and mulch temperatures under different shade were taken periodically during the growing season.

Results from this project indicated that leaf, soil, and mulch temperatures were all influenced by shade cover, though differences in responses due to different colors of shade were not significant. Leaf, soil, and mulch temperatures under no shade cover were higher compared to those under shade covers. Shade cloth also affected plant growth, the number of cut flowers and cut flower stem length, lettuce yield, growth index, leaf area, and even lettuce taste under different color shade. For cut flowers, plants grown under ChromatiNet Blue, ChromatiNet Grey, and Black shade clothes produce less flowers compared to plants grown under other color shades and no shade. Plants grown under ChromatiNet Red, ChromatiNet Pearl/White, Aluminet, and White shade clothes produced similar number of cut stems as plants grown without any shade. Plants grown under white, ChromatiNet Red, ChromatiNet Pearl/White, and Aluminet had a higher proportion of longer stems compared to plants grown under ChromatiNet Grey, ChromatiNet Blue, Black, and no shade cloth. For lettuce, in general, plants grown under all shade structures had higher plant growth index than the ones without shade. Plants grown under ChromatiNet Red produced the highest lettuce yield in term of fresh

weights. However, dry weight of lettuce was not influenced by the presence or type of shade. In general, lettuce grown under shade had sweeter or less bitter taste than those grown under no shade control. Between the two lettuce cultivars evaluated, in general, the green lettuce 'Two Star' had higher fresh and dry weight and total leaf area than the red lettuce 'New Red Fire' regardless of shade cloth treatment.

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

- Drs. Bi and Evans built the shade frame, installed the shade structure, and set up all the experiments in the high tunnels.
- Dr. Bi is responsible for the cut flower experiments, while Dr. Evans is 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

The goal of this project is to develop and deliver best management practices with focus on use of shade cloth for summer production of specialty crops in high tunnels in Mississippi to benefit growers and consumers. We were able to achieve this goal during the project period. We tested seven different types of shade clothes: Aluminet, ChromatiNet Red, ChromatiNet Gray, ChromatiNet Blue, ChromatiNet Pearl/White, Black, and White, all with 50% shade. We tested both vegetable and cut flower crops. We collected yield and quality data on the tested crops, pest and disease, and environmental data. We delivered the findings and recommendations 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 500 direct contacts at field days and trainings, with many more indirect contacts and social media interactions. 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 shade cloth into the production of vegetables and cut flowers using high tunnels in MS. Team members have also presented high tunnel information on local, regional, and national conferences. We are preparing two publications that will be completed after the official end of the project period. These include one peer-reviewed journal publication and one experiment station bulletin.

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

Conference presentation:

Bi, G and W.B. Evans. 2014. Effects of Shade Cloth on Specialty Crop Production in High Tunnels. American Society for Horticultural Science Annual Conference, Orlando, FL. July 28-31.

Bi, G and W.B. Evans. 2014. Effects of Shade Cloth on Specialty Crop Production in High Tunnels. HortScience 49(9), S379 (Abstract).

Field day/Tours/Events:

This project has been showcased in several formal and informal grower tours, student tours, and meetings. This project, along with other high tunnel research going on at the Truck Crops Branch Experiment Station, has garnered a lot of grower and public interest.

Mid-South Green Industry Conference in June 2013. About 70 people toured the high tunnels.

Fall Flower and Garden Fest in Oct. 2013. Over 150 people attended high tunnel seminars and toured the high tunnels during the 2-day Fest event.

Fall Flower and Garden Fest in Oct. 2014. Over 200 people attended high tunnel seminars and toured the high tunnels during the 2-day Fest event.

Many small and individual tours have occurred throughout the project period (total 100 contacts).

Beneficiaries

Beneficiaries of the project have included new and existing specialty crop growers in MS and surrounding states. More than 500 growers and gardeners have toured the research site over the life of the project. Knowledge gained from this project has supported grower and agent trainings in Mississippi.

Lessons Learned

Using high tunnels combined with other environment-modifying technology to temper the environment and reduce the environmental and economic risks of season extension production are of great interest to small- and medium-scale farmers and marketers because they provide added income for producers and increase the availability of produce to consumers during traditional off-season periods. Results from this project showed that there is great potential to use shade cloth to extend cool season crops such as various lettuce and salad greens into the summer months in high tunnels in Southern States where summer temperatures often reach well into the 90's (F).

Contact Person

Guihong Bi
Mississippi State University
Mississippi State, MS 39762
Phone: 601-892-3731
Email: gbi@pss.msstate.edu

Bill Evans
Mississippi State University
Crystal Springs, MS 39059
Phone: 662-325-2403
E-mail: wbe1@msstate.edu

Additional Information



Photo #1. Zinnia 'Benary's Giant Mix' grown in a high tunnel at Truck Crops Experiment Station in Crystal Springs, MS.

MISSISSIPPI FARMERS MARKET CERTIFICATION PROGRAM

Project Summary

The Mississippi Department of Agriculture and Commerce created the Mississippi Certified Farmers Market Program as a marketing initiative designed for true farmers markets across the state in 2008. This voluntary branding program is offered to identify and promote markets for Mississippi grown fruits, vegetables, plant materials, and other specialty crops grown in Mississippi. Funding was sought again with the 2012 Specialty Crop Block Grant to further continue this program. Markets deemed 'Certified' must have at least two Mississippi farmers and at least 51% of products sold have to be grown in Mississippi.

In 2008, MDAC received FY 2007 Specialty Crop Block Grant Program funds to begin the Mississippi Certified Farmers Market Program. The purpose was to create brand recognition to farmers markets with Mississippi farmers selling their produce directly to the public. Due to the success of this program, MDAC received FY 2008 SCBGP funds to continue with the program. The purpose of this SCBGP FY2012 project was to allow the continuation of the Mississippi Certified Farmers Market Program. The objectives of the project were:

- 1) Continue to identify which farmers markets in the state are operating as a true 'farmers' market with Mississippi growers selling their crops directly to the public;
- 2) Expand the Mississippi Farmers Market Certification Program certification program to include additional markets; and
- 3) Highlight each of the Mississippi Certified Farmers Markets and Mississippi's specialty crops through promotional efforts.

Project Approach

A Farmers Market Manager Workshop, hosted by the Mississippi Department of Agriculture and Commerce, was held April 4, 2013 just prior to the release of the 2013 Certified Farmers Market applications. Various topics were discussed including the Certified Farmers Market Program and the benefits of this program. This was a great time for new market managers to learn about this program and what it offered.

Supplies, including folders, banners, price cards, and labels were reordered before the application packets were mailed out on April 16, 2013. During 2013, there were 82 known farmers markets in Mississippi, of these 38 became certified. In other words, 46% of the markets in Mississippi were Certified Farmers Markets, exceeding our goal of 35%. These markets were certified by a MDAC's Consumer Protection Division Inspectors. Once markets passed certification, they were given a banner for the market to display, and certificates, price cards, and stickers the vendors may use in their booth to advertise MS grown fruits and

vegetables. In addition, the market was also given information about the mini-grants; these mini-grants are only available to Certified Farmers Markets for promotional purposes (advertising). Only specialty crops grown by Mississippi farmers can be promoted and reimbursed with the mini-grants. Eight farmers markets took advantage of the mini-grants in form of advertising in 2013.

The MDAC project manager created press releases for each market once they passed inspection; these were dispersed to each market's news outlets. MDAC also notified the Department of Revenue and the Mississippi Department of Health to inform them of which markets have passed certification. Certified Farmers Markets are listed on the MDAC website and are also in the summer month editions of the Mississippi Market Bulletin. Certified Farmers Markets benefited from the Mississippi Public Broadcasting show, *Fit to Eat*, which aired on PBS. Sponsorship was aired in June, August, September, and October 2013. Throughout the show, Chef Rob Stinson, demonstrates his techniques for combining fresh, healthy ingredients using Mississippi grown fruits and vegetables, as he continually encourages viewers to shop their local Certified Farmers Market for the same selection.

Results from the 2013 Certified Farmers Market Survey showed an average increase of specialty crop vendors by 32% from 2012 to 2013, above our target of 11%.

A Farmers Market Manager Workshop, hosted by the Mississippi Department of Agriculture and Commerce, was held April 23, 2014 just after the release of the 2014 Certified Farmers Market applications. Supplies, including price cards and labels were reordered before the application packets were mailed out on April 15, 2014. During 2014, there were 85 known farmers markets in Mississippi, of these 35 became certified. In other words, 41% of the markets in Mississippi were Certified Farmers Markets, exceeding our goal of 35%. These markets were certified by a MDAC's Consumer Protection Division Inspectors. Once markets passed certification, they were given certificates, price cards, and stickers the vendors may use in their booth to advertise MS grown fruits and vegetables. In addition, the market was also given information about the mini-grants; these mini-grants are only available to Certified Farmers Markets for promotional purposes. Only specialty crops can be promoted and reimbursed with the mini-grants. Four farmers markets took advantage of the mini-grants in form of advertising in 2014.

The MDAC project manager created press releases for each market once they passed inspection; these were dispersed to each market's news outlets. MDAC also notified the Department of Revenue and the Mississippi Department of Health to inform them of which markets have passed certification. Certified Farmers Markets are listed on the MDAC website and were also listed in the summer month editions of the Mississippi Market Bulletin (which reached over 47,000 subscribers).

Results of surveys from 2014 Certified Farmers Markets show that there is an average of 35% increase in the number of specialty crop vendors from 2013 to 2014, far exceeding our goal of 10%.

A Farmers Market Manager Workshop, hosted by the Mississippi Department of Agriculture and Commerce, was held April 1, 2015 where the 2015 Certified Farmers Market applications were released. Various topics were discussed including the Certified Farmers Market Program and the benefits of this program.

During 2015, there were 84 known farmers markets in Mississippi, of these 29 became certified. In other words, 34.5% of the markets in Mississippi were Certified Farmers Markets, narrowly missing our goal of 35%. These markets were certified by a MDAC's Consumer Protection Division Inspectors. Once markets passed certification, they were given certificates, price cards, and stickers the vendors may use in their booth to advertise MS grown fruits and vegetables. In addition, the market was also given information about the mini-grants available; these mini-grants are only available to Certified Farmers Markets for promotional purposes. Only specialty crops can be promoted and reimbursed with the mini-grants. One farmers markets took advantage of the mini-grants in form of advertising in 2015.

The MDAC project manager created press releases for each market once they passed inspection; these were dispersed to each market's news outlets. MDAC also notified the Department of Revenue and the Mississippi Department of Health to inform them of which markets have passed certification. Certified Farmers Markets are listed on the MDAC website: <http://www.mdac.ms.gov/bureaus-departments/farmers-market/certified-markets-mississippi/> and are also listed in the summer month editions of the Mississippi Market Bulletin (which reaches over 47,000 subscribers). Certified Farmers Markets benefited from the Mississippi Public Broadcasting show, *Fit to Eat*, aired on PBS. Sponsorship was aired in September 2015. Throughout the show, Chef Rob Stinson, demonstrates his techniques for combining fresh, healthy ingredients using Mississippi grown fruits and vegetables, as he continually encourages viewers to shop their local Certified Farmers Market for the same selection. In addition, as a new venture, advertisements placed in three *Well Being Magazine* magazines released in May, July, and September 2015. This magazine promotes healthy living across the state of Mississippi and was a perfect fit to promote fresh fruits and vegetables to consumers. Also, the markets benefited from radio advertisements statewide on the SuperTalk Mississippi radio network in September 2015 to encourage shoppers to continue to shop at farmers markets throughout the fall.

Preliminary results of surveys from 2015 Certified Farmers Markets show that there is an average of 12% increase in the number of specialty crop vendors from 2014 to 2015, exceeding our goal of 10%.

Goals and Outcomes Achieved

The goal of this project was to continue to implement the Mississippi Certified Farmers Market Program for brand recognition to farmers markets with Mississippi farmers selling their produce,

direct to the public. We strived for 35% participation among farmers markets. In 2013, we had 46% of farmers markets request certification, 41% in 2014 and 34.5% in 2015. We surpassed our goal in 2013 and 2014 and barely missed our target in 2015. The Department of Agriculture and Commerce will continue to explain benefits and entice markets to become certified well after the grant has ended.

Through this program, we expected specialty crop sales to increase at certified farmers markets. Due to the difficulty of obtaining sales figures directly from growers, this was measured by the number of farmers selling fresh Mississippi produce at these markets. The target was to increase the number of farmers selling fresh produce sold at certified farmers markets by 10%. Surveys were conducted to Certified Farmers Markets only in order to determine the growth in the number of specialty crop growers at the respective market. From 2012-2013 Certified Farmers Markets saw an increase in specialty crop vendors by 32%, a 35% increase from 2013-2014, and a 12% increase from 2014-2015.

Overall, the goal of the project was reached with variability from year to year. The weather plays such a significant role for farmers markets and the past few years, each part of the state has seen extreme conditions of rain, drought, late frost, hail, etc. This can detriment a farmers total crop for the year, despite these challenges, we still saw an increase in specialty crop producers selling at markets, therefore adding to our state's specialty crop industry.

Beneficiaries

At least 40 markets directly benefited from this grant, these were Certified Markets over the course of this grant. Over 385 specialty crop vendors exhibited at these farmers markets as well. There is some discrepancy in this number as vendors could be traveling to many markets and not all markets were able to submit their survey responses. Regardless, this is a strong number of specialty crop producers and shows that our industry is increasing. In 2015, our specialty crop industry was in the Top 10 of Mississippi agriculture sectors.

Lessons Learned

One challenge MDAC has encountered throughout this grant process is the lack of participation in the mini-grant programs. Only 13 mini grants were awarded throughout the three years of this grant.

The Mississippi Department of Agriculture and strived for feedback from Certified Farmers Market for useful materials that would promote their market's specialty crops; however, without sufficient response from markets, MDAC utilized the money to promote the program generically across the state and to educate consumers to still shop at their Certified Farmers Market in the fall and year-round, if applicable.

Contact Person

Donna West
Mississippi Department of Agriculture and Commerce
donna@mdac.ms.gov
601-359-1118

Additional Information



Certified Farmers Market Logo used to promote certified markets and specialty crops at markets.

Assistance for GAP/GHP Certification

Project Summary

The demand for “fresh, local” fruits and vegetables has increased significantly in recent years. Many factors contribute to the demand for local, rather than regional or foreign, sources of similar product. Factors contributing to the local demand include concern about food safety arising from agricultural practices and handling of product through the supply chain. To combat concerns of substandard growing and handling practices, many purchasing agents are now requiring certifications instituting rigorous food safety standards. The Good Agricultural Practices and Good Handling Practices certification has become the most prevalent certification in the marketplace. Many Mississippi farmers would benefit greatly from the opportunity to have their operation certified by GAP/GHP inspectors. However, many small scale farmers lack the capital assets to completely fund the cost of certification. The cost of certification is \$92 per hour which includes inspector drive time to and from the farm. The cost of inspection can easily range from \$600 to \$800 for one inspection. This is often cost prohibitive to growers and without the certifications, this opportunity for new markets ceases.

The objective of this grant was to increase number of Mississippi farmers possessing the GAP/GHP credential. By increasing the gross number of Mississippi farmers with GAP/GHP credentials, the market for fresh local produce will be expanded within the state. Expanding available supply capacity within the marketplace will provide institutional buyers with additional outlets for a fresh local supply of produce to meet their operational needs.

Our local farmers in Mississippi have the desire to grow into large scale producers who can supply the needs of institutional buyers; a program to obtain the necessary credentials must be offered to receive GAP/GHP certification so they may compete with regional whole suppliers.

This project does not build on other previously funded Specialty Crop Block Grant Programs, and this project has not been submitted to or funded by another Federal or State grant program.

Project Approach

The Mississippi Department of Agriculture and Commerce (MDAC) implemented this cost-share program to help offset some of the costs to acquire the Good Agricultural Practices/Good Handling Practices (GAP/GHP) certification and seek additional markets for growers to sell their products. The program requirements and application for cost-share reimbursement was developed early in 2013. Information and application instructions can be found at the MDAC

website: <https://www.mdac.ms.gov/bureaus-departments/market-development/gapghp-certification-cost-share-program/>.

Additional announcement avenues and locations included: a press release dispersed in May 2013; articles and reminders about the program in the Mississippi Market Bulletin; numerous conferences and workshops including a GAP/GHP training workshop; and MS Fruit and Vegetable Growers Association (MSFVGA) Annual Conference and Tradeshow. At the 2013 MSFVGA Conference, MDAC spoke at the GAP/GHP workshop and also exhibited at the tradeshow for farmers and others interested to acquire information about the cost-share program. Mississippi State University Extension Service incorporated information about the program into a few of their publications and announcements throughout the grant period as well.

MDAC reimbursed a total of 60 growers over the past three years for a percentage of their GAP/GHP certification costs. The overall number of MS GAP/GHP operations has increased from 24 to 37 according to the latest USDA GAP/GHP report. In order for growers to receive reimbursement, they have to submit an application, W9, a copy of their audit bill, score sheet to show completion, and documentation of the payment. Only Mississippi producers are eligible, and the farm must be located within the State of Mississippi. Only audits for specialty crops are eligible for reimbursement.

Goals and Outcomes Achieved

The goal of this project to increase the number of Mississippi farmers with the necessary credentials to participate in large scale distribution of fresh, local produce by a minimum of 50 percent was achieved. Our target of assisting at least 24 additional growers by providing financial assistance was surpassed by a total of 32 operations. While we had 60 reimbursements over the course of the three years, the total number of operations benefiting from this program was 32.

Beneficiaries

A total of 32 specialty crop operations benefitted as a result of the GAP/GHP cost share reimbursement program. This certification opened new market opportunities and avenues to sell their products. Growers that sell to our Farm to School program have benefitted from this program by being able to sell directly the school system. This has been a great opportunity to link our projects together to further enhance both programs.

Lessons Learned

This has been a successful project with many thanks to outside parties publicizing this opportunity. Grower organizations, workshops, meetings, and emails have included information about this funding cost-share program in their agendas and newsletters. Since someone in our agency serves as a GAP/GHP Certifier for USDA, we have a close working relationship to have a checks and balances system to ensure this program is not abused.

This also enables us to create informational handouts detailing the cost-share program to be given to the operator at the actual audit. All fruit and vegetable growers that have an audit conducted on their farm or operations therefore know about this opportunity.

Contact Person

Michael Lasseter
Mississippi Department of Agriculture and Commerce
michaell@mdac.ms.gov
601-359-1120

Additional Information

Mississippi Market Bulletin Articles:

Hyde-Smith Announces Cost-Share Program To Assist Fruit and Vegetable Growers

By Paige Manning
Director of Marketing
and Public Relations - MDAC

Commissioner Cindy Hyde-Smith announced that the Mississippi Department of Agriculture and Commerce is currently offering a cost-share program to provide financial assistance to Mississippi fruit and vegetable farmers receiving Good Agricultural Practices (GAP) and Good Handling Practices (GHP) Certification. Eligible farmers will receive reimbursement for 75 percent of the certification costs up to a maximum of \$500. GAP/GHP audits are voluntary independent audits of produce suppliers throughout the production and supply chain. These audits focus on best agricultural practices to verify that fruits and vegetables are produced, packed, handled, and stored in the safest manner possible to minimize risks of microbial food safety hazards.

"Food safety is not only a concern of consumers; it is a priority of our growers as well. This program will assist our farmers in receiving certification to verify that they are taking the proper precautions throughout the entire crop production process to ensure that they are providing a safe food supply. This certification will create new marketing opportu-



nities for our farmers allowing them to sell their products through avenues not available to them without certification," said Commissioner Cindy Hyde-Smith.

To receive reimbursement, farmers must submit a completed application with proper documentation of costs incurred. Only audits completed by an approved USDA certifier will be eligible for reimbursement. A list of auditor contacts is available at www.ams.usda.gov/gapghp. Funds are available on a first-come, first-serve basis until the funds are depleted. Funding for this program is provided through the USDA Specialty Crop Block Grant Program.

For more information about this program or to obtain an application, visit www.mdac.ms.gov, call Michael Lasseter at (601) 359-1120, or email michaelL@mdac.ms.gov. Funds are available on a first-come, first-serve basis.

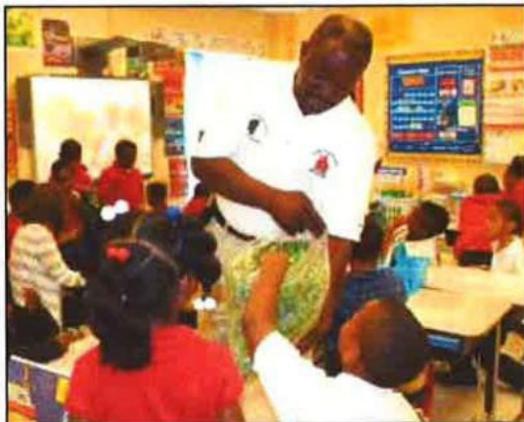
Farm to School Provides Marketing Opportunity for Mississippi Farmers

By Paige Manning
Director of Marketing
and Public Relations - MDAC

As spring approaches, farmers begin to focus on the crops that they will be planting soon. Prior to planting, it is a good practice to have a marketing plan in place detailing where products will be sold. Many fruit and vegetable growers choose to sell their crops through local farmers markets, retailers, wholesalers, and to restaurants. An additional market for fruits and vegetables is school systems. Selling to schools, often referred to as "farm to school," is gaining popularity across the country and in Mississippi. Efforts are being made to bring more locally-grown products into school lunchrooms.

Farm to school efforts benefit farmers, schools, and the local communities. The option to sell to schools creates an additional outlet for farmers to sell their produce while supplying schools with locally-grown produce, which tends to be fresher than produce that has traveled for miles over several days. Many schools that purchase from farmers take farm to school beyond the lunchroom and into the classroom by educating their students on where their food is coming from and the importance of farmers and agriculture. Local communities benefit from farm to school as money that is spent in the local economy tends to stay within the local economy.

There are two options available for farmers that are interested in selling their produce to schools. First, farmers can sell directly to their local school systems. When selling to local schools, farmers make contact with their local school system's Food Purchasing Director or Child Nutrition Director to discuss the products



Farm to school reaches beyond the lunchroom and into the classroom. Glyen Holmes with the Holmes County Food Hub shows students at Sherman Avenue Elementary in Vicksburg the collard greens that are produced for their school.



that the school may be interested in purchasing. Farmers then work directly with the Director to discuss pricing, volume, and delivery.

The second option for farmers interested in getting their products into school lunchrooms is through participation in the statewide purchasing program administered by the Mississippi Department of Education (MDE) and the Mississippi Department of Agriculture and Commerce (MDAC). Since 2002, MDE and MDAC have been working together to supply schools with produce from Mississippi farmers through the Department of Defense (DoD) Fresh Fruit and Vegetable Program. Each year \$2.5 million is devoted to purchase fresh fruits and vegetables. The MDE and the MDAC strive to purchase as much as possible from Mississippi farmers. More than \$1.25 million worth of fruits and vegetables were purchased from Mississippi farmers over the past five years. Farmers participating in this program work directly with the Mississippi Department of Agriculture and Commerce, rather than the school systems, to discuss product

availability and delivery.

Products that have been purchased from Mississippi growers through the DoD Farm to School program include: seedless watermelons, cantaloupes, frozen blueberries, sweet potatoes, satsumas, frozen collard greens, frozen butterbeans, frozen southern peas, bell peppers, grape tomatoes, eggplant, cucumbers, and strawberries. The MDE and MDAC are interested in expanding the volume and variety of Mississippi products and Mississippi farmers that participate in the program. Farmers that are interested in selling through the DoD Farm to School program should contact Chaille Clements with the Mississippi Department of Agriculture and Commerce at (601) 359-1140 or chaille@mdac.ms.gov.

Farmers participating in the statewide purchasing Farm to School program are required to obtain USDA's Good Agricultural Practices/Good Handling Practices (GAP/GHP) certification. To assist farmers in obtaining GAP/GHP certification, MDAC offers a cost-share program that covers 75 percent of the certification cost up to \$500. Farmers that are interested in participating in the GAP/GHP cost-share program should contact Michael Lasseter at (601) 359-1123 or michael.l@mdac.ms.gov.

As part of the Agency's effort to expand farm to school MDAC has developed a survey to determine some of the reasons why farmers may or may not sell to schools. It is designed to capture some of the challenges that farmers face when selling to schools. The information will be used when working with partner organizations to develop programs and materials that will make selling to schools simple for farmers. We encourage fruit and vegetables farmers, even those that have not sold to schools, to complete the brief survey. The survey can be found online at: www.mdac.ms.gov/farmtoschool.

Raised Beds Make Gardening Easier

By Gary R. Bachman
MSU Horticulturist
Coastal Research & Extension Center

I don't know about you, but as I've gotten older, the thought of digging up an area of the yard to install a new planting bed has lost its appeal.

Between a bad back and bad knees -- not to mention bad elbows, shoulders and hands -- using a tiller to break up soil and adding lots of organic matter is just too much work. Along with the aches and pains, I hope age has made me a little wiser about work and relaxation in the garden and landscape.

My solution to new landscape beds is really an old idea: raised beds.

Mississippi gardeners will find that raised beds offer many advantages. They are easier on our backs and joints, but perhaps the greatest benefit of raised beds is the increased water drainage. Most landscape and garden plant problems I come across in Mississippi are related to poorly draining soil.

Growing plants and flowers in raised beds means the texture of the planting medium will remain loose and airy because it is not being walked upon. Raised beds also allow you to grow vegetables and other plants more densely than more traditional garden or landscape beds.

The construction parameters of raised beds are quite simple. The width of the bed should be no more than 4 feet. At this width, the longest reach is only 2 feet, which gives gardeners easy access to the bed from

either side.

Sides constructed from hardscape materials will keep the growing medium where it belongs. The choice of materials is up to the gardener, but I like the newer treated lumber.

If you use lumber, I suggest 2-by-6-inch, 2-by-8-inch or 2-by-10-inch boards, depending on how deep you want the beds to be. A deeper bed gives you more planting options.

Of course, cedar, fir and redwood have natural resistance to decay if you don't want to use treated lumber. These materials are more expensive but will last much longer than untreated pine. Other options include using block, recycled concrete or recycled plastic boards.

You could fill the raised bed with native soil because the height of the bed will greatly improve drainage. But I want you to change your garden paradigm a little bit and treat your new raised bed like a very large container.

I never recommend using only native soil in containers. I like to see a lot of organic matter worked into that soil. In fact, my raised beds are filled with commercial bagged container media with a high percentage of peat moss, vermiculite and perlite. This media remains light, fluffy and well-drained with excellent porosity.

How much growing media or soil will a new raised bed need? A quick formula is to multiply length by width by depth, all measured in feet. This equation works for any raised bed regardless of dimensions.

Whoever thought we would need to use math in the garden?



Treated lumber, such as 2-by-6-inch boards, makes constructing raised beds quick and easy. (Photo by MSU Ag Communications/Gary Bachman)

★ ★ ★ NOTICE ★ ★ ★

Due to the extreme winter weather conditions, the *Mississippi Market Bulletin* February 1st issue was mailed late from Jackson on Thursday, January 30, 2014. We apologize for any inconvenience caused by the late delivery of your February 1st issue.

ENHANCING THE COMPETITIVENESS OF VEGETABLE FARMERS IN UNDERSERVED COMMUNITIES BY ENHANCING FOOD SAFETY

Project Summary

Small-scale producers face great challenges to sell specialty crops to commercial and direct markets because of mandates to implement food safety practices and inspections of farm operations can be costly for certifications and inspections. The University of Arkansas at Pine Bluff and Alcorn State University conducted 12 trainings to provide education in food safety for over 100 specialty crop producers. The train-the-trainer delivery model was used to train 42 agricultural professionals, university faculty and staff, extension associates and agents to transfer the learning to the project participants in implementing Good Agricultural Practices (GAP), Good Handling Practices (GHP), and production practices. Both universities were responsible for training at least 50 participants. As aforesaid, over 100 participants were trained. Cost-share arrangements were provided to farm operations that successfully participated in USDA GAP/GHP inspection and audits.

ISSUES REGARDING COMPETITIVENESS AND FOOD SAFETY

Issues that affect the competitiveness of small-scale farmers and limited resource cooperatives are: access to food safety education to increase knowledge and implement application; an increase in production and operational costs to implement an inclusive farm food safety program; and the cost for food safety audit, inspection and certification. The state of Mississippi has over 30,000 small-scale farmers with only 2 universities to provide food safety education: *Alcorn State University and Mississippi State University*.

Developing and implementing a complete farm food safety regime increases production and operational costs to the farm. An increase in production costs can occur if the commercial market has restrictions in certain farm practices—i.e., no manure or compost use. In addition, there are other certification requirements that increases farm expenses:

- Participation in farm food safety training
 - The training may be free or have a registration costs. Also, travel expenses may be incurred if the training is not provided locally to the farmer.
- Laboratory testing
 - Agricultural water must be tested at least once a year. If E. coli is present or if fecal coliform count is too high, additional tests will have to be conducted until the water meets safe agricultural water standards.
 - The Global Market Addendum of USDA Produce GAPs Harmonized Audit for Field Operations and Harvesting Checklist requests evidence of an annual residual testing or participation in a third-party protection residue monitoring system (5.5.7). This particular audit element is not a requirement; however, farmers are strongly advised to participate in such testing.
- Crop protection, secure building, and storage

- Commercial markets require farmers to have product liability insurance. Insurance is necessary in the event of foodborne illness, which affects the consumer, commercial market, food processor/manufacturer and farm.
- Domestic and wild animals must be excluded from the operation. This requirement may cause the farmer to incur expenses to build a fence. Also, easy farm accessibility — farm too close to highway, farm is separate from the farmer's residence, etc. — may require the building of a fence. The possibility of produce contamination would require a portion or the entire crop to be discarded, which reduces farm income.
- The USDA Good Agricultural Practices/Good Handling Practices (GAP/GHP) audit checklist and the USDA Produce GAPs Harmonized Audit require farms to separately store seeds and transplants from agricultural chemicals. Some farmers have had to build or purchase additional storage to fulfill this requirement.

There are other issues affecting the competitiveness of small-scale farmers and limited resource cooperatives; however, the costs of farm food safety certifications are high. This specific issue birthed a cost-share arrangement program at Alcorn State University. Competitive commercial markets require expensive annual certifications from Global Food Safety Initiative (GFSI) benchmarked audit scheme.

While implementing this multi-state collaboration, project participants specifically grew produce for local Walmart commercial distribution. Their list of third-party certification audits includes: USDA, BRC, FSSC 22000, Global GAP, etc. As aforementioned, farm food safety certifications are expensive. However, for southern states such as Mississippi and Arkansas, the most feasible certification option is to use USDA. The farmer must have successful certification in USDA Produce GAPs Harmonized Audit for the Field Operation and Harvesting with the Global Markets Addendum completed at the intermediate level. Other audits require payment of large inspection costs for the farm and harvesting crew audit, and the farmer must also pay the auditor's travel costs. In May 2012, the co-principal investigator participated in an auditor training for Primus GFS Standards. She learned that there were no auditors residing in Arkansas or Mississippi. Auditors were generally contracted to travel from California, Florida, Illinois, Michigan, or Texas. Unfortunately, travel costs can occasionally cost more than the fee charged for the audits. A 2013 audit cost for one of the aforesaid schemes was observed to be over \$2,800. Using a local USDA Specialty Crop auditor is cut-rate with charge of \$92.00 per hour for USDA Agricultural Marketing Service to conduct audits and inspections, plus a service fee; however, this cost is still expensive for small-scale farmers who live in the Mississippi Delta region or southern Mississippi.

This multi-state collaboration project was developed and implemented to assist small-scale farmers elevate their competitiveness by enhancing their farm's food safety program.

This project did not build on previously funded SCBGP projects.

Project Approach

This project was developed to enhance small, specialty crop producers' competitiveness in commercial production, increase farm income, and improve their operational efficiencies and effectiveness by training 50 Mississippi specialty crop producers and agricultural professionals. The specific project objectives were to:

1. Conduct food safety training to 15-20 agricultural professionals from outreach/extension programs, local agencies, community based organizations, and other non- governmental organizations that provide technical assistance and training to small, specialty crop farmers.
2. Facilitate food safety training and education to 50 small-scale and socially disadvantaged specialty crop producers from each state (Arkansas and Mississippi) that will enhance their preparation for a food safety audit.
3. Provide cost share arrangements for funding audits for specialty crop producers.

Alcorn State University conducted trainings to educate small-scale specialty crop farmers. These trainings included discussion of the audit process and development of farm food safety programs. Also, two (2) "Train-the-trainer" workshops were held and Alcorn provided cost-share arrangements for farmers. The program pays approximately 75% of the cost for each inspection, for a maximum of \$500.00. Also, the project approach included the development of a video on good agricultural practices.

The project directors conducted farm assessments. In each assessment, the co-project director met with the specialty crop producer, inspected each field and developed a plan of action. The producer completed each task on the action plan. Successful certification was obtained for all project participants inspected, with technical assistance from Alcorn State University, in Mississippi and Arkansas. The co-project director assisted the SCBG multi-state collaborator to develop various documents. She also conducted farm assessments and facilitated audits for Arkansas SCBG project participants. Alcorn State University will continue to conduct farm assessment and facilitate USDA audit and inspection. The project directors look forward to continuing their work with farmers and agricultural professionals.

Goals and Outcomes Achieved

The goals of this project were to conduct training to agricultural professionals and small-scale and socially disadvantaged specialty crop producers, facilitate food safety audits, provide cost share arrangements for funding audits for specialty crop producers, and develop a video for good agricultural practices. Regarding the achievements of this grant, the estimated benchmark targets will be compared to the actual outcomes.

Goal 1: To conduct a Food Safety workshop for 10-15 professionals per state.

Performance Measure: Registration records, pre and posttest.

Benchmark: Determined from the pre-training assessment.

Target: Average increase in Food safety knowledge between 40-50%.

Actual Outcome: Alcorn State University trained 38 Mississippi agricultural professionals. Also, there was an increase in food safety knowledge and was assessed as 63.3%. This amount is *higher* than the original target.

Goal 2: To conduct 2-6 workshops to train 50 farmers per state.

Performance Measure: Registration records, pre- and post-test.

Benchmark: Determined from the workshop evaluations.

Target: 90% of participants increased their knowledge of food safety.

Actual Outcome: Alcorn State University and the trained agricultural professionals conducted eleven (11) trainings to 432 farmers in Mississippi. Moreover, 97.2% project participants increased their food safety knowledge.

<i>Date</i>	<i>Training/Conference</i>	<i>Location</i>	<i>Number of Participants</i>
March 25-27, 2013	ASU Small Farmers Conference	Jackson, MS	127
July 8, 2013	Good Agricultural Practices Training	Marks, MS	14
July 22, 2013	Good Agricultural Practices Training	Mound Bayou, MS	9
November 5, 2013	Good Agricultural Practices Training	Holly Springs, MS	19
February 21, 2014	Alliance for Sustainable Ag Field Day	Goodman, MS	18
March 24-26, 2014	ASU Small Farmers Conference	Jackson, MS	116
April 22-24, 2014	Good Agricultural Practices Training	Jackson, MS	29
May 1, 2014	Good Agricultural Practices Training	Petal, MS	12
March 29-31, 2015	ASU Small Farmers Conference	Hattiesburg, MS	134
July 30, 2015	Good Agricultural Practices Training	Biloxi, MS	9
August 20, 2015	Good Agricultural Practices Training	Tylertown, MS	5

Goal 3: Prepare 20-25 farmers for GAP/GHP Food Safety audit.

Performance Measure: Survey farmers who had participate in audits.

Benchmark: Determined by survey

Target: 40% of farmers who participated in workshop will be GAP/GHP certified.

Actual Outcome: Many farmers expressed their desire to prepare and participate in food safety audits; however, only nine (9) farms were actually audited and inspected. Only 2.1% of farmers who participated in workshops were GAP/GHP certified from 2013-2015.

Goal 4: Provide cost share arrangements for audit funding for small and socially disadvantaged vegetable farmers.

Performance Measure: Completed audit documentation, food safety plan, and survey

Benchmark: Determined by survey

Target: Cost share arrangements for 20 farmers.

Actual Outcome: As aforesaid, many farmers expressed their desire to prepare and participate in food safety audits; however, the cost-share arrangement program only paid for two Alcorn-recommended audits.

Also, Alcorn experienced difficulty in paying for audits. Alcorn investigators wanted to pay for the cost-share portion of the audit after auditing because some farmers had difficulty paying the entire amount of the audit. Alcorn wanted USDA GAP/GHP Certifier to split the invoices, by sending one to Alcorn for 75% up to \$500 and invoice the farmer the remainder of the audit cost. This is not allowed per the USDA Certifier. After reimbursing two farmers, Alcorn relinquished the cost-share portion of their grant to MDAC, who in turn oversaw the cost-share program for the remainder of the grant. Alcorn worked with one additional farmer and helped them submit the paperwork to MDAC for reimbursement.

Beneficiaries

As stated in the original proposal, small and socially disadvantaged produce farmers in persistent poverty communities, agricultural professionals in universities, and community-based and other organizations would benefit from this project and increase farm income for the viability of the operation over the long haul. The program would educate at least 50 specialty crop producers and 10-15 agricultural professionals to facilitate a transfer of learning to impact surplus farm operations. Participants were to increase their knowledge and understanding of food safety by approximately 50%:

- Farmers increase knowledge of food safety.
- Increase number of small and socially disadvantaged farmers who are GAP certified.
- Enhance agriculture professionals' ability to provide assistance to farmers in the area of food safety.
- Provide access to cost share for audits.

As shown in the previous section, the project provided education to 432 small-scale specialty crop farmers. Also, the increase of food safety knowledge for agricultural professionals and farmers significantly increased.

This multi-state SCBG collaboration was developed to deliver training to agricultural professionals and small-scale and socially disadvantaged specialty crop producers; however, the long-term outcome includes an increase in farm income because the farmer is selling quality produce from his

USDA GAP inspected farm operation to a commercial market. Farmers are projected to increase cash receipts from increase in sales.

Lessons Learned

Farmers were hesitant to undergo USDA food safety audit and inspection. Seemingly, the hesitation is for two reasons: (1) possible intimidation or fear, and (2) because the farmers and agribusinesses are not required to participate in the certification program unless selling to Wal-Mart and other commercial markets that require the certifications. Moreover, the hesitation caused a significantly low participation in the USDA GAP/GHP and Produce GAPs Harmonized Audit certification over the past 3 years. The project directors allotted \$11,000 for certification; \$1,417 was used for cost-share arrangements. Farmers tend to do their own cost-benefit analysis followed by action or inaction.

Another lesson learned was financial planning. The project management team did not hold meetings with Alcorn State University's Business Affairs and Fiscal Office. MS Code does not allow prepayment of services. Therefore an invoice was needed for each participant before Alcorn would pay for goods and services. The USDA GAP/GHP Certifier could not split the invoice between the farmer and Alcorn for services rendered to the farmer. Alcorn was only able to pay for two cost-share arrangement. Alcorn then relinquished the cost-share portion of their budget to the Mississippi Department of Agriculture and Commerce (MDAC) to oversee the reimbursements for the remainder of the grant period.

A successful example of this program were local Wal-Mart distribution centers purchased locally-grown specialty crops that included southern peas, squash, watermelon, okra, etc., to reduce distribution costs, shipping, and transportation associated with high food miles. The grocery chain required farmers to have a third-party audit; which meant stricter food safety requirements forthcoming. Alcorn State University used grant funds from the multi-state collaboration to enhance small, specialty crop producers' competitiveness in commercial production. Project participants were able to increase farm income and improve their operations' efficiencies and effectiveness.

IMPLICATIONS OF FUTURE RESEARCH

The occurrence and cost of foodborne illness are persistent and consistent. Apparently, the cost and occurrence would lessen as more food safety requirements are imposed. However, the USDA Economic Research Service (ERS) and the University of Florida calculated the annual cost of foodborne illnesses to be approximately \$14.6 billion per year. A similar study conducted by the Ohio State University estimated the cost of foodborne illness at \$16.3 billion per year (Hoffmann and Anekwe, 2013). Product recalls, expensive cost and occurrence of foodborne illness imply more research is needed. Ostensibly, more effective and efficient food safety education and training are needed for small-scale farmers and limited resource agribusinesses; however, their participation is imperative for sustainable farming operation.

The final ruling of the Food Safety Modernization Act will impose mandatory restrictions and requirements on specialty crop farmers and agribusinesses. Farms will be required to develop and

implement farm food safety plans. The requirements are another implication for future research and education.

CONCLUSION

Enhancing the Competitiveness of Vegetable Farmers in Underserved Communities by Enhancing Food Safety” was a great project that benefitted specialty crop production in Mississippi. At least twelve (12) trainings were conducted to provide education in food safety for over 100 specialty crop producers. The train-the-trainer delivery model was used to train 42 agricultural professionals, university faculty and staff, extension associates and agents to transfer their knowledge to the project participants and others interested. Subsequently, said individuals could implement Good Agricultural Practices (GAP) and Good Handling Practices (GHP) in their diverse enterprises and operations. The University of Arkansas at Pine Bluff and Alcorn State University exceeded their expectations to provide training to farmers who own specialty crop operations and agricultural professionals.

The participants enjoyed the project activities until it was time for USDA GAP certification. Cost-share arrangements were provided to farm operations and those who successfully participated in USDA GAP/GHP inspection and audits; however, as noted in the “Lessons Learned” section, the specialty crop producer farmers were hesitant to undergo USDA food safety audits and inspections. When an audit and inspection were completed, the project directors were present to facilitate the audit and assist the project participants. The facilitation helped to calm the participant and introduced a smoother audit process.

Contact Person

ALCORN STATE UNIVERSITY

Mississippi Small Farm & Agribusiness Center
1000 ASU Drive # 1080
Alcorn State, Mississippi 39096

MAGID DAGHER, Ph.D.

ASSISTANT PROFESSOR AND DIRECTOR
PH: 601.877.6449
FAX: 601.877.3931
EMAIL: mdagher@alcorn.edu

NICOLE A. BELL, M.S.

PH: 601.443.3500
EMAIL: nicolebell@yahoo.com

Additional Information

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TRANSITION TO SUSTAINABILITY: ENHANCING THE COMPETITIVENESS OF FARMERS/PRODUCERS

Project Summary

The purpose of the project was to enhance the competitiveness of specialty crop farmers/producers, through the provision of regular and on-going education, training, and technical assistance. Special emphasis was placed on supporting the transition to more sustainable practices and help small, limited resource, and disadvantaged farmers/producers by hosting monthly training sessions/field days.

By providing these hands-on experimental learning opportunities, farmers/producers saw real progress on their farms, while learning from on-farm mini-courses. These outdoor classrooms also encouraged networking, fostered future leadership, and provided access to new ideas, information, and people. These monthly training sessions/field days focused on topics and issues that local specialty crop farmers/producers should have been addressing on their farms. Monthly training sessions/field days also helped these farmers/producers improve their profitability by showing them ways to increase income, lower costs, and improve efficiency. The project has made significant progress in meeting its stated goal, objectives, activities, benchmarks, and targets.

This project did not build on previously funded SCBGP projects.

Project Approach

The Alliance for Sustainable Agriculture's (ASAP) 50-acre demonstration farm served as the focal point for monthly training sessions/field days, building on other successful efforts to strengthen farmer/producer skills, capacity, and productivity. These training sessions/field days were conducted at the same times these activities were underway on farms throughout the state.

Mississippi's 1862 and 1890 Land Grant Institutions – Mississippi State University and Alcorn State University helped farmers/producers reach their full potential and capitalize on the rapidly growing market for local sustainably grown food. These collaborators joined forces with the Alliance, National Center for Appropriate Technology, and experienced farmers to provide experts/presenters and provide a legacy beyond the life of the project.

The following project activities were conducted as planned: The project leadership team provided coordination and direction throughout the project; refined an annual training schedule; marketed sessions throughout the state; conducted monthly training sessions/field

days; documented and shared information; and submitted quarterly reports, annual performance reports, and final report to MDAC.

Goals and Outcomes Achieved

To achieve the goal of enhancing the competitiveness of specialty crop farmers/producers, major project activities were completed as planned and involved conducting regular and on-going training sessions/field days.

During the grant period, 32 monthly training sessions/field days were conducted, involving 1,044 participants – just short of the 1,080 participants projected. The average number of participants per session was 33 - short of the projected 45 per session. Project partners made significant contributions, helping with logistical arrangements, identifying and securing 124 expert presentations that covered more than 50 major topic/issue areas. Sessions were conducted at appropriate times when farmers/producers should have been addressing these issues on their own farm.

The project leadership team and university partners helped improve survey methods and practices, ensuring that benchmarks and targets were achieved; improved understanding of subjects/topics (80%); applied new knowledge, principles, and practices (60%); and improved profitability, environmental, and social responsibility (60%), all gathered from pre- and post-surveys.

Efforts to document and share information from monthly training sessions/field days included: PowerPoint presentations, publications, hand-outs, pictures, and some videotapes. This database is being maintained as a resource for specialty crop farmers/producers.

Beneficiaries

Communities throughout the State of Mississippi have a history of declining population, high unemployment, high poverty level, and limited economic development. Regrettably, the situation is deteriorating – poverty rates are increasing, income disparities are worsening and some communities have the lowest life expectancy and the highest obesity rates in the United States. Despite these challenges, communities are blessed with rich soil; a long tradition of farming; and significant land ownership by historically disadvantaged groups. To take advantage of these opportunities, the Alliance and its partners are continuing to implement interventions specifically designed to improve farm profitability, expand market opportunities, and increase consumer access to healthy food.

Efforts to encourage farmers to grow more sustainably have resulted in increased interest throughout the state. This response reflects the growth and economic potential of sustainable

agriculture, as well as growing consumer demand for local, sustainably grown food. According to the USDA and trade groups, the market for organic products has increased 20% per year for the past 15 years, and a growing number of consumers are willing to pay 15-40% more for organic produce than for non-organic produce. The Alliance and its partners are committed to helping local farmers and consumers make the most of the opportunities presented by this rapidly growing sector. Therefore, the first, and most important, step was to make a real investment in skill and knowledge development.

Lessons Learned

Project targets were generally realistic and attainable. The total number of participants was over projected by only 36 and the number of participants per session was over projected by an average of 12. Despite severe and variable weather conditions such as snow, rain, cold, and flooding, as well as, busy time periods for farmers/producers, only one training session/field day was cancelled. Even though it was a challenge conducting “monthly” training sessions/field days, there were no significant problems or delays.

As a result of implementing this project, several “*positive lessons*” were learned that provided a foundation for not only continuing, but expanding these activities. By providing these hands-on experimental learning opportunities; farmers/producers grew more, grew more sustainably, and increased sales. This was made possible because state universities and others collaborated to provide expertise on more than 50 major topics/issues. With this encouragement and support farmers developed a greater appreciation for the economic potential and growing consumer demand for local, sustainably grown food.

The Alliance and its partners are expanding monthly training sessions/field days statewide by refining the curriculum, identifying experts/presenters, and hosting these events at local demonstration farms, located throughout the state. We are pleased that monthly field days will continue from August through December 2015 without grant funds. Long-term plans call for ensuring the sustainability of this unique collaboration.

In conclusion, local farmer networks formed through these training sessions/field days are helping to champion a revival of family farms by strengthening linkages between specialty crop farmers; increasing quality food production; expanding market opportunities; and embracing social responsibility. Through collaboration, these strategies will transform the quality of life and economic landscape for poor, rural, and under-served communities.

Contact Person

Contact Person: Keith Benson
Phone Number: 601-988-4999
Email: keithmdp@yahoo.com

DEVELOPMENT AND DELIVERY OF FOOD SAFETY AND QUALITY PROGRAMS FOR THE SPECIALTY CROP INDUSTRY AND DEVELOPMENT AND ASSESSMENT OF POTENTIAL VALUE-ADDED PRODUCTS AND PROCESSES FOR ENHANCING REVENUE AND DECREASING RISK OF FARMERS AND HANDLERS OF SPECIALTY CROPS

Project Summary

This project addressed immediate and future needs for specialty crops farmers and handlers through a number of subprojects that addressed research and outreach programs in food safety, product handling, value-added products and processes. This was needed in light of new and additional regulations, increased number of non-traditional farmers and handlers, and increased demand for locally grown products. One research project and delivery of food safety outreach programs per year was the goal.

The purpose of this project was to: 1. Conduct research to enhance the marketability and value of specialty crops in the state of MS, especially berries, sweet potatoes and nuts; and 2. to conduct training in food safety, quality and other priorities for the education and enhancement of marketing and consumer protection of producers.

This project is new but builds on two previous SCBG projects- one on training on GAPs for Farmers and Packers and the other on Food Safety for Farmers Markets. Even though we reached over 250 people over the life of the previous projects, more training and updated training and information is needed. In addition, new guidance from the state on acidified canned foods and other regulations to come from the federal government have brought about the need for additional training and research in these areas.

Project Approach

Food Safety for Farmers & Packers (GAP/GHP/GMP) Training

This training targeted farmers and packers to enhance their knowledge and help them get certified in GAPs. The certification is part of the USDA requirements and opens markets and better prices for farmers. This training was conducted in conjunction with regulatory personnel from USDA/MDAC and included academic, trade and regulatory personnel at times. A total of 5 training sessions were conducted throughout the state, with the participation of 110 farmers and packers, in addition to others. The participants were able to improve their knowledge substantially, achieving over 80% understanding in a post test. Improvements in knowledge were also significant. Satisfaction with the courses and instructors ranged between 4.5 and 4.8 (on a 5-point scale).

Food Safety (FSFM) for Certified Farmers Markets Training

This training covered general concepts of food safety and how products should be handled to minimize food safety hazards during the production, transportation, and sale of foods in farmers markets. This training was targeted at farmers' markets managers and vendors. This training was conducted in conjunction with personnel from the Mississippi State Department of Health. A total of 5 training sessions were conducted throughout the state, with the participation of 65 vendors and managers. The participants were able to improve their knowledge substantially, between 5.4 - 25%. Satisfaction with the courses and instructors was high, ranging between 4.6 and 5.0 (on a 5-point scale). General food safety sessions for farmers' markets managers were conducted each year during their annual meeting in Jackson.

Acidified Canned Foods (ACF) for Certified Farmers Markets Training

This training was to educate farmers' markets vendors and others on the basic concepts of acidified canned foods, with two primary steps: acidification and heat process. A total of 5 training sessions were conducted throughout the state, with the participation of 66 vendors and managers. Most participants (60/65) passed the exam (minimum score of 80% in the first test, and all but two passed the exam on the second trial). The participants were able to improve their knowledge substantially, averaging about 10%. Satisfaction with the courses and instructors was high, ranging between 4.5 and 5.0 (on a 5-point scale).

Acidified Canned Foods (ACF) for Commercial Processors (certified course)

This training covered 8 chapters (2 days) of the national training curriculum (Better Process Controls School, BPCS). These chapters were necessary to obtain certification. A total of 9 participants from regulatory, academia (extension) and commercial processors attended the course. The participants passed all the chapters covered, averaging 83% (minimum of 70% needed to pass). Satisfaction with the course and instructor was 4.8 (on a 5-point scale).

Other Presentations

The PI and co-PIs presented or participated in 5 other trainings/workshops. Attendance in those workshops was over 250 people. Presentations on food safety, quality and processing for Greenhouse tomato growers, grape and muscadine growers, blueberry growers, strawberry growers, and farmers markets vendors and associates were conducted. Personnel from the MDAC were at many of the workshops/trainings and were instrumental in helping market the courses and in assisting the PI.

Research studies

Two studies were conducted. One on prevention of sprouting of small size sweet potatoes. This project resulted in the development of hot water treatment for the reduction of sprouting in sweet potatoes that could then be used as is or converted to value-added products. The second study looked at the effect of freezing methods on the quality of rabbiteye blueberries grown in the state. There is a myth that rabbiteye blueberries get tougher with freezing and that blast freezing prepackaged berries are not as good as IQF berries. Results showed very little differences in the morphology of the berries and no differences in sensory perception between

treatments. A presentation at a national conference was conducted. A thesis is being developed from the second study.

Product Testing

A number of products were tested on site at trainings or were sent to MSU for testing. The PI offered this service at no cost to participants for the first few samples, and at minimum cost thereafter. This service is ongoing.

Project partners contributed by helping organize and register participants, market the courses, teach sections of the course, and redo assessments based on results from the first year. The assessment exams and improvement measures were examined and the training content in FSFM and ACF trainings changed to enhance teaching and education, with the goal of filling knowledge gaps in food safety.

Goals and Outcomes Achieved

Participants, including farmers and packers, market managers, vendors, and others that sell at MS certified farmers markets were instructed on minimum requirements necessary to maintain the safety of fresh fruits and vegetables and of products derived from them, in particular, acidified canned foods. Their responses to evaluations and subsequent observations noted that they could:

1. Develop a food safety manual for the documentation of Good Agricultural and Handling Practices for the safe production of fresh fruits and vegetables;
2. Monitor the production of fresh fruits and vegetables in order to minimize contamination;
3. Monitor water quality, personal hygiene, and other sources of produce contamination and food contamination;
4. Avoid the sale of high risk products like unpasteurized milk, sprouts (unless certified), low-acid canned foods, and others, that could lead to making consumers ill;
5. Learn the impact they could have on the viability of farmers markets if one of them could cause illness and death to consumers;
6. Learn the proper method of processing fresh vegetables and other products by acidification so as to make them safe to the consumer; and
7. To find reliable sources of information for developing their processes.

A total of 16 trainings were conducted with the participation of 250 people. In trainings that required post-tests, participants scored 84% (84/100), showing a very good understanding of the training. For those trainings where improvements (pre/post test changes) were measured, participants averaged 12% gain in knowledge (post/pre test improvement). This number may be small but significant since most attendees had a general knowledge of food safety but not specific requirements or guidelines.

Beneficiaries

More than 250 direct participants and about 300 additional participants were exposed to intensive or short trainings on food safety requirements for handling fresh produce or for making safe value-added products.

Consumers benefit from these trainings/workshops by being provided safer foods and by being instructed by vendors and others on how to handle food safely until it is consumed.

Lessons Learned

The project PIs were able to interact with people and learn their shortcomings and challenges. Lack of resources and misinformation are detrimental and make the application of the principles taught very difficult.

An incubator/demonstration facility, and more support is needed to improve the benefits of food safety training and keep our farmers markets safe for the consumers. In addition, we need to work with food policy makers and developers, not only regulatory but also non-governmental organizations to understand their points and try to collaborate towards the same goal to provide safe food to the consumers, at a reasonable cost to the farmer/vendor.

Contact Person

Contact Person: Juan L. Silva
Mississippi State University
Telephone Number: 662-325-3200
Email Address: jls46@msstate.edu

MISSISSIPPI AG & FORESTRY MUSEUM DOCTOR'S OFFICE MEDICINAL HERB GARDEN

Project Summary

This project was developed through recognition of the need for improved educational opportunities in the Doctor's Office Herb Garden located at the MS Ag Museum.

The aim of the project was to restore this medicinal herb garden in order to increase the accessibility to this garden as well as enhance the ease of interpretation for visitors to the garden.

This project has not been submitted for funding to any other federal or state grant program. This project is not a continuation of a previously funded SCBGP.

Project Approach

The Metro Jackson Master Gardeners partnered with the MS Ag Museum in this endeavor. Philip Laird of the Metro Jackson Master Gardeners partnered with Aaron Rodgers, director of the MS Ag Museum, to complete the physical restoration of the garden. This included renovating the paths and the compost areas as well as installing new signage.

The Ag Museum oversaw the design, completion, and implementation of interpretive material for the garden. MS Ag Museum Staff developed educational programming to coincide with the newly restored garden.

Volunteers have been obtained and will continue to be used to present educational demonstrations in the garden.

Goals and Outcomes Achieved

One of the ways we are measuring the outcome of this project is by giving benchmark pre-tests to determine existing knowledge on the subject, followed by post-tests after visitors have had exposure to our new signage and/or programming in the Doctor's Office Herb Garden.

Our test-takers improved in their knowledge of specialty crop production and usage. The average score on the given benchmark pre-test was 13.4%. This average increased to 100% on the post-test, which is an average overall increase of 86.6%.

The long-term outcome that this project will provide will manifest itself in the form of increased interest and activity in this part of the museum.

In implementing this program, we have enhanced educational capabilities, especially pertaining to medicinal herbs and their historical usage.

Beneficiaries

The most direct beneficiaries of this project are the numerous visitors to the campus each year. The museum hosts over 100,000 visitors on average every year.

Guests who would have previously experienced trouble maneuvering around the garden, such as guests with physical disabilities, will now find the area accommodating to their needs. Every visitor, including students and educators, will now receive an improved educational experience from their visit.

Lessons Learned

In completing this project, the MS Ag Museum recognized how we could effectively partner with outside groups, such as the Metro Jackson Master Gardeners Association. Through this experience we have learned to create viable relationships with community organizations and acknowledge the great value of these partnerships.

Completing this project and seeing its positive results gives the MS Ag Museum the confidence to continue seeking opportunities to enhance and improve all the museum has to offer.

Contact Person

Aaron Rodgers
601-432-4512
aaron@mdac.ms.gov

Additional Information





PREVIOUSLY APPROVED FINAL REPORTS

RENIFORM NEMATODE IMPLICATED IN SWEET POTATO END ROT: THE KEY TO ECONOMIC LOSSES?

Project Summary

Mississippi is the third largest sweetpotato producer (per CWT) in the United States after California and North Carolina (USDA National Agricultural Statistics Service, 2009). Sweetpotatoes are grown on about 21,000 acres by about 122 family farmers in rural Mississippi (USDA Agricultural Census, 2007). The estimated value of Mississippi's sweetpotato production was sharply higher in 2008, to \$73,000,000, continuing a two year trend (Mississippi State University, 2008). Since most sweetpotato farmers reside in two rural counties which possess the majority of the state's appropriate soils, Calhoun and Chickasaw, any impact on the sweetpotato crop will be felt throughout north central Mississippi.

Sweetpotato storage rots in Mississippi increased annually from 2005-2009. The rot also started occurring earlier in storage, becoming a late November problem instead of a January one. In 2005-2008, the rot increased in incidence, but seldom damaged enough of the crop to cause serious economic loss. Among growers, rot incidence was erratic and with few exceptions, would occur one year but not the next. Until 2008, the most common rots were Rhizopus, different types of Fusarium rots, circular spot, and punky rot.

When placed into storage, affected roots appear healthy. When the roots are pulled from storage, washed and sorted on the packing line, end rot diseased roots show areas of black, almost charcoal like color. The black areas may be dry and desiccated or wet and smelly, depending on which other fungi have been present. The black color is due to a fungus called *Macrophomina phaseolina* (Mp). When the disease is discovered, it is at the economically worst time for the grower, since all investments have been made (investments in seed, fertilizer, cultivation, management practices, labor-intensive harvesting, transportation, storage, washing, and sorting), only to suffer the additional expense with the disposal of the rotting roots, instead of expected income at the end. Worse, the grower knows how many roots went into storage and can predict what will pack out. This information might well be used to make contracts, which then might have to be filled by purchasing sweetpotatoes.

Although the fungus Mp has historically been present in Mississippi fields, recent work shows that it has been especially important in the end rot outbreak, where it accounts for 13%-28% of all fungal isolates taken from fields with an end-rot history (Stokes et al., 2011). Some possibilities that have been discussed to explain this event include a change in the fungus (eg. mutation), a change in the sweetpotato, or something new. We suspect something new and

preliminary data support this latter view.

Service nematode samples drawn by a Mississippi State University Extension plant pathologist have indicated that fewer root-knot nematodes and more reniform nematodes are being recovered from sweetpotato fields. Samples submitted to the Mississippi State University Extension Service Plant Nematology Laboratory, also seem to indicate increases of reniform nematodes in sweetpotato soils. Further, a trial examining the potential of biological fungicides for alleviating end rot disease, showed a very significant and highly-correlated relationship between reniform nematode numbers at harvest and soil counts of Mp (Henn, A. and W. Burdine, MSU, unpublished data).

A large amount of literature is available showing associations between plant-parasitic nematodes and fungi to harm a plant host (Black et al., 2002.). Early dying is a disease of Irish potato, caused by the interaction of the root lesion nematode with *Verticillium* fungi. When both organisms are present, the plants can die early, even though environmental conditions favor continued vigorous growth of the plant (Martin et. al., 1982). Yield losses are not just the sum of the expected damage by *V. dahliae* and *P. penetrans*, but are synergistic, much greater than expected (Rowe et al., 1985). Further, in many such interactions, the change in the physiology of the plant induced by nematode parasitism is such that even if the plant roots are split with the nematode in a separate pot from the fungus, the synergistic interaction still occurs (Black et al., 2002). Other examples of nematode/fungal interactions include soybean cyst nematode (*Heterodera glycines*) and *Fusarium solani* f. *glycines* as major cause of sudden death syndrome of soybean crops (Roy et al., 2000; Gao et al., 2006). On cotton, root-knot (*Meloidogyne incognita*) nematode and *Fusarium oxysporium* f. sp *vasinfectum* form a disease complex responsible for yield losses from wilt (Kirkpatrick et al., 1984). These interactions can also occur on tree hosts (Powell, 1971; Ruehle, 1973; Dreistadt et al., 1994).

An interaction between nematodes and Mp would explain, at least mostly so, the erratic appearances of end rot disease within a field and among years. Plant-parasitic nematodes and soil dwelling fungi are tightly clumped into “pools” within the soil. As their numbers increase, the size and number of pools in the field also increase. This could explain why some boxes of sweetpotatoes from a field yield healthy roots upon removal from storage whereas others produce end rot diseased roots, and explain why some fields are more likely than others to produce the disease. Another part of the disease expression is clearly environmental.

This project only benefitted the specialty crop, sweetpotatoes, no other crops or commodities were researched with these funds. This project has not been submitted for funding elsewhere and does not expand on previously funded SCBGP.

Project Approach

Field and greenhouse data were collected on the densities of reniform nematode, Mp, and the consequential end rot development. Controlled densities of Mp and reniform and were studied in greenhouse trials to better understand field results. Separate greenhouse trials examined potential interactions between Mp and reniform nematodes using a factorial treatment arrangement and a split root technique. This knowledge can be leveraged to set up a scale to assess grower risks and suggest management strategies to eliminate or reduce severity of the end rot. Training of Mississippi State Extension Service personnel, crop consultants, and industry associates can then ensue.

The stated goal for this project was to provide a scientific basis from which sweet potato fields can be assessed for the risk of producing end-rot infected roots during storage. To that end, the following activities were completed:

Field Trials: Fields used for growing sweetpotatoes in previous years were sampled for reniform nematode populations. Fields with high variability in nematode populations were selected for use during the 2013 growing season for field plots. 20 plots of 1/1000 acre were created in

each of the two fields, and each plot was intensively sampled for nematode population levels. Plots were sampled at mid-season and at harvest time during the season for variation in nematode populations. Harvestable yield was collected and counted, and subsamples were taken for determining presence or absence of Mp in harvested potatoes. Harvested potatoes were stored at recommended temperature and humidity, and subsampled at 90 and 120 days after harvest for the presence of Mp in the stored product.

Field trials were repeated in the 2014 growing season, but after pre-planting soil sampling for nematode population levels, the growers supplying the fields decided to rotate to a different crop rather than continue with sweetpotato in the established fields. New fields had to be selected, and the sweetpotato extension specialist Dr. Stephen Meyers was instrumental in creating new trial plots. Once new plots were established in new fields, midseason and harvest samples were taken as in the previous year. Harvestable yield was collected and counted, and subsamples were taken for determining the presence of Mp. This data will be reported in the FY2013 Specialty Crop Final Report.

Greenhouse Trials: Controlled tests were established to determine interactions between known levels of reniform nematode populations and known volumes of Mp. Soil was collected from each of the two selected fields for Field Trials with the intent of pasteurizing in a large volume autoclave. However, during setup for this trial, the large volume autoclave used for soil pasteurization stopped working and was unavailable for several weeks. Because we could not prepare field soil as planned, we chose to use ProMix BX soil substrate, as it provides a suitable growing substrate with minimal microbial interference. 12" clay pots were set up with 5000 mL of ProMix, and virus-tested culture grown slips were introduced into each pot. Soil substrate was moistened and the plants were allowed to establish for two weeks. Once plants

were established and thinned to one healthy plant per pot, treatments were applied of three different levels of Mp with a standard level of reniform nematode based on the average mid-range population seen in the fields. Plants were allowed to mature for 90 days, and then were harvested from pots. Harvested roots were examined for visible signs of tip- end rot. Tissue samples from roots were taken to determine the presence of Mp.

Contributions from project partners included but were not limited to:

- Drs. Henn and Stokes performed surveying of field locations for reniform nematode population variations in early 2013.
- Drs. Baird, Henn, and Stokes established collaborations with growers in the primary sweetpotato growing region of the state
- Drs. Baird and Stokes established field plots, collected, and analyzed field samples with student workers, established and maintained greenhouse trials, and collected and analyzed samples from greenhouse studies.

Goals and Outcomes Achieved

Research Plot Establishment

Table 1. Nematode population measurements (nematodes per pint of soil) to determine locations of field test plots.

Treatment	Field Test 1 (Penick_17)			Field Test 2 (Bailey_West)		
	Reniform nematode <i>Rotylenchulus reniformis</i>	Root-knot nematode <i>Meloidogyne</i> spp.	Others	Reniform nematode <i>Rotylenchulus reniformis</i>	Root-knot nematode <i>Meloidogyne</i> spp.	Others
Control plot	0	0	Lesion – 0 Spiral – 0 Ring - 0	0	0	Lesion – 0 Spiral – 0 Ring - 0
Low nematode plots	1230 – 1663	0	Lesion – 0 Spiral – 0 Ring - 0	24 – 126	0	Lesion – 0 Spiral – 32 – 55 Ring – 0-8
High nematode plots	9614 – 13,023	0	Spiral – 503-615 Lesion – 0 Ring - 0	2042 – 3122	0	Lesion – 0 Spiral – 0 Ring - 0

Control plots were designated as those with undetectable reniform and root-knot nematode populations. Low nematode plots were designated as those with nematode populations below or near the threshold for treatment. High nematode plots were designated as those plots far above the threshold for treatment. 24 plots were randomly placed throughout each field, and plots meeting the criteria for control, low, and high treatments were selected from these. Treatments were separated based on low and high populations having approximately 10% or greater difference. Potential correlations will be evaluated comparing tip/end rot levels vs. nematode population counts.

Densities of Reniform Nematodes

Table 2. Densities of reniform nematodes in test plots through 2012 growing season. Reported in nematodes per pint of soil.

	Density at Planting	Density at Mid-Season	Density at Harvest
Bailey 1C	39	1277	3892
Bailey 1F	24	1547	2617
Bailey 2C	2814	3765	5099
Bailey 2E	3122	2659	5267
Bailey 4A	2042	4126	7146
Bailey 4C	126	1017	5703
Penick 1A	1230	6520	8658
Penick 1C	1261	3700	5883
Penick 2C	9614	13247	17618
Penick 3C	1663	3977	6125
Penick 4B	13023	14980	19024
Penick 4F	9893	10442	13887

Throughout the season, populations increased in all test plots, indicating stable populations of pathogenic reniform nematodes throughout both test fields.

Additionally, Mp presence in harvested roots was examined and found to be inconclusive. Mp was cultured in approximately 40% of root tissues, but incidence of visual signs of tip-end rot was much lower, at less than 15% of harvested roots. Circular spot damage was much more prevalent, along with charcoal rot of roots. Based on this information, it was determined that refining field methodology and repeating the sampling period in the following growing seasons would provide more data with which to draw comparisons and connections between presence of Mp and incidence of tip-end rot.

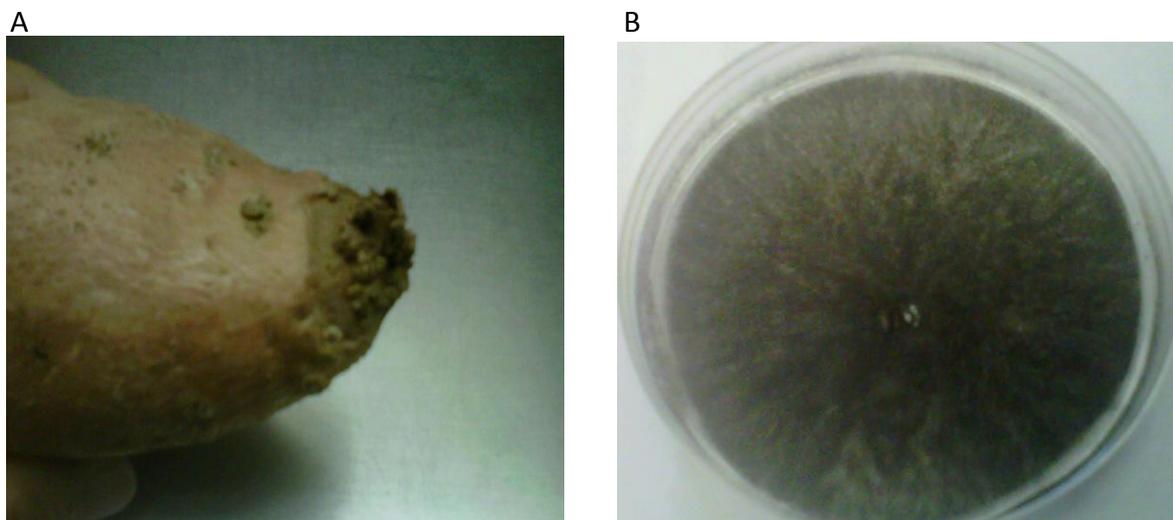


Figure 1. (A) *Macrophomina phaseolina* culture collected from sweetpotato root tissue in 2012 field harvested sweetpotato roots. (B) Tip-end rot visual symptom observed in harvested root.

Beneficiaries

Sweetpotato growers now plant and harvest a crop hoping that when they remove it from storage it will be free from end rot and can be sold; too often it cannot. Several growers have adopted the strategy of selling their sweet potatoes out-of-the field or as soon after harvest as possible, to avoid the risks of disease that storage brings. End rot accounted for at least 50% of the storage losses reported during a 2008/2009 season survey (Burdine, unpublished data). Not knowing how end rot disease is triggered or when or where it will occur adds to grower uncertainty and increases the risk growers will stop cultivating sweetpotatoes, a crop worth about \$73,000,000 to the north Mississippi area.

This project related varying densities of Mp and reniform nematodes to end rot incidence. It also sought to determine whether reniform nematodes interact with the sweetpotato host and Mp in a way that facilitates end rot disease. The data will be used to provide a risk assessment tool that will generate multiple benefits. First, it could provide pre-planting warnings to growers so that nematode and fungi mitigation programs can be implemented. Secondly, the base data will allow continual development of superior mitigation strategies for the disease.

Lessons Learned

Lessons learned in this first year of reniform nematode vs Mp examinations included a refining

of field techniques for determining presence of tip-end rot as opposed to other types of root damage produced in sweetpotatoes, and what is feasible for setup of comparative greenhouse trials. Especially in the greenhouse nutrients, soil types being used all will impact sizes and growth of the roots in pots. In all cases to use pasteurized soils (one clean of microbes), the only clear and safe method is Pro-Mix versus field soils, with the latter never really are cleaned up in our available autoclaves. Furthermore fields having problems with tip/endrot one year may not have the same occurrence of the rot in consecutive years, regardless of nematode populations. Collaboration with many growers is absolutely necessary, as one cannot know for certain if a field will be utilized for the same crop in consecutive seasons until immediately before planting, based on grower expectations and planning for crop plantings.

Contact

Dr. Richard E. Baird, PhD
662-325-9661
rbaird@plantpath.msstate.edu

DEVELOPING TARGETED DIRECT MARKETING STRATEGIES FOR MISSISSIPPI SPECIALTY CROP PRODUCERS USING REGIONAL CONSUMER MARKET RESEARCH

Project Summary

Mississippi State University implemented this project with the intent to provide locally-grown, direct-to-consumer marketing strategies for Mississippi growers that will improve profitability from regional consumer surveys. The stated purpose of this project was to understand “the motivating factors of Southeastern consumers who are seeking to purchase locally grown specialty produce” and create a “knowledge bank” that might be useful to Mississippi specialty crop growers in increasing profits. The work plan consisted of two focus groups which would inform the design of a consumer survey whose results in turn would be disseminated to producers through three workshops. The work plan proceeded unaltered.

The survey examined consumer preferences for specific attributes of locally grown produce, looking specifically at tomatoes. Also, participants at the grower workshops were invited to complete a questionnaire, a few months following the workshops, to assess whether the information provided would be useful to them in making future production and marketing decisions.

The importance of this project stems from the desire of specialty crop producers to be able to capitalize on the increased demand for locally and “responsibly” grown food items.

This project did not build upon a previously funded specialty crop block grant project.

Project Approach

The project team traveled to Atlanta, GA on March 28, 2013 and Memphis, TN on May 6, 2013 to conduct focus groups, information from which would be used to design the survey. The discussion in the focus groups centered on why people do or do not try to buy locally-grown produce, how often they do so, and what the most important attributes of produce are for them when making purchase decisions. We also looked specifically at whether they consider environmental and health impacts of their produce purchasing decisions as we decided to focus our research on better understanding consumer preferences for health and the environment when buying produce.

From the focus groups we narrowed our focus on the environmental attributes of travel miles,

water usage, fertilizer type, and pesticide residue. We also narrowed our focus on health to incidences of several diseases within the family, on physical activity, and on changes in lifestyle for health reasons.

The consumer survey was administered by Research Now in August 2013. It targeted primary shoppers in households in the southeast: Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas. We received about 300 responses each from Alabama, Louisiana, and Mississippi, 1061 responses from Florida, 1327 responses from Georgia, and 1416 responses from Texas for a total of 4707 responses. Of these, 4217 were actually usable for the data analysis due to some incomplete responses. Table 1 compares the demographic breakdown of the survey sample with that of the population broken down by state. They match closely except that our sample contains older respondents on average.

Table 1. Respondent Demographics by State

Respondent Demographics by State							
		N	% Female	% White	% Hispanic	Age (median)	Income (mean)
Alabama	Sample	301	54.3	75.3	2.9	52	70,267
	State	4.78 M	51.5	68.5	3.9	37.9	59,273
Florida	Sample	1060	51.3	77.8	17.5	50	62,298
	State	18.8 M	51.1	75	22.5	40.7	66,599
Georgia	Sample	1327	54.8	66.8	5.7	49	76,380
	State	23.6 M	51.2	59.7	8.8	35.3	67,659
Louisiana	Sample	302	50.2	69.2	1.7	49.5	68,430
	State	4.5 M	51	62.6	4.2	35.8	62,369
Mississippi	Sample	300	51.3	64.8	2.1	48	60,777
	State	2.97 M	51.4	59.1	2.7	36	54,176
Texas	Sample	1416	45.3	67.3	32.8	46.5	78,636
	State	25.1 M	50.4	70.4	37.6	33.6	71,651

The primary task of the survey was for respondents to complete a choice experiment. In a choice experiment, respondents are asked to choose their favorite of competing alternatives. They may be asked to make several such choices. In our survey, respondents were presented with a hypothetical farmer’s market tomato and a hypothetical tomato from a grocery store. The two tomatoes differed according to (these are called the tomato “attributes”) the distance they had travelled from where they were grown, the amount of non-recycled water used to grow them per pound, whether they were grown using petroleum-based fertilizer, the amount of pesticide residue they contained, and their price. Respondents were asked which they would

purchase or whether they would purchase neither. They answered four such questions where the attribute levels differed in each question.

In addition to the choice experiment, respondents answered questions about their personal and family health, about their produce purchasing habits, and about typical demographic information.

Table 2. Willingness to Pay for Attributes: Mean per Pound (95% CI)

Variable	Willingness to Pay
Tomato is sold at a farmer's market (relative to grocery store)	\$ 0.36 (0.18, 0.54)
Tomato grown using 2.8 gallons of underground or surface water per pound	\$ 0.10 (0.03, 0.17)
Tomato grown using 3.4 gallons of underground or surface water per pound	\$ 0.09 (0.04, 0.15)
Tomato has 60% less pesticide residue than the maximum allowed	\$ 0.25 (0.18, 0.33)
Tomato has 40% less pesticide residue than the maximum allowed	\$ 0.13 (0.08, 0.18)
Tomato was grown within 50 miles from where it is being sold	\$ 0.44 (0.36, 0.54)
Tomato was grown between 50 and 274 miles from where it is being sold	\$ 0.19 (0.14, 0.24)
Tomato that was not grown with petroleum-based fertilizer	\$ 0.42 (0.34, 0.51)

The primary purpose of the survey was to estimate how much more, if anything, consumers would be willing to pay for tomatoes with certain environmental attributes as specified above. Table 2 shows the mean willingness to pay estimates and their 95% confidence intervals in parentheses. We estimate that consumers are willing to pay \$0.36 more per pound for a tomato sold at a farmer's market compared to a tomato sold in a grocery store. This value captures benefits to consumers of buying at farmer's markets that are not captured by the other attributes specified in the table. This may include reasons such as supporting local farmers, the enjoyment of interacting directly with the grower, or the enjoyment of the farmer's market experience. The water measures are relative to a tomato grown using 4 gallons of water per pound, which is a typical amount derived from the Mississippi State 2013 Vegetable Planning Budget (Mississippi State University, 2012). In the survey it was explained that tomatoes could be grown using alternatives to surface and ground water such as rainwater and recycled water. The results indicate that consumers are willing to pay about \$0.10 per pound to reduce the amount of ground and surface water used in production. Consumers are also willing to pay \$0.13 - \$0.25 per pound to reduce the amount of pesticide residue on their tomatoes and \$0.42 per pound more for tomatoes that are not grown using petroleum-based fertilizer. Consumers prefer tomatoes that are grown closer to where they are being sold; they are willing to pay \$0.19 per pound more for tomatoes grown within 50 to 274 miles of the point of production (relative to more than 274 miles away) and \$0.44 per pound more for tomatoes grown within 50 miles of where they are sold.

The survey focused on tomatoes specifically. Initially, we had considered focusing on a wider variety of specialty crops, but decided that the costs involved in terms of survey complexity were not worth it. Rather than do a lower quality study on several crops, we decided to focus on a high-quality survey on a single crop. Thus, there is no guarantee that the willingness to pay values estimated for tomatoes will carry over to other products, but we would be surprised if similar results – in the sense that consumers are willing to pay for these environmental production attributes – did not hold for other products as well.

These results were typed up into an informational sheet which was presented to workshop participants in three workshops in early 2014. The workshops were designed to educate school representatives and producers about the Mississippi Market Ready Farm-to-School program. An invitation to complete a short survey was sent out to the producers (N=10) who attended these workshops. The goal of the survey was to assess the usefulness of the results of the study. Only two of the ten producers completed the survey, so the amount of feedback we have is limited. Nonetheless, one producer said that the information received was “not likely” to affect his/her production practices in the future, while the other said that the info was “somewhat likely” to affect future production practices. One producer said the information was “somewhat likely” to affect his/her marketing practices while the other said it was “very likely” to do so. One producer indicated very little flexibility in being physically able to produce tomatoes grown using less water, fewer pesticides, and without petroleum-based fertilizer, whereas the other producer indicated he/she would be able to do so without much difficulty. Both producers agreed that the results pertaining to tomatoes would likely hold true for other specialty crops as well.

In a separate analysis we examined whether health factors affect whether or not consumers buy produce at farmer’s markets. We find that the presence of heart disease within the family is correlated with purchases at farmer’s markets, and that consumers who are more physically active, who are concerned about food safety, and who have made lifestyle changes for health reasons are more likely to purchase food at farmer’s markets.

The results of the study suggest several different avenues for marketing and production of specialty crops. First, growers who sell at farmer’s markets can market their products by association with a healthy lifestyle. For example, they could tout the benefits of consuming fruits and vegetables. Second, they could use the results to help decide whether they should engage in certain production processes. One limitation of our study is that it examines only the consumer side, not the costs to producers of actually implementing production changes. Nonetheless, producers can use the results as a guide to assess whether or not it might be profitable for them to invest in a rainwater catchment system or a recycled water system, or whether they should switch to alternative fertilizers and pest management strategies. If they do so, they could center their marketing strategy on informing consumers about the

production changes they undertake, possibly capturing premiums from consumers who value the environmental impacts of their produce purchase decisions.

Goals and Outcomes Achieved

The stated **GOAL** of this project was to “conduct survey research that will provide quantitative measurements of Southeastern consumer behavior specific to their decision to purchase locally- grown fresh produce” and to disseminate the research findings to growers and agricultural professionals (**PERFORMANCE MEASURE**) in order to help them make more informed production and marketing decisions. Both of these goals were completed. Furthermore, the results pertain to a relatively understudied population, produce consumers in the Southeastern US (**BENCHMARK**).

Besides the dissemination of results to growers at the workshops, the master’s student working on the project presented preliminary results from the survey at the 2013 annual meeting of the Food Distribution Research Society in Chicago, IL to an audience of primarily academic and food researchers. Also, we expect to write two research manuscripts to be published in academic journals to further disseminate the findings to other specialty crop and food issue researchers. One manuscript will focus on consumer willingness to pay for environmental attributes of food production and the other will focus on the health factors affecting local food purchase decisions.

Beneficiaries

Although only two producers completed our feedback survey (see above), the results were disseminated to all producers who attended the workshops. The results provide information that the producers can possibly use to increase profits through alternative production and marketing strategies. The information might also signal that certain production strategies are not feasible (i.e. “worth it”) for certain producers. Either way, the information fills a knowledge gap that existed before the research was undertaken.

Other researchers might also benefit from this research. We believe the tomato survey was high quality and that similar research can and should be conducted for other specialty crops. We deliberately focused our health factors more specifically in order to gain more precise knowledge about what exactly it is about health that affects purchasing decisions. We believe this focus should be replicated in future studies. In general, our study examined both environmental issues and health issues in more detail than previous studies.

The economic impact of this study will be borne out in future years. Now producers have more information about what consumers care about when making fresh produce purchasing decisions. The next step is for producers to decide whether it is beneficial to them to alter their production processes or to change their marketing strategies. Their decisions will ultimately be the test of the usefulness of our research and other similar research studies.

Lessons Learned

The research team learned a lot from conducting this study. First, we learned that produce purchase decisions are more complex than we previously thought. From existing studies, we had only a vague understanding that consumers “consider the environment” or “are concerned about health” when they make produce purchase decisions, but little more detail was known. This study helped us to learn more about what exactly it is about the environment that they care about, for example, water conservation, travel miles, pesticides, and fertilizer types. We learned that certain types of health issues, like heart disease, are strongly correlated with local food purchases, but that others, such as diabetes, back and joint pain, and Alzheimer’s or dementia, do not seem to be as strongly correlated except possibly when the respondent himself/herself has the ailment.

Through our discussions with producers, we also learned about the challenges of connecting consumer desires with producer capabilities. Many producers express the desire to better understand what consumers want when they purchase locally-grown food. After learning about consumer desires, however, they also recognize that not all the desires can be easily met. For example, the Southeast has a climate that makes organic or even low-pesticide production processes extremely difficult. However, one of the advantages of our study is that we never framed the production processes as all-or-nothing. We deliberately specified incremental changes in production processes so that producers could decide whether to make incremental production changes. For example, they almost certainly cannot eliminate pesticides entirely, but they could make incremental reductions for which they might expect to be rewarded through higher price premiums. Also, a recycled-water system may not be feasible for many growers, but perhaps a low- cost water catchment system might be a feasible alternative. It can be a challenge to change producer thinking towards the idea of incremental changes rather than considering only a complete production changeover to organic production.

Contact

Dr. Matthew G. Interis
Department of Agricultural Economics
PO Box 5187
Mississippi State, MS 39762
(662)325-4787
m.interis@msstate.edu

Additional Information

This study provided data that have been used/are being used to complete two master's theses in the Department of Agricultural Economics at Mississippi State University. After the theses are completed, the team will attempt to publish the results in peer-reviewed economics journals. Support by the USDA SCBG program will be acknowledged in any publications.

MISSISSIPPI SWEET POTATO PROMOTION/MARKETING CAMPAIGN

Project Summary

The purpose of this proposed project was to influence purchasing decisions of produce buyers by promoting Mississippi sweet potatoes at the Produce Marketing Association's annual trade show.

The Mississippi Sweet Potato Council (SPC), sought to continue to build the brand awareness of Mississippi sweet potatoes. Sweet potatoes per capita consumption is trending upward and buyers are looking for sources of sweet potatoes. Through this project, the SPC, planned to make buyers more aware that Mississippi has quality sweet potatoes. In addition, the SPC planned to make new buyer contacts and further their sales.

The Mississippi Sweet Potato Council implemented this project to promote and market Mississippi sweet potatoes to buyers across the United States. This project involves participating as an exhibitor at the Produce Marketing Association (PMA) tradeshow to promote and enhance the Mississippi sweet potato industry by increasing sales and brand loyalty.

This project does build upon previous Specialty Crop Grants funded through Fy-2009, Fy2010, and Fy-2011. This project builds upon the market share gained through these previously funded projects to promote Mississippi Sweet Potatoes by participating in the Produce Marketing Association's annual tradeshow.

Project Approach

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. Four growers/shippers attended the Tradeshow as a result of the grant. Additional sales generated by contacts made at the tradeshow are estimated to be \$265,000. Sales continue to be made as a direct result of the tradeshow.

There were no other partners in this project.

Goals and Outcomes Achieved

The goal of the project was to participate in the PMA trade Show in order to attract new buyers to purchase Mississippi sweet potatoes in order to increase sales.

Activity: Attendance of four growers/shippers to the PMA Fresh Summit in New Orleans, LA, in October, 2013. The SPC provided contact/informational brochures and one-on-one contacts to buyers. Additional sales will continue to be made over time as a result of buyer contacts made at the PMA Tradeshow.

Participation at the PMA Tradeshow was achieved. New buyer contacts were established and have been maintained.

\$265,000 of Mississippi sweet potatoes have been sold as a direct result of new buyer contacts. This is an increase from \$224,000 (benchmark) set in our project proposal and represents an approximate 18% increase in sales.

Beneficiaries

Mississippi sweet potato growers were the group that benefitted from the completion of this project. The Town of Vardaman 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 \$ 224,000 (benchmark) to \$265,000.

Lessons Learned

As a result of completing this project, we learned that the PMA tradeshow continues to be a very effective venue to make contact with buyers looking to buy Mississippi sweet potatoes.

Sales of sweet potatoes increased significantly more than anticipated. Sales can be increased as a result of quality contacts with buyers.

All goals and outcomes were achieved.

Contact Person

Benny Graves, Executive Director, Mississippi Sweet Potato Council
662-769-7300
benny.spcouncil@gmail.com

PUBLIC RELATIONS CAMPAIGN TO PROMOTE BUYING LOCAL SPECIALTY CROPS

Project Summary

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 to clarify. 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 towards specialty crops. This specialty crop promotion was the only portion of the overall campaign promoting specialty crops.

This project was previously funded by the 2010, 2011, and 2012 Specialty Crop Block Grant Programs. The program for 2013 built on the name recognition that was achieved in previous years. The push to feature specialty crops in the cooking segment that ran on several TV stations highlighted the use of locally grown products and gave interesting facts about the commodities while the dish was being prepared.

Project Approach

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. These included WLBT in Jackson, WLOX in Biloxi, WABG in Greenwood/Greenville, WATV in Tupelo, and WDAM in Hattiesburg. This gave FFM virtually statewide coverage. These spots generally ran during morning, noon, and evening news programming but also picked a few TV shows that fit the targeted demographics and ran some spots during that time. Approximately 550 TV spots featuring specialty crops were run throughout this media event. 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 over 750 times.

There were 14 billboards that featured a specialty crop; they were displayed in Jackson, on the Gulf Coast, and in the Greenwood/Greenville, MS area.

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 obtain a baseline number and then again immediately following the campaign. The survey results showed that the ads had the desired effect on consumers. The number of respondents that 'frequently' tried to find and purchase locally grown specialty crops increased from 46% in February 2012 to 66% in May 2013. A number of those that are now 'frequently' purchasing specialty crops would have previously stated 'occasionally,' if they were interviewed in the February 2012 survey, this is a result of the advertising obviously changing their shopping behavior.

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 30% in February to 38% in May for the response of buying locally grown specialty crops helps the local economy and keeps money local is a very nice change. Fifty-one percent of those surveyed believe that buying locally produced crops provides their family with fresher, healthier meals.

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, which further indicate the effectiveness of the ad campaign.

Farm Families of Mississippi is a group of approximately 175 agricultural organizations, companies, and individuals committed to educating and improving the image of agriculture among the state's consumers and the list is still growing. This is not just a short-term 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 focus of the long-term goal of creating positive public perception of agriculture in Mississippi.

Goals and Outcomes Achieved

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, Gulf Coast, and Greenwood/Greenville media markets; radio spots were aired statewide. The goal was to raise the awareness of the benefits of specialty crops by at least four percent. When asked to name benefits of buying and consuming locally grown crops, it is clearly evident that the advertising program was successful. Especially the increase from 46% in February to 66% in May 2013, for the response that they frequently try to find and purchase locally grown specialty crops shows that advertising had the desired effect; this is an increase of 20%.

Beneficiaries

The groups that will benefit from this public relations effort are the local farmers that raise these specialty crops. 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 23rd and 25th 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 sales figures from all of the local farmers are not available, the increase in the awareness of the benefits of buying locally produced foods should increase local sales, especially when you combine the responses from the survey showing the public realizes 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. The campaign highlighted the fact that most people try to find and buy locally grown fresh produce rather than a brand they may be familiar with and accustomed to buying. As seen in the results of the May survey in 2013, 68% say they now find and buy locally grown produce as opposed to buying a familiar brand.

Lessons Learned

An interesting insight came as a result of our long-term campaign. The project coordinator received a phone call from Eat Jackson. They are a web-based publication company that promotes all things related to food in Mississippi. They had seen the ads over the years and sought partnership in promoting locally grown foods. This partnership has opened many doors for Farm Families of Mississippi, and by extension, the specialty crop producers in the social media world. Our Facebook page has more than quadrupled this year. Conversations about how and where your food is grown are abundant and continue to expand.

The Farm Families of Mississippi felt like this was a very worthwhile campaign because it showed the public really does want to buy locally produced food and understands the benefits of doing so. 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 FY2013 Specialty Crop Block Grant Program.

Contact

Greg Gibson, Mississippi Farm Bureau Federation
Phone: (601) 977-4154
Email: ggibson@msfb.org

Additional Information

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

<http://www.growingmississippi.org/newsroom.htm>