Louisiana Specialty Crop Program
Final Performance Report
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PROGRAM OVERVIEW

The Louisiana Department of Agriculture & Forestry (LDAF) applied for a Specialty Crop Block Grant (SCBG) from the USDA Agriculture Marketing Service (AMS) under the authorization of Section 101 of the Specialty Crops Competitiveness Act of 2004 (7 U.S.C. 1621). That application was approved by AMS at which time the LDAF and AMS entered into a cooperative agreement September 2014. The award was in the amount of $437,456.11.

Louisiana's projects focused on programs working to inform consumers of the availability of Louisiana horticulture and other specialty crops, where they can be purchased for increased sales and consumption, and how to purchase, buy and grown them. Projects also focused on specific specialty crop research to improve management, growth development and yield, the study of new crops for production in Louisiana, and educational training and outreach to address food safety.

These projects were chosen for their importance to Louisiana's specialty crop industries and to help add money into the local economy. LDAF projects were designed to improve the competitiveness of Louisiana's specialty crops and educate the consumer.

LDAF staff monitored each project by requiring quarterly activity reports and maintaining periodic phone calls, site visits and email update discussions. All invoicing and grant fund payments were completed prior to this report.

LDAF submitted Change in Budget Requests as needed and they were approved by the USDA and contract amendments between LDAF and the subgrantees were conducted to reflect these changes and new project end dates.

PROJECT ONE TITLE- TRAIN GROWERS IN MARKET READY & FOOD SAFETY MODERNIZATION ACT REGULATIONS AND PRACTICES

SUB-GRANTEE: LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Project Summary:

This project was designed to help Louisiana specialty crop growers become more competitive in these ways: assist entities in the distribution chain develop "Good Agricultural Practices" (GAPs) and "Good Handling Practices" (GHPs), particularly in response to changes under the Food Safety Modernization Act (FSMA) via training with MarketReady program; enhance food safety by training producers in GAPs and GHPs under FSMA; and enhance marketing of specialty crops by training producers in aspects of good business functions and practices expected by buyers of specialty crop produce with MarketReady program.

This project was designed to help producers gain access to more markets by addressing the challenges Louisiana specialty crop growers perceive and actually face in their efforts to conform to food safety policies under FSMA that satisfy their customers. In addition, we helped producers develop a better understanding of the specific food safety policies of grocery stores of all sizes in Louisiana via modification of the existing MarketReady program developed at the University of Kentucky.

Importance of the project

Based on the 2013 Louisiana Agriculture and Natural Resources Summary, there were 6,228 specialty crop growers who had a direct economic impact to Louisiana exceeding $130 million in 2013. Concerns Louisiana specialty crop producers have with any regulations like those under FSMA could have a serious impact to the state's specialty crop producers and food system. FSMA enables the FDA to better focus on preventing food safety issues rather than reacting to problems after they occur. The process of renewing the food safety system based on prevention will take time and FDA has started. Louisiana Specialty Crop Growers must begin preparing for FSMA now by assessing their farm's standard operating procedures begin to adopt preliminary FSMA standards through adoption of Good Agricultural Practices (GAPs). The actions to be taken by individual growers will depend on their size as measured by sales, by the kinds of markets they pursue, and other factors. To become competitive in the marketplace specialty crop growers need to understand GAPs, how to assess the risks on their farms and what practices reduce risks." Similar views are held by many in the food marketing chain in Louisiana; implying that all producers, regardless of size, must begin addressing issues of food safety, in compliance with FSMA, if they wish to remain competitive and profitable over the long run.

The project had 3 specific objectives:
(1) Gauge specialty crop producers' knowledge of GAPs, GHPs, and FSMA requirements and practices prior to training.
(2) Modify the Market Ready program to Louisiana, including standards related to FSMA.
(3) Train specialty crop producers with the modified Market Ready program with attention to GAPs, GHPs and FSMA requirements and practices.

Project does not build on previously approved project under the SCBGP or SCBGP-FB.

Project Approach:

Over the project period, eight MarketReady Program Producer training workshops were held at various locations throughout the state: in Baton Rouge, New Orleans, Hammond, Lake Charles, Lafayette, Alexandria, Monroe and Port Allen, Louisiana. At these MarketReady Producer trainings for specialty crop producers, a total of 202 people attended the training in these 8 locations. During the training workshops, producers received training in all business functions covered by the MarketReady training modules, including requirements of GAPs, GHPs, and FSMA relevant to specialty crops. The

training at all 8 locations included two to four local buyers of specialty crops – one produce buyer from a local grocery chain in Louisiana, one or two local restaurants, and/or one local school system representative. We incorporated information from Farm-to-School programs into the curriculum too, so producers could interact with a buyer from a local school system in all locations. This latter addition to the training helped increase producer understanding of the requirements and limitations of farm-to-school program participation.

Significant contributions of project partners:
The Farm-to-School participation of local school districts was very helpful as local producers were able to interact and know their local contact for this program.

Also of benefit to local producers was the buyer's panel at lunch. This created opportunity for producers to make contact with and network with local buyers so that their marketing opportunities were expanded.

Goals and Outcomes Achieved:

Outcome 1: Have 100-120 producers increase understanding of basic business-to-business functions and best practices for participation in the food marketing channel. This will include conducting 8 Market Ready workshops with 10-15 participating specialty crop growers throughout the state within the year.

Overall, during the period of grant, we conducted eight (8) MarketReady Producer training workshop in Baton Rouge, New Orleans, Hammond, Lake Charles, Lafayette, Alexandria, Monroe and Port Allen, Louisiana. At these MarketReady Producer training for specialty crop producers, there were 202 producers received training in all business functions covered by the MarketReady training modules, including communication, marketing, invoicing, packaging, labeling, pricing, and delivery relevant to specialty crops. At each of the eight training programs, there were two to four local buyers of specialty crops – produce buyers from grocery chains in Louisiana, local restaurants, and/or local school meal programs (farm-to-school program). ***At the end of year, cumulative total MarketReady participants in 2015 was 202 – an average of 25 producers per workshop. This exceeded original goal of 100-120 producers or an average of 15 per workshop.***

In summary, over the year, we conducted pre-post-test questionnaire of producers at the MarketReady producer training about their understanding of business functions or successful specialty crop producers marketing product locally, good practices for creating relationships with buyers and maintaining those relationships with expectation of increased sales and revenues from better marketing of produce. ***The number of producers at these eight trainings with improved knowledge of the best practices for marketing specialty crops to buyers (as measured by percent correct on the pre-post-test) increased by roughly 18% (pre-post-workshop surveys identified a 18% increase in knowledge).***

Outcome 2: Have 100-120 producers increase understanding of basic regulations and requirements of FSMA and GAPs and GHPs relevant to specialty crop growers. This will entail incorporating this component of training on FSMA, GAPs and GHPs as part of the scheduled 8 Market Ready workshops with 10-15 participating specialty crop growers throughout the state within the year.

Over the course of the year, we conducted three (8) MarketReady Producer training workshop in Baton Rouge, New Orleans, Hammond, Lake Charles, Lafayette, Alexandria, Monroe and Port Allen, Louisiana. At the MarketReady Producer training for specialty crop producers, attended by 202 producers, they received training in management functions covered by the MarketReady training modules, including requirements of GAPs, GHPs, and FSMA in general and those relevant to specialty crop producers and specialty crop produce in particular. ***At the end of the four quarters of 2015, cumulative total participants at MarketReady training was 202 producers who received training in the requirements of GAPS, GHPs and FSMA in general and issues relevant to specialty crop producers and specialty crop produce. This exceeded the goal of 100-120 participants of an average of 15 per workshop.***

During the year, we conducted pre-post-test questionnaires of 202 producers at both training workshops about their understanding of requirements of GAPs, GHPs, and FSMA, in general and particularly as they relate to specialty crop producers. ***The number of producers with improved knowledge of the best practices (GAPs and GHPs) specialty crops and FSMA related to specialty crop producers (as measured by percent correct on the pre-post-test) increased by roughly 19% (pre-post-workshop surveys identified a 19% increase in knowledge).***

Beneficiaries:

Beneficiaries of the project: Specialty crop producers participating in the training modules benefited directly from knowledge transfer. Additionally, other producers will have secondary benefits as a result of the training workshops because they will be possible vendors for the buyers who participated in the workshops. Buyers participating in buyer's panel also benefitted from training workshops. They were able to identify potential specialty crop producers who could supply produce to them.

How many: 202 producers participated in the 8 scheduled training workshops. Secondary beneficiaries of the training workshops would be several hundred specialty crop growers in the state. The 20 buyers from grocery stores and restaurants, and the 8 Farm-to-School representatives from local school districts, benefitted by identifying and contacting local specialty crop producers who could provide produce.

Impacted: Producers (beneficiaries) received training on best practices for business-to-business transactions in the food marketing channel via the Market Ready program; they were educated and trained on GAPs, GHPs, and other requirements and practices under

FSMA. For specialty crop growers to remain competitive in the market place in the future, they need to be certified in compliance with FSMA requirements and this program helped them gain the required information to properly seek certification for FSMA. We provided timely information to all participants on upcoming additional training provided by LSU AgCenter on FSMA.

Lessons Learned:

Lessons learned by the project staff as a result of completing this project: the amount of producers participating in workshops was directly related to the effort made by local LSU AgCenter staff in promoting the workshops. When staff made concerted effort to publicize event in various outlets, participation was very good. Often insufficient effort was made and resulting numbers were low.

Unexpected outcomes or results that were an effect of implementing this project the buyer's panel portion of the training greatly increased networks for both producers and buyers (local restaurants and grocery stores). Additionally, the networking opportunities for producers were very great for those attending and participating in the workshops. This was unanticipated, but greatly appreciated by the producers.

Goals or outcome measures were achieved.

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PROJECT TWO TITLE- NUTRITION CHARACTERIZATION TO ENHANCE MARKETING OF SWEET POTATOES

SUB-GRANTEE: LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Project Summary:

Increasing sweet potato consumption and developing additional market outlets are necessary for sustained growth of the Louisiana and U.S. sweetpotato industry. Consumers are placing increasing importance on the nutritional composition of foods in making their purchasing decisions. In addition, nutritional labeling is becoming increasingly important in produce marketing. However, limited information is available on the nutrient content of the leading sweetpotato cultivars marketed in North America.

The purpose of this research project was to characterize the chemical and nutrient composition of the roots of commercially important sweetpotato cultivars and promising breeding lines. The concentrations of the individual sugars, crude protein, macronutrient elements, micronutrient elements, and principal vitamins were characterized in raw and baked roots at harvest and during storage. Sweetpotato marketing efforts to increase consumption can be strengthened by a more thorough characterization of the nutritional composition of the different edible sweetpotato products. This is especially true in the rapidly expanding European Union (E.U.) and Canadian export markets, which represent a significant immediate opportunity for fresh market Louisiana sweetpotatoes and their value-added products.

This project quantified the carbohydrate, protein, mineral, and vitamin contents in the roots of the commercially important sweetpotato genotypes produced in Louisiana and the U.S. This information can be incorporated in marketing and consumer education efforts to enhance sweetpotato consumption and strengthen the sweetpotato industry. Consumers can also benefit by being able to make more informed purchasing decisions when product nutritional information is available.

Project Approach:

Fourteen commercially important Louisiana and U.S. sweetpotato cultivars and/or breeding lines were planted in the summer of 2014 at the LSU AgCenter Sweetpotato Research Station in Chase and at an out-grower farm in Gilbert, LA. The cultivars included ‘Bayou Belle’, ‘Beauregard’, ‘Bellevue’, ‘Bonita’, ‘Burgundy’, ‘Covington’, ‘Evangeline’, ‘Jewel’, ‘Murasaki’, ‘Orleans’, ‘Porto Rico’, ‘Purple 164’, ‘Purple 165’, and ‘05-24’. The cultivars represented a wide diversity of skin and flesh colors, including orange, white, and purple.

The roots from these plots were harvested in November, followed by analyses of the roots for individual sugars, crude starch, dry matter, crude protein, total carotenoid content, ascorbic acid, organic acids, macronutrients, and micronutrients. Additional root samples were cured and stored at 14° C for subsequent analyses after short-term storage (~2 months) and long-term storage (~8 months).

Initial project activities focused on establishing and improving the analytical protocol and laboratory analyses procedures for quantifying sweetpotato carbohydrates, minerals, ascorbic acid (vitamin C), and total carotenoids (vitamin A). Laboratory procedures were developed for using the extracted juice of fresh roots to quantify the sugar profile of the different sweetpotato cultivars. This was a significant improvement over past methods of utilizing homogenized tissue that required boiling and several filtration steps.

Several different high performance liquid chromatography (HPLC) methodologies were compared and optimized for individual sugar analyses. The most effective methodology for quantifying the major sugars in both raw and baked roots required the use of an aminopropyl bonded phase column at 21°C with a mobile phase of 70% acetonitrile and 30% water. This resulted in baseline separation of all four of the major sugars present in baked roots (maltose, sucrose, glucose, fructose), and the three major sugars present in raw sweetpotatoes (sucrose, glucose, fructose).

The protocol for tissue preparation and quantitation of ascorbic acid (vitamin C) was fine-tuned and optimized for sweetpotato roots. Optimal ascorbic acid separation was achieved with a reverse phase C18 GraceSmart column using an isocratic mobile phase consisting of monobasic sodium phosphate and ultraviolet light detection at 254 nanometers.

The individual sugar profile differed widely among the sweetpotato cultivars. The major sugars in raw roots of all sweetpotato cultivars at harvest were sucrose, glucose, and fructose. The disaccharide sucrose was the principal sugar in all but one of the cultivars. Only ‘Bayou Belle’ raw roots contained higher amounts of the monosaccharide sugars (glucose and fructose). Glucose was the principal monosaccharide in the raw roots of all cultivars, and consistently exceeded the concentration of fructose by between 5-10% in each cultivar. The quantitation of individual sugar concentration in the different cultivars is important from a flavor and processing quality standpoint. Roots with high sucrose concentrations typically are the sweetest, whereas roots with low monosaccharide content typically do not turn as dark during the chipping and frying process. The sucrose concentration in the raw roots at harvest ranged from a high of 3.98% in ‘Burgundy’ to a low of 1.91% in ‘Bayou Belle’. Glucose concentration ranged from a high of 2.35% in ‘Bayou Belle’ to a low of 0.62% in ‘Burgundy’. Fructose concentration ranged from a high of 2.06% in ‘Bayou Belle’ to a low of 0.56% in ‘Burgundy’. The total sugar content at harvest in the roots of the seven sweetpotato cultivars analyzed ranged from 6.32% in ‘Bayou Belle’ to 4.75% in ‘Beauregard’.

The total carotenoid content in raw roots of the orange-flesh cultivars at harvest ranged from a high of 3.3 mg/100 g fresh weight in ‘Burgundy’ to 2.1 mg/100 g in ‘Orleans’. The nutritional importance of carotenoids, particularly beta-carotene as a precursor to

vitamin A, is well-known. Sweetpotato cultivars with high concentrations of carotenoids are nutritionally superior with respect to vitamin A.

The individual sugar profiles in the raw and baked roots after 2 months of storage differed greatly among cultivars. The major sugars in raw roots of all sweetpotato cultivars after 2 months storage were sucrose, glucose, and fructose. The disaccharide sucrose was the principal sugar in eleven of the fourteen cultivars. Only 'Beauregard', 'Orleans', and 'Bellevue' raw roots contained higher amounts of the monosaccharide sugars (glucose and fructose). Glucose was the principal monosaccharide in the raw roots of all cultivars, and consistently exceeded the concentration of fructose by between 10-50% in each cultivar. The monosaccharide concentration increased in all cultivars, except 'Evangeline' during the two month storage period. The sucrose concentration in the raw roots after 2 months storage ranged from a high of 5.86% in 'Burgundy' to a low of 1.46% in 'Beauregard'. The sucrose concentration increased during 2 months of storage in only three of the seven cultivars. Glucose concentration ranged from a high of 2.80% in 'Bellevue' to a low of 0.87% in 'Burgundy'. Fructose concentration ranged from a high of 2.24% in 'Bellevue' to a low of 0.66% in 'Burgundy'. A wide range in individual sugar profiles is evident among the sweetpotato germplasm. The total sugar content after 2 months of storage in the roots of the sweetpotato cultivars analyzed ranged from 7.55% in 'Bayou Belle' to 4.53% in 'Purple-165' breeding line. Total sugar content increased slightly during 2 months of storage in all cultivars, except 'Bonita'. Therefore, short-term storage was found to enhance overall root sweetness.

The total carotenoid content in raw roots of the orange-flesh cultivars after 2 months of storage ranged from a high of 8.8 mg/100 g fresh weight in 'Evangeline' to 5.7 mg/100 g in 'Orleans'. Total carotenoid content increased during two months of storage in all cultivars.

The major sugar in baked roots of all sweetpotato cultivars was maltose. The second most abundant sugar in baked roots after 2 months storage was sucrose in eleven out of fourteen cultivars. Only 'Beauregard', 'Orleans', and 'Bellevue' roots contained slightly more glucose than sucrose. Glucose was the principal monosaccharide in the baked roots of all cultivars, and consistently exceeded the concentration of fructose by between 5-50% in each cultivar. The sucrose concentration in the baked roots after 2 months of storage ranged from a high of 7.73% in 'Burgundy' to a low of 2.19% in 'Bellevue'. Glucose concentration in the baked roots ranged from a high of 3.41% in 'Bellevue' to a low of 0.94% in 'Murasaki'. Fructose concentration ranged from a high of 2.56% in 'Bellevue' to a low of 0.57% in 'Murasaki'. The total sugar content after 2 months storage in the roots of the fourteen sweetpotato cultivars analyzed ranged from 19.25% in 'Murasaki' to 13.26% in 'Beauregard'. The total sugar content of baked roots is substantially higher than raw roots due to the conversion of starch to maltose during baking.

The crude protein content of the sweetpotato cultivars at harvest ranged from 5.27% dry weight in 'Bonita' to 8.62% in 'Burgundy'. The protein content in sweetpotato roots increased slightly during storage. After 2 months of storage, the crude protein content among cultivars ranged from 5.46% dry matter in 'Bonita' to 10.24% in 'Burgundy'. Consumed in moderation, sweetpotatoes contribute a minor amount of protein to the diet.

Potassium (K) was the principal macronutrient element in all cultivars. The K content in sweetpotato roots at harvest ranged from 0.96% dry matter in 'Bonita' to 1.53% in 'Beauregard'. The K content in sweetpotato roots of all cultivars increased on average about 20% during 2 months of storage in all cultivars. After 2 months of storage, the K content among cultivars ranged from 1.21% dry matter in 'Bonita' to 1.89% in 'Burgundy'. The sweetpotato is a potentially good source of K to the diet. The second most abundant macronutrient element found in sweetpotatoes was phosphorus (P). The P content at harvest ranged from 0.11% dry matter in 'Bellevue' to 0.16% in 'Bayou Belle'. The P content in sweetpotato roots increased during storage and ranged from 0.13% dry matter in 'Bellevue' to 0.19% in 'Bayou Belle' after 2 months at 14° C storage. The sweetpotato is minor source of P to the diet. The third most abundant macronutrient element in sweetpotato roots was calcium (Ca). The Ca content at harvest ranged from 0.08% dry matter in 'Bonita' to 0.16% in 'Bellevue'. The Ca content in sweetpotatoes generally did not increase during storage. Sweetpotato roots are minor sources of P to the diet.

The remaining macronutrient elements were present in lesser amounts, with roughly similar levels found in magnesium (Mg), and sulfur (S). The Mg content at harvest ranged from 0.07% dry matter in 'Orleans' to 0.13% in 'Bellevue'. The S content ranged from 0.07% dry matter in 'Bonita' to 0.11% in 'Burgundy'. The S content in sweetpotato roots increased during storage and ranged from 0.08% dry matter in 'Bonita' to 0.13% in 'Burgundy' after 2 months at 14° C storage. However, sweetpotato roots are minor sources of Mg and S to the diet. Substantial differences in macronutrient element content existed between cultivars. However, 'Bonita' contained the lowest amounts of nearly all macronutrients. Sweetpotatoes would contribute only low amounts of macronutrient elements to the diet.

Iron (Fe) was the principal micronutrient element in all cultivars. The Fe content in sweetpotato roots at harvest ranged from 20.3 parts per million (ppm) in 'Bonita' to 36.6 ppm in 'Beauregard'. The Fe content in the sweetpotato roots did not significantly change during 2 months of storage. Sweetpotato roots are minor sources of Fe to the diet. The second most abundant micronutrient element found in sweetpotatoes was manganese (Mn). The Mn content at harvest ranged from 17.9 ppm dry matter in 'Bonita' to 29.2 ppm in 'Evangeline'. The Mn content in sweetpotato roots increased slightly during storage in most cutivars. The sweetpotato is a minor source of Mn to the diet. The third most abundant micronutrient element in sweetpotato roots was zinc (Zn). The Zn content at harvest ranged from 8.7 ppm dry matter in 'Bonita' to 11.8 ppm in 'Bayou Belle'. The Zn content in sweetpotatoes increased during storage and ranged from 11.2 ppm dry matter in 'Bonita' to 15.2 ppm in 'Burgundy' after 2 months at 14° C. Sweetpotato roots are minor sources of Zn to the diet. The remaining micronutrient elements were present in lesser amounts; with roughly similar levels found in boron (B) and copper (Cu). The B content at harvest ranged from 6.2 ppm dry matter in 'Bonita' to 9.0 ppm in 'Bellevue'. The B content in sweetpotato roots increased during storage and ranged from 6.8 ppm dry matter in 'Bonita' to 10.0 ppm in 'Burgundy' after 2 months at 14° C storage. The Cu content at harvest ranged from 4.6 ppm dry matter in 'Bonita' to 7.1 ppm in 'Beauregard'. The Cu content in sweetpotato roots increased during storage and ranged from 5.4 ppm dry matter in 'Bonita' to 8.7 ppm in 'Beauregard' after 2 months at 14° C

storage. Sweetpotato roots are minor sources of B and Cu to the diet. Substantial differences in micronutrient element content existed between cultivars. However, 'Bonita' contained the lowest amounts of all micronutrients. Sweetpotatoes would contribute only minor amounts of micronutrient elements to the diet.

The general pattern of change in the three principal individual sugars during long-term storage of the raw roots included an increase in the main disaccharide sugar sucrose, but a decrease the secondary monosaccharide sugars (glucose and fructose). After 8 months of storage, 'Evangeline' contained the highest amount of sucrose (8.11%), while 'Purple-164' contained the lowest amount (1.63%). 'Bayou Belle' contained the highest amount of glucose (2.48%), while 'Evangeline' contained the lowest amount (0.73%). 'Bayou Belle' contained the highest amount of fructose (2.00%), while 'Muraski' contained the lowest amount (0.52%). The total sugar content in the baked roots of the majority of sweetpotato cultivars decreased slightly during the storage interval from 2 to 8 months. Baked roots of 'Bonita' contained the highest amount of total sugar (18.55%), while the '05-24' contained the lowest amount (11.83%) after 8 months of storage. The general pattern of change in the four principal individual sugars in baked roots during long-term storage included a decrease in the principal sugar maltose, but an increase in the secondary sugar sucrose. Baked roots of 'Murasaki' contained the highest amount of maltose (12.19%), while '05-24' contained the lowest amount (2.42%). Baked roots of 'Evangeline' contained the highest amount of sucrose (9.51%), while 'Purple-164' contained the lowest amount (1.76%). The baked roots of the breeding line '05-24' contained the highest amount of glucose (3.54%), while 'Murasaki' contained the lowest amount (0.82%). 'Bayou Belle' contained the highest amount of fructose (2.27%), while

'Muraski' contained the lowest amount (0.54%). The crude protein content of the dry matter of the sweetpotato cultivars at harvest ranged from 8.62% in 'Burgundy' to 5.27% in 'Bonita'.

The vitamin C or ascorbic acid (AA) content of raw sweetpotato roots at harvest ranged from 25 mg/100 gm fresh weight in 'Covington' to 17 mg/100 gm in 'Bayou Belle'. Slight reductions in the vitamin C content occurred during storage. The AA content of the raw roots ranged from 21 mg/100 gm in 'Beauregard' to 13 mg/100 gm in 'Bayou Belle' after 2 months at 14° C. After 8 months of storage the AA content ranged from 15 mg/100 gm in 'Beauregard' to 10 mg/100 gm in 'Bayou Belle'. Baked roots generally contained 20-30% less AA than raw roots.

The total carotenoid content in raw roots of the orange-flesh cultivars after 2 months of storage ranged from a high of 11.4 mg/100 g fresh weight in 'Evangeline' to 3.1 mg/100 g in 'Porto Rico'. The recently released 'Burgundy' cultivar contained the second highest content of total carotenoids at 10.9 mg/100 g fresh weight. This was followed by 'Bayou Belle' at 8.3 mg/100 g fresh weight, 'Bellevue' at 6.3 mg/100 g fresh weight, 'Beauregard' at 6.1 mg/100 g fresh weight, and 'Orleans' at 6.0 mg/100 g fresh weight. Only slight changes in carotenoid content occurred in the roots during long term storage.

Goals and Outcomes Achieved:

The purpose of this research project was to characterize the chemical and nutrient composition of the roots of commercially important sweetpotato cultivars and promising breeding lines. The concentrations of the individual sugars, crude protein, macronutrient elements, micronutrient elements, and principal vitamins were characterized in raw and baked roots at harvest and during storage. This information can be used in marketing and consumer education efforts to enhance sweetpotato consumption and strengthen the sweetpotato industry. The accomplishments of the project have met the goals established at the onset of the project. A detailed description of the nutritional content of the sweetpotato cultivars was sent to and received by 89 sweetpotato producers, processors, and marketers via the Louisiana Cooperative Extension sweetpotato stakeholder electronic mailing list and also via the statewide sweetpotato extension newsletter. This information is also being presented to the Louisiana sweetpotato producers, processors, marketers, and other industry stakeholders at the annual LSU AgCenter Sweetpotato Field Day event at Chase, LA on August 31, 2016. In addition, over 50 researchers, extension specialists, and other industry stakeholders were provided this information at the National Sweetpotato Collaborators conference in San Antonio, Texas in February, 2016. In addition, a detailed technical manuscript is in preparation for submission for publication in the Journal of American Society for Horticultural Science.

Beneficiaries:

The number of Louisiana sweetpotato industry personnel that benefited from the project included 89 producers, processors, and marketers in 8 parishes that grow 9,500 acres, with a gross farm value of $66.7 million. About 80 percent of the sweetpotato crop is grown in the northeastern region of the state, primarily in the parishes of Franklin, Richland, West Carroll and Morehouse. The remaining 20 percent of the production is located in the south-central parishes of Avoyelles, Acadia, St. Landry and Evangeline.

Louisiana sweetpotatoes are grown for two primary markets: the fresh market and for processing. Much of the processing is in the form of sweetpotato fries at the ConAgra facility in Richland Parish. Total value of sweetpotato production, including a value-added amount of $50 million, was $116.8 million in 2014.

The nutritional information obtained by this project will be able to be incorporated in marketing and consumer education efforts to enhance sweetpotato consumption and strengthen the Louisiana and U.S. sweetpotato industry. Consumers will also benefit by being able to make more informed purchasing decisions when product nutritional information is available. The potential economic impact of the project information will be realized over time with sustained and increased consumption of Louisiana and U.S. sweetpotatoes by informed and health-conscious domestic and international consumers.

Lessons Learned:

The experienced and well-trained student worker earmarked for this position obtained another job offer and de-committed to the laboratory analyses position. A replacement

worker was identified, but also resigned soon for a higher paying position. It was not possible to find another qualified laboratory assistant. Therefore, the laboratory analyses work was conducted by the principal investigator and another part-time staff member. There were no project activities left undone and all the proposed work was conducted as planned. However, any future grant proposal should have a significantly higher salary budget for any laboratory assistant in order to more likely retain their services. Otherwise, unspent funds may remain in the personnel category.

New laboratory analytical procedures often require more time to develop than anticipated and equipment malfunctioning and repair should be factored into the anticipated time schedule of work activities.

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Additional Information:

The project results were presented to research and extension personnel at other leading sweetpotato producing universities and industry stakeholders at the annual meeting of the National Sweetpotato Collaborators and Southern Region of the American Society for Horticultural Science.

Specific components of the project study are in preparation and will be submitted for publication in various trade and scientific journals. The information will also be disseminated to Louisiana sweetpotato growers, packers, and marketers via Louisiana Cooperative Extension Service electronic information networks.

The nutritional information from the recently completed conventional and organically-grown research study has been prepared and submitted for presentation at the national meeting of the American Society for Horticultural Science in August, 2016. The summary results were also be available for dissemination at upcoming late fall/winter annual sweetpotato grower meetings. In addition, a detailed research manuscript will be prepared for scientific journal publication.

PROJECT THREE TITLE - ENHANCING GROWERS FOOD SAFETY AWARENESS & MARKET OPPORTUNITIES THROUGH GHP/GAP

SUBGRANTEE: LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Project Summary:

Produce food safety has emerged as a critical agricultural issue because of recent foodborne disease outbreaks related to specialty crops. The potential introduction of foodborne pathogens during production necessitates that producers understand pathogen sources and pre-harvest risk factors in order to minimize the potential for produce contamination. This is especially important as many fresh produce retailers and foodservice buyers now require third-party GAP certification and FDA receives new authority of enforcing the food safety law through the Food Safety Modernization Act (FSMA). As such, the sustainability of the fresh fruit, vegetable and nut industries in Louisiana is going to depend in large part on producer awareness and adoption of preventative food safety practices. While many states across the country have implemented educational training programs to provide producers with accessible science-based information about GAPs, on-farm food safety hazards, and FSMA proposed rules, and to facilitate adoption of GAPs and new standards, Louisiana was not providing such programs. The stakeholders meeting highlighted the importance of a formal LSU AgCenter-driven program that will provide the necessary knowledge and resources for stakeholders to adopt GAPs and GHPs, and open new markets for producers from GAPs certification. A team of multi-disciplinary specialist from the LSU AgCenter was formed in partnership with Louisiana Department of Agriculture and Forestry, Louisiana Fruits and Vegetable Growers Association and Southern University AgCenter to develop a formal produce food safety program in Louisiana.

Project Approach:

This project implemented Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) programs that facilitated the adoption of on-farm food safety practices in Louisiana. A multi-disciplinary team of specialist from LSU AgCenter (Achyut Adhikari, Melanie Lewis Ivey, Katheryn Fontenot and Charlie Graham), LDAF (Audrey Carrier) and Southern University (Fatemeh Malekian) was involved in executing the project goals and objectives. Project stakeholders: LSU AgCenter, SU AgCenter, LDAF, Department of Health, Market Umbrella, Louisiana Fruits and Vegetable Growers Association, Sprout NOLA, Recirculating Farms, National Young Farmers Association, Sweet Potato Growers Association, Pecan Growers Association, Acadiana Food Alliance, and Central Louisiana Economic Development Forum were involved in the outreach programs related to the project. Project activities targeted the specialty crop growers, socially disadvantaged and transitional farmers and producers through live workshops, web based educational materials and on-farm visits with extension personnel. A teaching curriculum based on National GAPs, GHPs and Produce Safety Alliance (PSA) was developed by the project team. Curriculum content included science-based knowledge that covers the entire chain of custody.

A two-series Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) programs was offered within a 8-month period (one workshop for increasing knowledge and one for implementation). Series I was focused on providing information intended to

increase participants' knowledge of GAPs, GHPs, and rules pertaining to FSMA. Series I was a prerequisite for participating in Series II. Series II expanded on the knowledge provided in Series I and provided growers with the resources and tools needed for developing their own on-farm food safety plan and prepared them for the third-party auditing process. Food safety workshops were hosted around Louisiana with total participants of 293 producers, processors and extension agents. Topics covered during the workshops were water quality and management, manure management, harvesting and storage, worker health and hygiene, recordkeeping systems, and developing an on-farm food safety plan. An on-line multi-lingual factsheet series addressing the risk factors associated with on-farm production of fresh produce and management tactics for minimizing risk was produced. Factsheets are available in English and Spanish on the LSU AgCenter website and shared with LDAF and Southern University food safety web page. A cost reimbursement program was established to assist specialty crop producers with the cost of GAPs and GHPs certification and third-party audits. A cost reimbursement program was established to assist specialty crop producers with the cost of GAPs and GHPs certification and third-party audits. Growers that met all of the following criteria were eligible for the rebate: 1) successfully completed Series I and Series II training programs, 2) passed a third party-audit process and, 3) provided proof of third party audit. Rebates covered 75% of auditing fees up to $1000. Rebates were offered until the end of the granting period. Third party audit fees depend on production operation size, location, size of processing facilities, and the auditing agency. We were expecting to provide.

Goals and Outcomes Achieved:

Our goal was to provide GAPs/GHPs training to at least 200 farmers; such that 100 farmers will complete risk assessment, 66 will adopt record keeping and 20 farmers will receive third party GAPs certification with cost-sharing arrangement for funding audit from the project fund. Through this program we have provided GAPs/GHPs training to 293 specialty crop growers and extension agents and FSMA training to 164 individuals in Louisiana. This program has resulted in an increase in 62% (n= 21) of GAPs Certified farms in Louisiana between 2014 and 2016. In 2014, there were only 13 producers with USDA GAP certification and the majority was sweet potato farmers (n = 10). This project assisted a variety of specialty crop farms including micro green producers, greenhouse produces, row crop, blueberry, citrus and sweet potato producers to obtain GAPs/GHPs certification.

Almost all the workshops attendees (95%) indicated that their knowledge on implementing USDA GAPs/GHPs increased to high or very high level. A survey conducted among the workshop participants at the end of the project period indicated 90% have improved their on-farm food safety practices, 80% implemented good agricultural practices, 68% started keeping on-farm records, 46% performed workers health and hygiene trainings and 90% shared their increased in knowledge to other growers and producers. The growers also indicated an increase in sales after adopting on-farm food safety practices; 50% indicated increased market opportunity, 8% increased

their sales by 20% and 30% of the growers indicated their sales was increased by 10% as a result of implementing GAPs/GHPs.

Twenty eight fact sheets in English and Spanish were prepared and published in LSU AgCenter food safety web page (http://www.lsuagcenter.com/portals/communications/publications/publications_catalog/food%20and%20health/on-farm%20food%20safety). The fact sheets cover different elements of good agricultural practices such as Agriculture water, Water sanitation (with easy calculations to measure residual chlorine), Workers health and hygiene, Animal control, Composting, Harvesting equipment, Tools and container sanitation, Record keeping, Pre-harvest assessment, Post-harvest handling of fruits and vegetables, Fruits and vegetable storage area pest control, Post-harvest water treatment-chlorination and Manure application method. A web base "food safety decision tree" that help producers to identify food safety hazards and mitigation practices, prioritize management tactics and familiarize producers with the principles of GAPs/GHPs was developed and published in the LSU AdCenter's food safety web page (http://www.lsuagcenter.com/topics/food_health/food/safety/producer/on-farm%20food%20safety/how%20to%20use%20the%20decision%20trees).

In our project goal we were expecting that 300 farmers will use the education material we have developed from our food safety web page each year. In fact during the project period we have more than 12,700 views of our food safety web page. This indicates the quality and popularity of our publications on issues related to on-farm food safety.

Good Agricultural Practices (GAPs) workshop Curriculum
Series I

This workshop will help growers understand produce safety issues and Good Agricultural Practices as well as the FSMA proposed produce rule. They will improve their knowledge on identifying and reducing food safety risk on their farming environment.

Half an hour presentation in each topic, two 15 min short break and one 1 hour lunch break.

- GAPs Overview/Preventive Controls (30 min)
    - History
    - Principle and practices
    - Produce Food Safety Issues
        - Food Microbiology Overview
        - Foodborne Disease Overview
        - Indicator Organisms
        - Produce Food Safety
- **Regulatory Perspectives (LDAF)(From an Auditor's eye) (15-30 min)**
- Water Quality (30 min)
    - Microbial Hazards
    - Good Agricultural Practices for Control of Potential Hazards
        - Agricultural Water

        - General considerations
        - Microbial testing of agricultural water
    - Processing water
        - General considerations
        - Antimicrobial Chemicals
        - Wash water
        - Cooling Operations
- Manure Management (30 min)
    - Microbial Hazard
    - Control of Potential Hazards
        - Municipal Biosolids
        - Good Agricultural Practices for Manure Management
            - Treatments to Reduce Pathogen Levels
                - Passive treatments
                - Active Treatments
            - Handling and Application
                - Untreated Manure
                - Treated Manure
        - Animal Feces
- Worker Health, Hygiene and Sanitary Facilities (30 min)
    - Worker Health and Hygiene
        - Microbial Hazards
        - Good Agricultural Practices for Control of Potential Hazards
            - Personal Health and Hygiene
            - Training
            - Customer-Pick Operations and Road-Side Produce Stands
    - Sanitary Facilities
        - Microbial Hazards
        - Good Agricultural Practices for Control of Potential Hazards
            - Toilet Facilities and Handwashing Stations
            - Handwashing demonstration using Glitterbug
            - Sewage Disposal
- Harvesting, Storage, Transportation and Animal control (30 min)
    - Field Sanitation
        - Microbial Hazards
        - Good Agricultural Practices for Control of Potential Hazards
            - General Harvest Consideration
            - Equipment Maintenance
    - Packing Facility Sanitation
        - Microbial Hazard
        - Good Agricultural Practices for Control of Potential Hazards
            - General Packing Considerations
            - General Considerations for Facility Maintenance
            - Pest Control
    - Transportation
        - Microbial Hazard

        - Good Agricultural Practices for Control of Potential Hazards
            - General Considerations
            - General Transport Considerations
    - Animal Control
        - Microbial Hazard
        - Good Agricultural Practices for Control of Potential Hazards
            - Pasture Field Management
            - Working Animals
            - Co-management Strategies
- Food Safety Plan (30 min)
    - Risk assessment
    - Preventive Practices
    - Monitoring
    - Corrective Actions
    - Record Keeping
- Updates (30 min)
    - Produce Safety Alliance
    - Food Safety Modernization Act
        - Background
        - Principles
        - Produce Safety Rule
        - Key Requirements for the Produce rule
        - Record Keeping
        - Summary
- Program Evaluation

Good Agricultural Practices (GAPs) workshop Curriculum
Series II

- Highlights on water and manure management
- Highlights on Harvesting, Animal Control, Worker Health, Hygiene and Sanitary Facilities
- Highlights on USDA GAPs/GHPs requirement
- Develop your own Farm Food Safety Plan (Group of 4-5 persons)
        - General Farm Review
        - Field Harvest and Field Packing Activities
        - House Packing Facility
        - Storage and Transportation
        - Traceability
        - Wholesale and Distribution Center/Terminal Warehouses
        - Preventive Food Defense Procedures

- USDA GAP GHP auditing (Ms. Carrier Audrey and Ms. Nancy Schleismann)
- Group discussion
- Evaluation

Food safety educational and training programs conducted under this project

2014

FSMA Produce Safety Rule Update Meeting

1. Food Safety Modernization Act Supplement Produce Safety Rule Update Meeting. Red River Station, Bossier City. November 17th, 2014. (13 Participants)
2. Food Safety Modernization Act Supplement Produce Safety Rule Update Meeting. Alexandria. November 18th, 2014. (24 Participants)
3. Food Safety Modernization Act Supplement Produce Safety Rule Update Meeting. Scott Center, Winnsboro, November 19th, 2014. (14 Participants)
4. Food Safety Modernization Act Supplement Produce Safety Rule Update Meeting. Hammond Research Station, November 20th, 2014. (29 Participants)
5. Food Safety Modernization Act Supplement Produce Safety Rule Update Meeting. Crowley Rice Station. December 1st, 2014. (11 Participants)

2015

GAPs/GHPs Series I workshops

1. Good Agricultural Practices and Good Handling Practices workshop. Red River Station, Bossier City. February 10th, 2015. (12 Participants)
2. Good Agricultural Practices and Good Handling Practices workshop. Rapides Parish office. Alexandria. February 11th, 2015. (34 Participants)
3. Good Agricultural Practices and Good Handling Practices workshop. Winnsboro. February 12th, 2015. (20 Participants)
4. Good Agricultural Practices and Good Handling Practices workshop. Hammond Research Station. February 13th, 2015. (45 Participants)

GAPs/GHPs Series II workshops

1. Good Agricultural Practices and Good Handling Practices workshop. Rapides Parish Office, Alexandria. August 12th, 2015 (27 Participants)

2. Good Agricultural Practices and Good Handling Practices workshop. Hammond. August 20th, 2015 (17 Participants)

FSMA workshop

1. Food Safety Modernization Act Final Produce Safety Rule Meeting. December 3rd, 2015. Alexandria, LA. (20 Participants)

2016 (From this year the two session were merged into a one and half day workshop).

GAPs/GHPs one and half day workshop

1. Good Agricultural Practices and Good Handling Practices workshop. Alexandria, LA. February 24-25th, 2016 (23 Participants)

2. Good Agricultural Practices and Good Handling Practices workshop. Oak Grove, West Carrol Parish, LA. March 2-3rd, 2016 (20 Participants)

3. Good Agricultural Practices and Good Handling Practices workshop. Franklinton, Washington Parish, LA. May 26-27. 2016 (22 Participants)

4. Good Agricultural Practices and Good Handling Practices workshop. NOLA, LA. July 25-26th. 2016 (22 Participants)

2017

1. Produce Safety Alliance Growers Training NOLA, March 17-18. (43 Participants)
2. Good Agricultural Practices and Good Handling Practices workshop. Hammond May 30 – 31 (31 Participants)
3. Good Agricultural Practices and Good Handling Practices workshop. Dean Lee June 6-7 (20 Participants)
4. PSA Growers Training NOLA, August 1 (10 Participants)

On-farm food safety fact sheet publications in English:

- Adhikari, A., Graham, C., Malekian, F., Fontenot, K., and Lewis Ivey, L. M. "Agricultural Water: Best Practices to Ensure On-farm Food Safety". Pub. 3441. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104143/1_Pub3441_AgriculturalWater_FINAL1.pdf

- Malekian, F., Adhikari, A., Graham, C., Fontenot, K., and Lewis Ivey, L. M. "Transportation of fresh produce: Best practices to ensure food safety". Pub. 3442. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104146/2_Pub3442_TransportationofFreshProduce_FINAL.pdf

- Fontenot, K., Adhikari, A., Graham, C., Malekian, F., and Lewis Ivey, L. M. "Post-Harvest Handling of Fruit and Vegetables: Best Practices to Ensure On-Farm Food Safety". Pub. 3443. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104150/3_Pub3443_PostHarvestHandling_FINAL.pdf

- Lewis Ivey, L. M. Adhikari, A., Graham, C., Malekian, F., and Fontenot, K. "Postharvest Water: Best Practices to Ensure On-farm Food Safety". Pub. 3444. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104206/4_Pub3444_PostHarvestWater_FINAL1.pdf

- Lewis Ivey, L. M. Adhikari, A., Graham, C., Malekian, F., and Fontenot, K. "Vegetable Seed Sanitation: Best Practices to Ensure On-farm Food Safety".

Pub. 3447. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104215/7_Pub3447_VegetableSeedSanitation_FINAL1.pdf

- Graham, C., Adhikari, A., Malekian, F., Fontenot, K., and Lewis Ivey, L. M. "On-Farm Composting: Best Practices to Ensure Food Safety". Pub. 3460. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104185/15_Pub3460_OnFarmComposting_FINAL.pdf

- Lewis Ivey, L. M. Adhikari, A., Graham, C., Malekian, F., and Fontenot, K. "Wash Water Chlorine Disinfection: Best Practices to Ensure On-farm Food Safety". Pub. 3448. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104170/8_Pub3448_WashWaterChlorineDisinfection_FINAL.pdf

- Adhikari, A., Graham, C., Malekian, F., Fontenot, K., and Lewis Ivey, L. M. "Worker Health and Hygiene: Best Practices to Ensure On-farm Food Safety". Pub. 3449. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104214/9_Pub3449_WorkersHealthandHygiene_FINAL1.pdf
- Fontenot, K., Adhikari, A., Graham, C., Malekian, F., and Lewis Ivey, L. M. "On-farm Animal Exclusion: Best Practices to Ensure On-farm Food Safety". Pub. 3461. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104174/10_Pub3461_OnFarmAnimalExclusion_FINAL.pdf

- Malekian, F., Adhikari, A., Graham, C., Fontenot, K., and Lewis Ivey, L. M. "Environmental Monitoring of Fresh Produce Packing Area". Pub 3458. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104213/11_Pub3458_EnvironmentalMonitoringofFreshProduce_F.pdf

- Malekian, F., Adhikari, A., Graham, C., Fontenot, K., and Lewis Ivey, L. M. "Good Hygienic Practices in a Packing Facility". Pub. 3462. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104212/12_Pub3462_GoodPersonalHygienePractices_FINAL1.pdf

- Fontenot, K., Adhikari, A., Graham, C., Malekian, F., and Lewis Ivey, L. M. "Harvest and Field Sanitation Practices: Best Practices to Ensure On-farm Food Safety". Pub. 3459. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104211/13_Pub3459_HarvestandFieldSanitationPractices_FINA.pdf

- Graham, C., Adhikari, A., Malekian, F., Fontenot, K., and Lewis Ivey, L. M. "Manure Use: Best Practices to Ensure On-Farm Food Safety". Pub. 3463. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104183/14_Pub3463_ManureUse_FINAL.pdf

- Fontenot, K., Adhikari, A., Graham, C., Malekian, F., and Lewis Ivey, L. M. "Pest Control in the Packing and Storage Area: Best Practices to Ensure Food Safety". Pub. 3464. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104187/16_Pub3464_PestControlinthePackingandStorage_FINAL.pdf
- Graham, C., Adhikari, A., Malekian, F., Fontenot, K., and Lewis Ivey, L. M. "Pesticide Use: Best Practices to Ensure On-farm Food Safety". Pub. 3465. Available at: http://www.lsuagcenter.com/NR/rdonlyres/B07F1B9F-EC91-4317-A365-E2F1F294240D/104189/17_Pub3465_PesticideUse_FINAL.pdf

Spanish Publication:

- Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Agua agrícola: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas (online only)". 2017, Publication No. 3441-SPAN

- Malekian, Fatemeh, Adhikari, Achyut, Graham, Charles J., Fontenot, Kathryn, Lewis Ivey, Melanie. "Transporte de productos agrícolas frescos: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3442-SPAN

- Fontenot, Kathryn, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Lewis Ivey, Melanie. "Manipulación poscosecha de frutas y verduras las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3443-SPAN

- Lewis Ivey, Melanie, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn. "Agua de poscosecha las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3444-SPAN

- Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Evaluaciones de precosecha de los riesgos para la inocuidad de los alimentos". 2017, Publication No. 3445-SPAN

- Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Mantenimiento de registros en la granja: si no se anotó, no sucedió". 2017, Publication No. 3446-SPAN

- Lewis Ivey, Melanie, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn. "Desinfección de semillas de plantas hortícolas: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3447-SPAN

- Lewis Ivey, Melanie, Adhikari, Achyut, Graham, Charles J., Fontenot, Kathryn, Malekian, Fatemeh. "Desinfección del agua de lavado con cloro: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3448-SPAN

- Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Salud e higiene de los trabajadores: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3449-SPAN

- Malekian, Fatemeh, Adhikari, Achyut, Graham, Charles J., Fontenot, Kathryn, Lewis Ivey, Melanie. "Monitoreo ambiental de las áreas de empaque de productos agrícolas frescos". 2017, Publication No. 3458-SPAN

- Fontenot, Kathryn, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Lewis Ivey, Melanie. "Prácticas de desinfección de cosechas y campos: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3459-SPAN
- Graham, Charles J., Adhikari, Achyut, Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Compostaje en la granja: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3460-SPAN

- Fontenot, Kathryn, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Lewis Ivey, Melanie. "Exclusión de animales en granjas: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3461-SPAN

- Malekian, Fatemeh, Adhikari, Achyut, Graham, Charles J., Fontenot, Kathryn, Lewis Ivey, Melanie. "Buenas prácticas de higiene personal en una instalación de empaque de productos agrícolas". 2017, Publication No. 3462-SPAN

- Graham, Charles J., Adhikari, Achyut, Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Uso de estiércol: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3463-SPAN

- Fontenot, Kathryn, Adhikari, Achyut, Graham, Charles J., Malekian, Fatemeh, Lewis Ivey, Melanie. "Control de plagas en las áreas de empaque y de almacenamiento: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3464-SPAN

- Graham, Charles J., Adhikari, Achyut, Malekian, Fatemeh, Fontenot, Kathryn, Lewis Ivey, Melanie. "Uso de pesticidas: las mejores prácticas para garantizar la inocuidad de los alimentos en granjas". 2017, Publication No. 3465-SPAN

Beneficiaries:

The beneficiaries of this project are Louisiana specialty crop growers, packers and processors, extension agents and fresh fruit and vegetable consumers. Through this program we have provided GAPs/GHPs training to 293 specialty crop growers and extension agents and FSMA training to 164 individuals in Louisiana. Our cost-share rebate program increased the economic feasibility of specialty crop growers becoming USDA GAPs certified through a third party auditing process, which has increased their market access opportunities. This program has resulted in an increase in 62% (n= 21) of GAPs Certified farms in Louisiana between 2014 and 2016. In 2014, there were only 13 producers with USDA GAP certification and the majority was sweet potato farmers (n = 10). This project assisted a variety of specialty crop farms including micro green producers, greenhouse produces, row crop, blueberry, citrus and sweet potato producers to obtain GAPs/GHPs certification. At least, 40 farms used the tools and resources provided during the workshop between the year 2015 - 2017 to receive the USDA GAPs/GHPs certification. In addition, we had more than 12,700 views of our food safety web page which indicates the quality and popularity of the publications resulting from this project on issues related to on-farm food safety. Our novel web base decision-making applications have provided technology savvy fruit and vegetable growers and LSU AgCenter ANR agents with instant access to information and management tactics to assist producers with on-farm food safety practices. This project helped to increase implementation of food safety practices and documentations on GAPs/GHPs among specialty crop growers. Specialty crop growers learned about risk associated with food safety hazards and learn on-farm practices to mitigate the risks. Producers adopted GAPs/GHPs in their operations and addressed food safety risks and enhance product safety, thereby decreasing legal and production risks. Almost all the workshops attendees (95%) indicated that their knowledge on implementing USDA GAPs/GHPs increased to high or very high level. A survey conducted among the workshop participants at the end of the project period indicated 90% have improved their on-farm food safety practices, 80% implemented good agricultural practices, 68% started keeping on-farm records, 46% performed workers health and hygiene trainings and 90% shared their increased in knowledge to other growers and producers. The growers also indicated an increase in sales after adopting on-farm food safety practices; 50% indicated increased market opportunity, 8% increased their sales by 20% and 30% of the growers indicated their sales was increased by 10% as a result of implementing GAPs/GHPs.

In addition, the increase awareness of food safety principles and best management practices helped them to meet the requirements that are proposed in the Food Safety Modernization Act.

Lessons Learned:

The reimbursement of GAPs auditing fees was slower than anticipated. It was a lengthy process for producers to fill out and submit necessary documents for GAPs reimbursement because of the LSU AdCenter's new Workday system. Also, some producers were requested frequent field visit and mock audit to get ready for GAP auditing. Therefore from fall 2016 we hired graduate students to address this additional effort and help the producers to walk it through the reimbursement procedure. In our budget we allocated around $1000 auditing cost for each growers but it end up costing an average of $300 - $600 for auditing cost. It was because of our continuous efforts that helped the growers to be prepared for GAPs auditing and organized the documents in an efficient way. This had resulted in using lower than anticipated funds allocated for GAPs auditing fees in our budget.

Additional information:

Figure 1: Hand washing training to extension agents

Figure 2: Hand washing training to specialty crop growers


Figure 3: Dr. Adhikari teaching at the GAPs/GHPs workshop

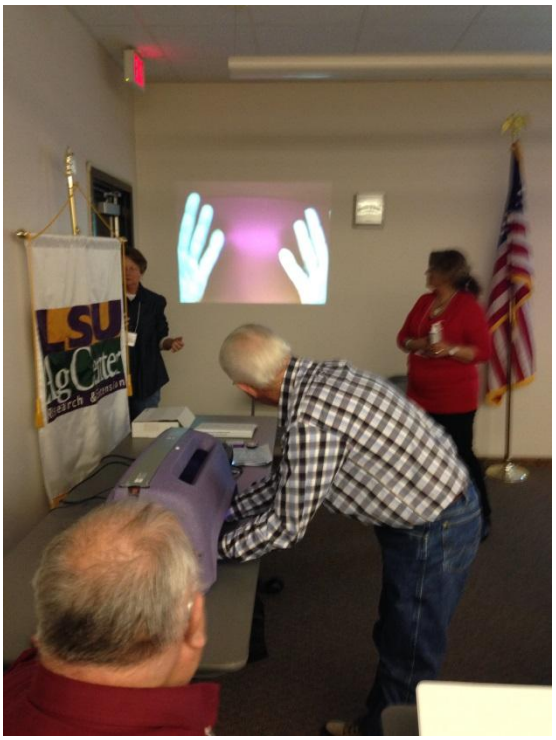

Figure 4: Sanitation, health and hygiene training


Figure 5: Training on Produce Safety Alliance Growers Training Curriculum

Figure 6: LSU AgCenter specialists working with growers to help them prepare their on-farm food safety plan

PROJECT FOUR TITLE: LOUISIANA HARVEST OF THE MONTH STATE-WIDE PROGRAM FOR FRUITS AND VEGETABLES

SUBGRANTEE: LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Project Summary:

The Louisiana Harvest of the Month State-wide Program for Fruits and Vegetables (LA HOM) project worked to enhance the competitiveness, consumption and marketing of Louisiana produced specialty crops while also addressing the issue of increasing child and adult nutrition knowledge of Louisiana residents. The LA HOM program worked in three schools throughout Louisiana to source and serve fresh, Louisiana specialty crop items one time per month in the cafeteria. Posters were developed to highlight the item of the month and stickers were handed out to students who tried the item. Throughout the period discussions were held on the item and information on the posters were reinforced. This extra incentive and exposure of these Louisiana specialty crop items to students has provided an opportunity for increased consumption, marketing and selling of Louisiana specialty crop items and knowledge on these items.

Increasing child and adult nutrition knowledge is an issue of up most importance as Louisiana's overall health rank remains at the bottom of the United States rankings. Louisiana's overall health rank, based on America's Health Rankings is 50th (United

Health Foundation 2015). This includes a rank of 47th for obesity, 39th for diabetes and 46th for cardiovascular deaths. In addition, Louisiana ranks 50th for children in poverty, highlighting the importance of school meals that may be the student's main caloric intake for the day. The National School Lunch Program served almost 88 million lunches to Louisiana students in 2015 at an annual cost of over $237 million (USDA FNS). Because youth consume a large portion of their calories at school, it is important that schools serve nutritious meals that provide healthy options and servings of fruit and vegetables. Increased access to nutrient dense fruits and vegetables in school cafeterias is important for the health of our children.

An individual's food choices are driven by access, preference, availability and cost of food. Related to food consumption and choice is poverty and being able to afford healthy food. The three schools selected for the Harvest of the Month program were in very different settings but having populations below the federal poverty level was a fact that each of them had in common. East Baton Rouge Parish (EBR) is the second largest school district in Louisiana and is an urban, predominately African American (>80%) student population. Approximately 96% of the students in East Baton Rouge Parish are at or below the federal poverty level and therefore qualify for free and reduced lunch. The Community Eligibility Provision is in effect for East Baton Rouge Parish due to its high poverty rate, more than double the qualifying percentage (≥40%). This allows all students in the district to receive free and reduced lunch without each student having to apply for it. In New Orleans, Andrew Wilson Charter School is another urban school with a large percentage of minority population; predominately African American and Hispanic with a total school population of 610 students. Andrew Wilson has 64% students qualifying for free and reduced lunch. In Rapides Parish, North Bayou Rapides is in a more rural location with a small school population. Even with this small population the free and reduced lunch is 74 percent and the district, which is very widespread and quite rural, has a population of 308 students. Each of the three schools was chosen for their diversity in school management and location (urban/rural). They all are similar in that each of the schools has a high rate of free and reduced lunch indicating the high incidence of poverty in the school population.

This project was important and timely as Louisiana continued to work on opportunities to change and improve healthy food access in our schools (and other institutions such as universities, colleges, prisons and hospitals) and impact the health of our citizens, especially children. The increased fruit and vegetable offerings mandated in the Nutrition Standards in the National School Lunch and Breakfast Programs in 2012 set a platform for programs that increase awareness and sampling of fruit and vegetable programs like LA HOM. These rules allowed for fresher, unprocessed foods to be sourced to cafeterias, paving the way for specially crop producers to provide more fruits and vegetables to the schools. Exposure and access by people of an early age is important as a study at LSU reported that repeated exposure of vegetables increased preference for vegetables by low-income elementary students (Lakkakula et al. 2010). This study also indicated that repeated tasting by children of less-preferred vegetables in a cafeteria-based setting is a strategy to promote liking of these items and is effective in approximately half of participants. In addition, it has also been shown that following the implementation of the

healthier USDA school lunch standards, vegetable consumption increased significantly and more students are selecting fruit during school meals (Cohen et al. 2014).

Food procurement is central to increasing local specialty crop offerings in Louisiana institutions such as schools. In the pilot stage of the program the food procurement of each school, a charter school and two public schools, was assessed. Food service personnel working with the HOM project were key to purchasing, menuing, and preparation. They also provided recommendations for managing and expanding the HOM program in their schools and districts in the future. During the spring of 2015, while this grant was still in the pilot stage, the Louisiana Legislature passed a bill raising the small purchase threshold for Louisiana to $150,000 from $40,000. This increase is extremely helpful when schools and districts are using the informal bid process and provides for an opportunity to source more local fruits and vegetables.
The Louisiana Harvest of the Month program is very well suited for this sort of bid process, therefore this increase was very fortunate for the Louisiana Harvest of the Month Program. Also, at the end of the program a full Farm to School legislative bill was passed supporting Farm to School in the state. The Louisiana Harvest of the Month Program is an excellent program with materials, information and recommendations as resources that are available when the farm to school program in Louisiana expands and thrives.

A major aspect of the LA HOM program was market access and increasing demand for locally produced fruits and vegetables. Access to institutional markets such as school and hospitals is often difficult for small to medium-scale specialty crop producers. The LA HOM program developed protocols and recommendations for local food purchasing and use in schools during the pilot implementation of the project. The three pilot schools for this program worked together with local distributors and fruit and vegetable farmers to increase access into these schools on a monthly basis.

Project Approach:

During this grant period from October 2014 – June 2016, the following activities took place.

<u>October 2014- December 2014</u>

- Items selected for initial Harvest of the Month poster development.
- Communication established with schools and districts.
- Pre-HOM implementation surveys developed[1]

<u>January 2015- March 2015</u>

- Pre-HOM implementation surveys distributed[1]
- Louisiana Harvest of the Month Program begins in schools
- File Sharing platform developed[3]
- Contractual employee hired for New Orleans[2]
- Taskforce is developed and meets
- HOM Posters begin development
- Stickers (“I tried it”) created

<u>April 2015- June 2015</u>

- LA HOM expands to school in Alexandria
- The three schools finish out the school year (April, May) begin the summer feeding program[4] (June) highlighting one Louisiana fruit or vegetable per school each month.
- Taskforce meets at LA Farm to School Conference
- EBR Food Service Director participating in LA HOM presented at the LA Farm to School Conference about the program to other community members and child nutrition personnel.
- Andrew Wilson Charter School, Charter is revoked and management and leadership changed at the end of June.

July- September 2015

- Wrap up of summer meals program in early July.
- Meeting with new leadership and food service management at Andrew Wilson Charter School to ensure smooth transition into program.
- Surveys distributed to schools in late August[1].
- Letters went out to teachers at the beginning of September to update on the LA HOM program and dates of rollouts for the semester[5].
- New LA HOM semester began in September at all 3 schools.
- Task Force one on one meetings taking place to discuss future expansion of the program.

October – December 2015

- Surveys - post quantitation done[1].
- Contractual employee hired for Baton Rouge school.
- Rollout continues at each school highlighting one fruit or vegetable item per month.
- Letters sent out to teachers and parents to update on the LA HOM program and dates of rollouts for the month/semester[5].
- Meetings with schools and partners on expansion of program opportunities.

January – March 2016

- Expansion of program with the partnering schools and districts[6].
- Dissemination of LA HOM materials
- Meetings with districts and schools interested in LA HOM.
- Meeting with wholesalers on how to collaborate on getting local food into school cafeterias.

April – June 2016

- Data analysis (in results section).
- Draft of final report and recommendations.
- Share results with partners and taskforce for future use and dissemination.
- New website platform set up for use by those interested in LA HOM after the program is over.
- Final reporting and documentation for project.

[1]- Surveys originally developed were very extensive and required permission from both students and parents. The use of these surveys proved to be very difficult and we were not allowed to use many surveys because we didn't receive the parent permission slips.

Also, these original surveys were about 10 pages long which were too long for most of the students to keep their attention on for the entirety of the survey. Recommendations for future surveys of this length would be to have volunteers or contractors that are able to assist the teachers when giving the surveys.

In order to resolve the issues with the permission slips, surveys were developed for the next semester that still asked for similar information but were shorter (one page front and back) and could be delivered either by hard copy or on the internet. This allowed for the teachers to much easily administer the surveys to students and find ways to integrate the surveys into curriculum so that parent permissions were not needed, especially since there were no longer questions about personal information on the surveys. This would be recommended for future surveys involving students with the HOM program. If no individual data is needed and assessing the student population in this fashion was suitable for the needs of the grant.

[2]- Contractual employee for EBR was hired later because there was trouble finding someone who could fill this position that already worked with or within the school that would be willing to assist for the hours that were allotted. Once this position was filled the contractor was not reliable and was not available on the days needed: before, during and after roll outs. Since the PI and Program Directors offices are located in EBR the duties for The Durfrocq School were fulfilled by them as needed.

[3]- The file sharing system originally set up in the grant project was a google drive as it is free, efficient and easy to access, update and maintain. However, within the first few months of the program it became obvious that it was not being used often by the partners. This was evaluated through conversations with our collaborating partners, the project team learned that Google drive can be difficult to access since many employers use different email servers and have software blocking it. A blog was then developed to hold the information. The file containing all the information, however, is still located on Google drive but is a one click downloadable file from the drive.

[4]- The summer feeding programs integrated with summer school were very short programs, usually a little over a month at each of the schools. This did not allow for time for pre and post-surveys. For the New Orleans school site, this didn't allow for a July item to be highlighted since they did not go to school in July.

[5]- Letters sent to teachers proved to be very successful as teachers made more plans to either eat with students or to bring the item in their lunch to have a conversation with students about the items. The teachers were also able to discuss the HOM item before going to lunch. Due to this success, students were sent home with letters about the item to let parents know what was happening in their lunches the following day.

[6]- This past spring, East Baton Rouge Parish decided to expand the program to all of its 84 schools by highlighting sweet potatoes 4 times. These whole baked Louisiana sweet potatoes replaced canned sweet potatoes (cooked and in sugar syrup) sourced from another state served in the cafeteria those days. Through the HOM pilot program East

Baton Rouge Parish schools decided that Louisiana sweet potatoes, due to their availability year round and quantities available, would be a great step to take to expand the program to all schools in the city. EBR Child Nutrition Personnel were provided with posters and information and held a meeting with food service staff on how to order whole fresh sweet potatoes and highlight them in their cafeterias.

In New Orleans, Sodexo, the Food Service Management Company that supplies food to Inspire Charter, the Charter organization that includes Andrew Wilson Charter School, expanded the Louisiana Harvest of the Month program in its formal state. Each month all three schools in the Inspire NOLA Charter highlighted one new Louisiana fruit or vegetable using posters and other materials supplied by Sodexo.

In Alexandria, a farm to school working group worked with other local districts and schools to highlight the program, hosting a principal and child nutrition LA HOM rollout. This allowed for these school representatives to learn more of the logistics of the HOM program and to see what the rollout entailed. In addition, this was an opportunity to ask the Program Director and local partners' questions about LA HOM in their respective districts or schools and what opportunities and/or issues with this program.

Partners in the Louisiana Harvest of the Month Program include The Dufrocq Elementary School food service staff, principal and teachers, East Baton Rouge Parish Child Nutrition Program Staff, Andrew Wilson Charter School's staff and personnel with both Chartwell's Food Service Management Company and Sodexo Food Service Company who both worked for Andrew Wilson throughout this grant period. Also, North Bayou Rapides Elementary School, their food service staff, principal and teachers as well as the Rapides Parish Child Nutrition Program staff who worked as part of the project. All three schools and partners had significant contributions of time and effort to support the LA HOM programming at each school.

Goals and Outcomes Achieved:

The main activities that were necessary to achieve the performance goals and measurable outcomes for the project were the following. Meetings with Child Nutrition Programs and food service management companies on program goals and how we can work together to achieve these goals were held. Those groups worked independently to supply the schools with designated items each month and work with suppliers to ensure the items were Louisiana sourced. Meetings with each school's food service staff were also held to discuss menuing, sourcing local product, and promotion of the HOM selection the cafeteria the day of serving. Contractual employees were hired to assist the school and district with needs on HOM item roll out days. In addition, other activities included creating and displaying posters for students, passing out stickers for trying HOM selections on that particular day and holding conversations with students on days of HOM item roll out.

Partner schools and districts were provided with information and assistance in starting to buy and to expand the purchase of local fruit and vegetables as needed. This will expand

this purchasing power for the schools at a rate that is suitable for that particular school or district. The program also provided basic information and ideas on how to start purchasing more Louisiana fruit and vegetables and how to highlight these items in the cafeteria when they are served. It also, allowed for those interested to contact the schools or districts that have participated if they want or ideas from those who have previous experience with the HOM program and to serve as mentors for other school districts.

Expected Measurable Outcomes –

Goal	**Performance Measure**	**Benchmark**	**Target**
1. Promote the consumption of fruits and vegetable consumption with a preference for local, specialty crops	Surveys taken before and after the project which show the amount of fruits and vegetables that students report eating before, during and after the project.	The results of the pre-project survey of students	15% increase in fruit and vegetable consumption of students in school
2. Promote the purchase of local specialty crops by Louisiana institutions	Surveys taken before and after the project which show the Number and type of products distributors provide to the pilot institutions before and after	The results of the pre-project survey of food purchases from distributors	5% increase in purchase of local fruit, nut and vegetable specialty crops
3. Promote an Increase food literacy in students and staff of schools	Surveys taken before and after the project that are able to show amount of knowledge of food-related skills, such as recipe development, and food preparation of fruits and vegetables before and after project	The results of the pre-project survey of food service personnel	25% Increased knowledge of food strategies: menus, increase line of sight, reach of healthy, local food.

A. The performance will be monitored by pre and post surveys. Various surveys are available from other HOM programs targeting the various clientele groups and performance measures. Data will be collected on sight via surveys.
B. The data that is to be gathered via surveys will be used to correct deficiencies and to make changes in Objective 3, the expansion of the HOM program

Goal 1. Promote the consumption of fruits and vegetable consumption with a preference for local, specialty crops.
Through surveys about fruit and vegetable consumption given before and after the program, participating students from all three schools showed an overall approximate 8% increase in fruit and vegetable consumption therefore lowering plate waste during school lunches which is a benefit for participating schools, food service management companies and child nutrition programs. This increase in consumption also, ultimately increases the health of the students participating. In addition, research suggests that students participating in programs such as HOM promotes healthier eating and lifestyles in children. Note this is lower than the HOM Pilot Program target of a 15% increase in fruit and vegetable consumption of students in school.

Goal 2. Promote the purchase of local specialty crops by Louisiana institutions.
There was a HOM Pilot Program target of a 5% increase in the purchase of local fruit, nut and vegetable specialty crops by the schools. The purchase of locally sourced fruit and vegetables at the beginning of the project, based on informal surveys, was 0 % or none. The demand for local product through the Louisiana HOM created an opportunity to source one item (out of 2 vegetables and 1 fruit item) on the lunch tray for 1 day a month through the 12 month cycle of the HOM program. This increase is approximately a 2 % in fruit and vegetable purchases as a direct result of the HOM program.

Goal 3. Promote increase food literacy in students and staff of schools.
The target of 25% increased knowledge of food strategies: menus, increase line of sight, reach of healthy, local food was not able to be surveyed due to logistics as described below. The procurement and kitchen staff at the 3 schools participating in the HOM pilot program indeed had to be creative and worked diligently to insure that the locally sourced fruit or vegetable that was designated for the HOM item was served on the lunch line with an appealing choice. In general, it was simplest to modify an existing menu and insert the HOM item where this was possible. Often, a simple recipe such as sliced squash with a dip was well appreciated by the students and was easy to prepare.

Beneficiaries:

There are various beneficiaries to this project: school administrators, students, parents, food service workers, child nutrition program officials, local food distributors and Louisiana fruit and vegetable farmers. In the long-term, Louisiana fruit and vegetable

growers will benefit from increased marketing opportunities and the success of providing local product on a limited basis to Louisiana schools. The local food distributors benefited by greater knowledge of the demand for local seasonal product in school markets.

Through distribution of posters and information school districts in Louisiana are benefiting from the LA HOM program. These materials could also one day benefit hospital and other institutions that buy fruit and vegetable products wholesale. A website housed on a blog holds information for those interested in the program to use at their discretion for the future of the Louisiana Harvest of the Month program.

Implementing the LA HOM pilot program at three schools directly impacts all of the students. The total number of students directly impacted by the pilot program is approximately 1,751 students as well as their families.

Program Pilot School	Location	School Population	Poverty Rate (%)
Andrew H. Wilson Charter	New Orleans	610	64
North Bayou Rapides Elementary	Alexandria	308	74
The Dufrocq School	Baton Rouge	633	96*

*Since East Baton Rouge Parish is a Community Eligibility Provision district this is the number for the entire district, this data may be updated in July 2016.

The National School Lunch Program served almost 88 million lunches to Louisiana students in 2015 costing over $237 million (USDA FNS) showing the amazing opportunity for farmers to market to schools. Lafayette Parish School System has reported spending $20,000 per week on fruits and vegetables due to the increased standards of offering fruit and vegetables for students. There is a great opportunity for local specialty crop growers that have the capacity and quality of product to market to local schools.

Lessons Learned:

Through this program there were numerous lessons learned. The first was that school districts and charter schools have significantly different purchasing processes even from school district to school district. If this grant was repeated in the future, it would be important to have clearly defined positive points for meetings with schools, districts, and food service management companies. Another lesson that is good to be aware of, is working with charter schools can sometimes be unpredictable. While we were working with Andrew Wilson, the charter was revoked and a new charter organization ended up taking over changing the food service company, staff and many of the students. This was neither positive nor negative but good to be aware of as going in to work with charter schools and having memorandums of understanding available and ready for this change. A major lesson learned through this program was the difficulty in student surveys. For future projects, it is necessary to either have a dedicated person who helps give the surveys in the classroom, which will take additional permissions or find a way that it can

be integrated into curriculum and does not ask for personal information. Another lesson was the cost of materials. In the original grant, the costs of materials were grossly underestimated and the time to produce the materials was not accurately accounted for. Lastly, there is a need for more fruit and vegetable farmers in Louisiana in order to become a major supplier to school systems. There were an adequate number for this pilot program and for the Louisiana Harvest of the Month program to expand but if much more demand is brought about more support for specialty crop producers will be necessary. This support should include technical, GAP certification and marketing support. The more farm to school programs grow in Louisiana the more specialty crop producers will realize the opportunities that exist in selling produce to schools.

There were several unexpected outcomes as a result of this project. The first was North Bayou Rapides Elementary in Alexandria put a garden in at their school as a result of the program. The teachers worked to get support from a local organization to assist with the garden materials and installation and worked to produce fruits and vegetables and connect them with the items being served in the cafeteria. Quite a few times when the Harvest of the Month items were highlighted the students reported having tried it from the garden just days before and being excited to eat it. This demonstrates the importance of holistic feature of farm to school where farm to school programming is very powerful when all 3 aspects (procurement, education, gardening) are in place at schools.

Another unexpected outcome was collaboration with a wholesaler in Louisiana that provides fruits and vegetables to most of the school districts in south, central and north western Louisiana. Through this project the wholesaler became aware of the demand for local not only in schools but to their other customers as well. The project team has been meeting and advising with this wholesaler to help connect them with farmers that have the capacity to source the school districts and are meeting and advising with them on possible product needs. The project team has outlined a list of items schools in the region are interested in menuing and how much they would need for those schools to help give the wholesaler an idea of how much would be needed of each item and which items are preferred. This wholesale distributor has started to develop connections with medium and large-scale farms with the goal of expanding marketing of local fruits and vegetables in institutional markets. In addition, they are developing production timetables in order to have specific commodities available.

The largest school system partner with the HOM project, East Baton Rouge Parish, evaluated the HOM program and the effort involved and selected to conduct their own pilot in Spring 2016 to highlight baked Louisiana sweet potatoes at all 84 schools. This is an excellent opportunity for the sweet potato industry as normally canned sweet potatoes (from North Carolina) are served on a regular basis (often 2 to 3 times per month). There is also an opportunity to replace Irish potato fries, in part with sweet potato fries which are more wholesome and nutritious in the future. The project team is continuing to work on this and will do so after the HOM pilot project ends.

Surveys for food service staff were tricky because the project already asked for so much from the food service personnel without offering much incentive. It also in some cases,

for example charter schools, is up to the discretion of Food Service Management Company. Even in the school districts it is difficult because there are lots of permissions that have to be given from the top down to allow for outsiders to collect information and opinions of employees. But most importantly, employees are often wary with the information they provide because they know that the data from the surveys will be provided to their managers and overseers and do not want to put things that could cause unfavorable reactions from their managers especially since the pilot was held with just one school and the managers and overseers would know exactly who's feedback was being reviewed. Therefore a survey of the food service personnel was not possible, although the project target of 25% in increased food service staff food literacy may actually have been achieved. Anecdotal evidence from informal surveys suggests that at all 3 partner schools the food service staff enjoyed the challenge of introducing the HOM item, developing/selecting the recipe and challenging/encouraging the students to try the HOM item.

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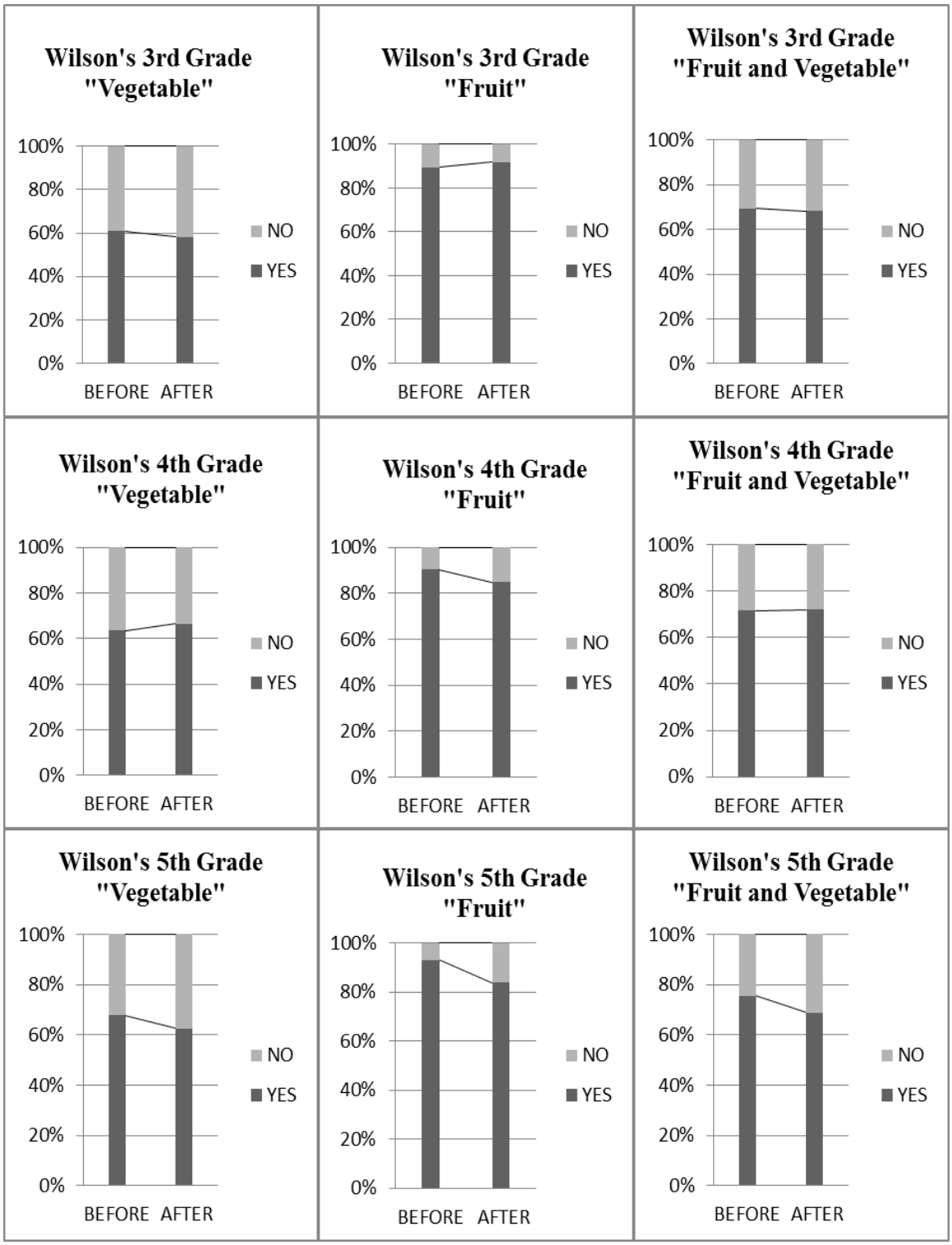
Additional Information:

The following is data from surveys of students participating in the HOM program. In general, students had consumed more fruits compared to vegetables and preferred fruit more.

Table 1. Wilson and Dufrocq elementary students' responses before and after the program when asked if they had ever eaten certain vegetables and fruits. The vegetables included sweet potatoes, cabbage, broccoli, squash, cucumbers, tomatoes, and eggplant. The fruit included strawberries, melons, and satsumas.


Wilson's 3rd Grade "Vegetable"
Wilson's 3rd Grade "Fruit"
Wilson's 3rd Grade "Fruit and Vegetable"
Wilson's 4th Grade "Vegetable"
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Wilson's 4th Grade "Fruit and Vegetable"
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Wilson's 5th Grade "Fruit and Vegetable"
100%
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40%
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BEFORE AFTER
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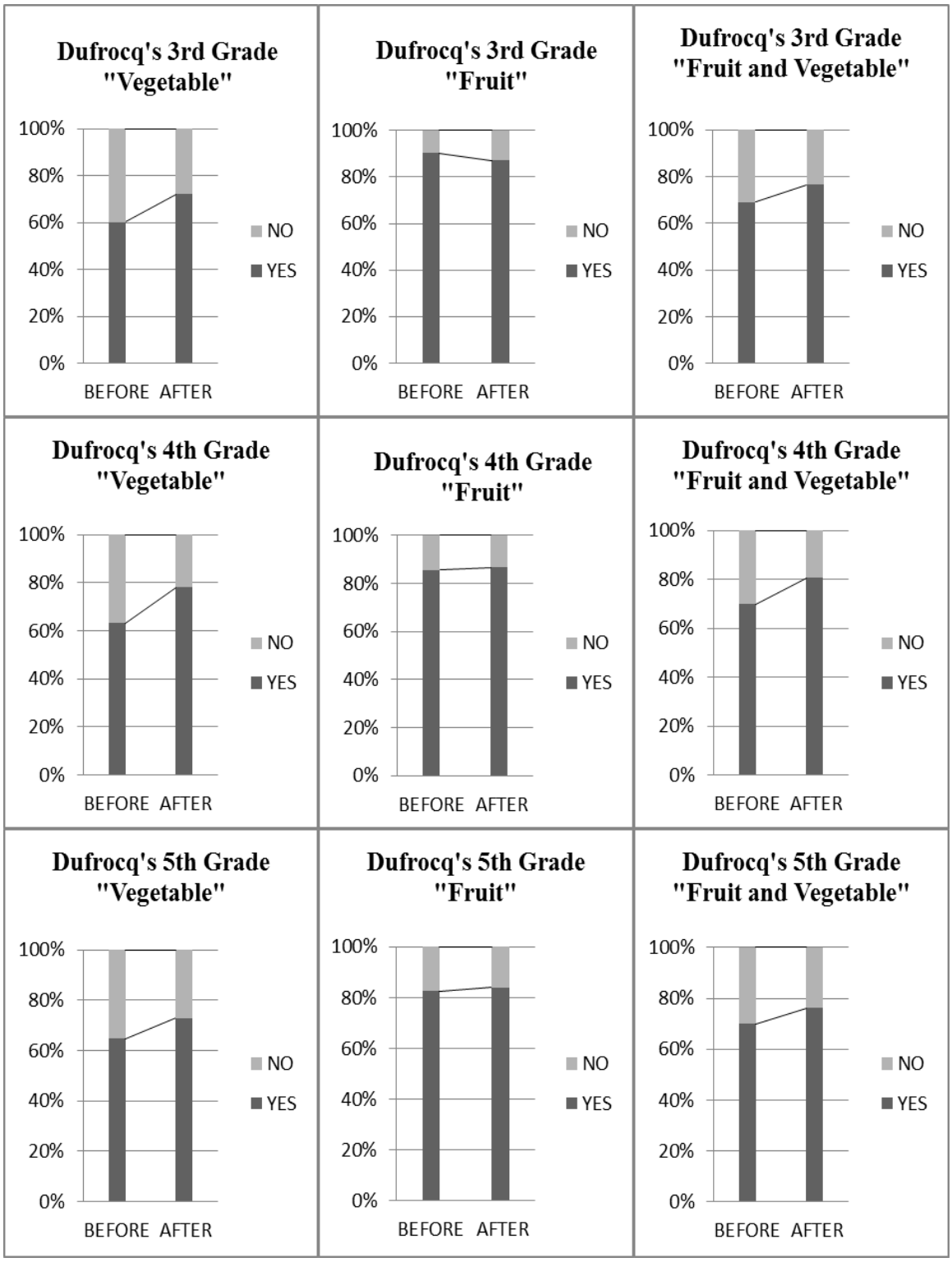
YES


Dufrocq's 3rd Grade "Vegetable"
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Dufrocq's 5th Grade "Vegetable"
Dufrocq's 5th Grade "Fruit"
Dufrocq's 5th Grade "Fruit and Vegetable"
100%
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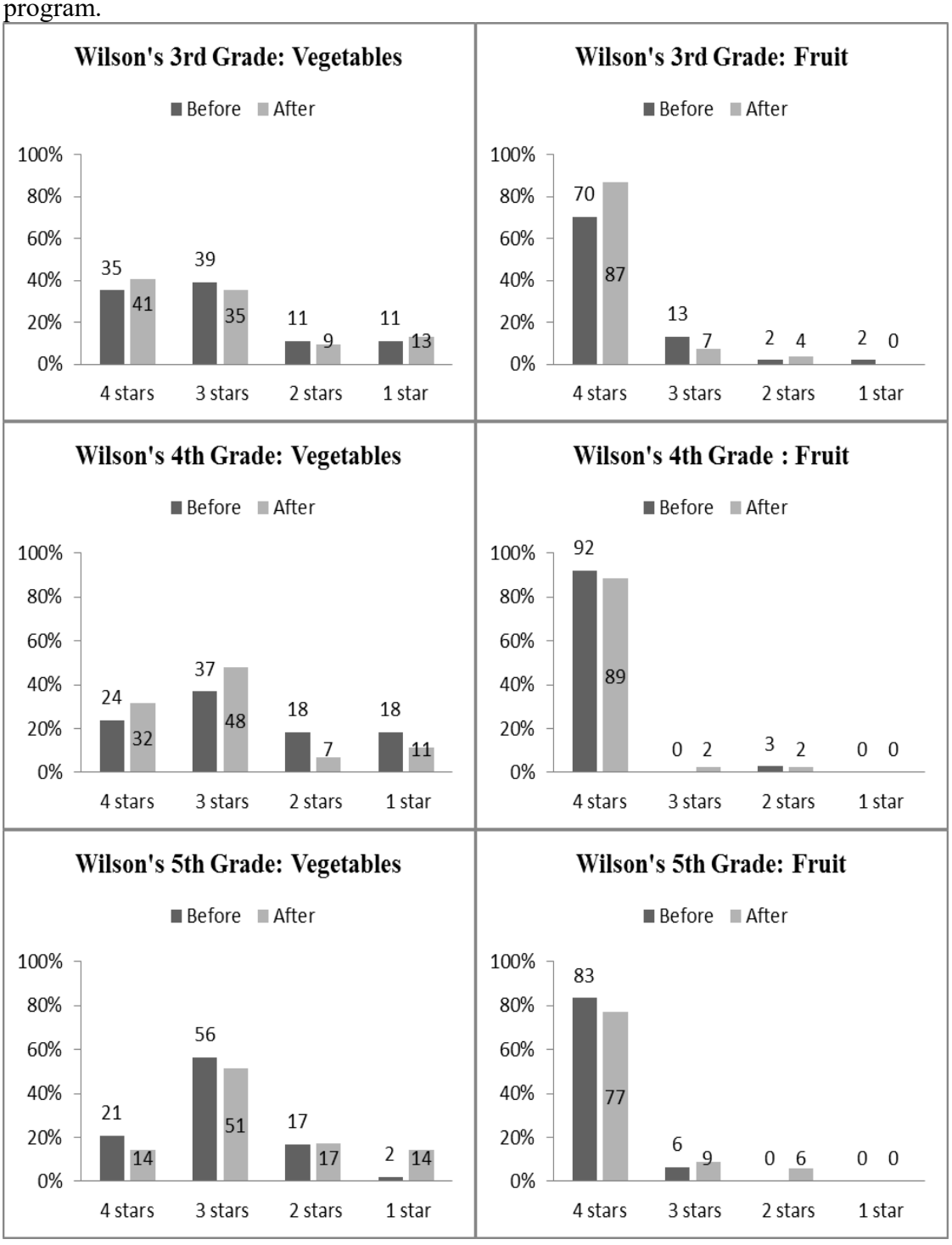
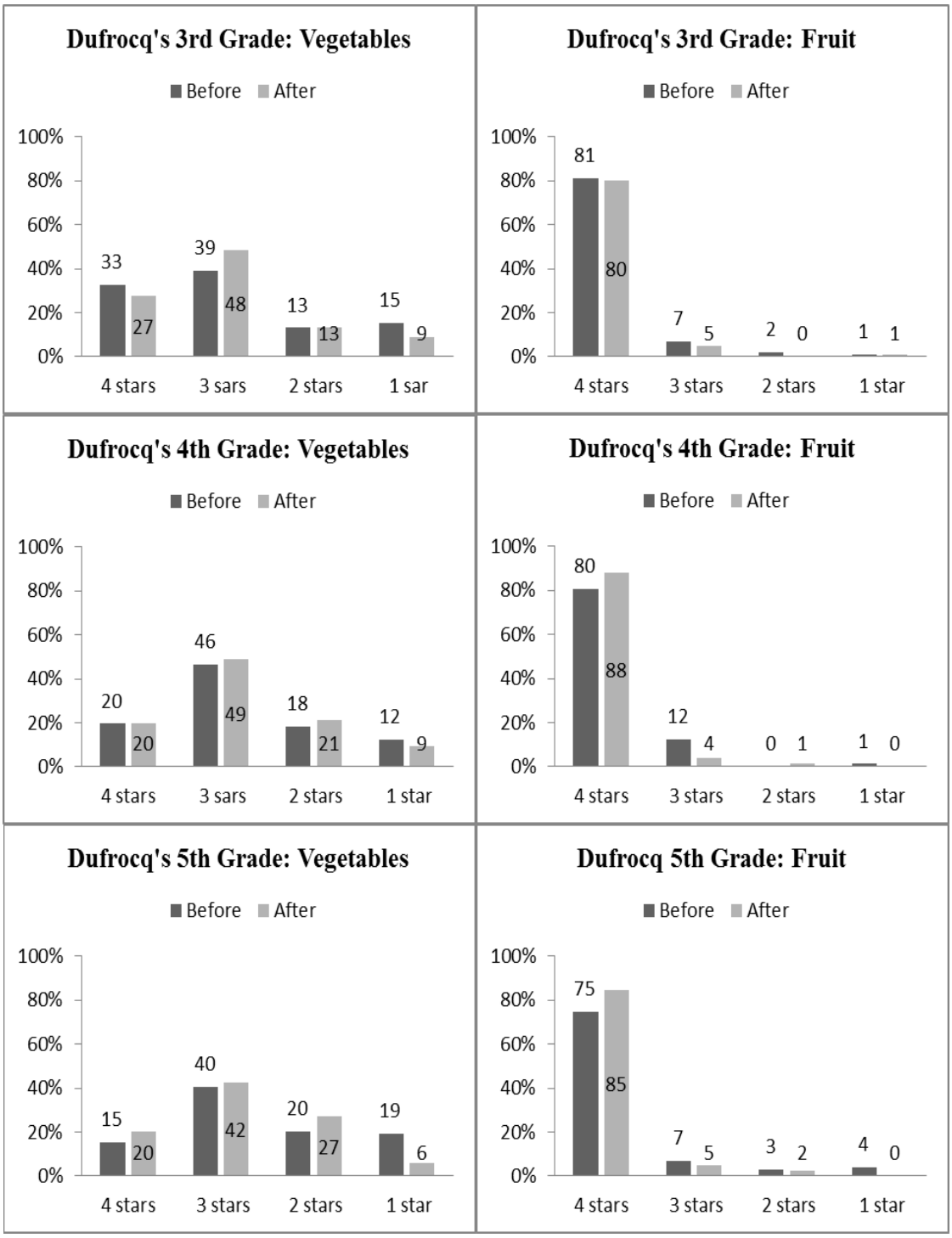
0%
BEFORE AFTER
NO
YES

Table 2. Wilson and Dufrocq elementary students' responses to the questions "How much do you like vegetables?" and "How much do you like fruit?" before and after the program.




Dufrocq's 3rd Grade: Vegetables
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15
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Dufrocq's 3rd Grade: Fruit
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Dufrocq's 4th Grade: Vegetables
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12
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Dufrocq's 4th Grade: Fruit
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Dufrocq's 5th Grade: Vegetables
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Dufrocq 5th Grade: Fruit
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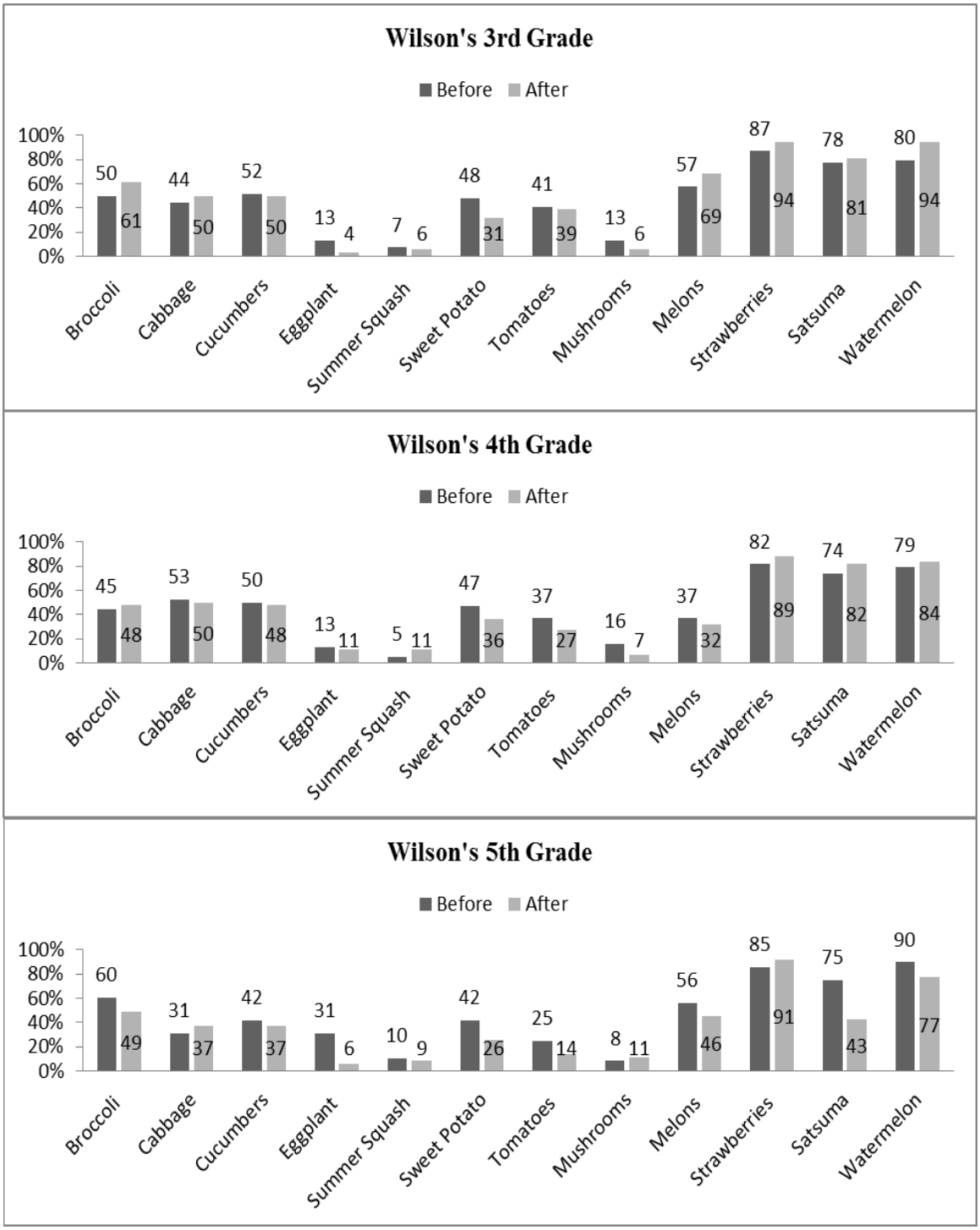
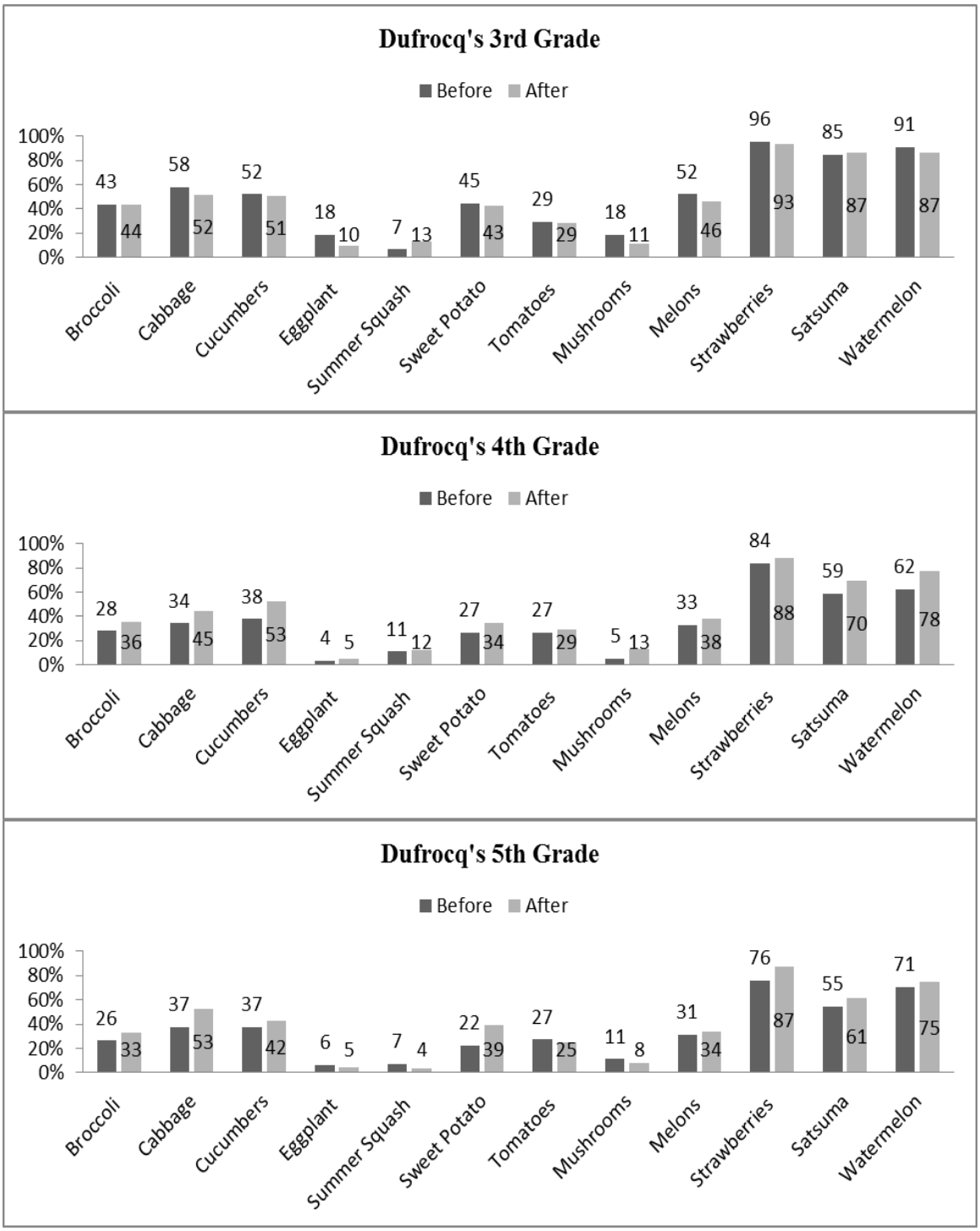
Table 3. Wilson and Dufrocq elementary students' responses to the question "What would you like to eat during your school lunch?" before and after the program.




Dufrocq's 3rd Grade
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93
85
87
91
87
Broccoli
Cabbage
Cucumbers
Eggplant
Summer Squash
Sweet Potato
Tomatoes
Mushrooms
Melons
Strawberries
Satsuma
Watermelon
Dufrocq's 4th Grade
Before
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100%
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40%
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78
Broccoli
Cabbage
Cucumbers
Eggplant
Summer Squash
Sweet Potato
Tomatoes
Mushrooms
Melons
Strawberries
Satsuma
Watermelon
Dufrocq's 5th Grade
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25
11
8
31
34
76
87
55
61
71
75
Broccoli
Cabbage
Cucumbers
Eggplant
Summer Squash
Sweet Potato
Tomatoes
Mushrooms
Melons
Strawberries
Satsuma
Watermelon

PROJECT FIVE TITLE: ESTABLISHMENT OF AN OLIVE ORCHARD FOR DEMONSTRATION AND VARIETY OBSERVATIONS

SUBGRANTEE: LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

Project Summary:

Background / Project Purpose. The specific issue, problem or interest that was addressed by this project was the high demand for olive variety, production and cultural practice information among consumers, master gardeners, retail garden centers, and nursery growers in Louisiana. There was also considerable interest among members of the Louisiana Fruit and Vegetable Growers Association and the Louisiana Nursery and Landscape Association for olive information. When the project commenced, the LSU AgCenter, Southern University AgCenter and the Louisiana Department of Agriculture and Forestry had no research based information or extension demonstration projects on-going pertaining to olive trees in Louisiana. The first olive information distributed by the LSU AgCenter was an article by horticulturist David Himelrick in the fall 2014 issue of the Horticulture Hints (home gardening) newsletter. Motivation for Project. This project was important and timely due to the aforementioned lack of research and/or extension information on olives in Louisiana. Prior to 2014, olive trees were being bought by retailers and growers in Louisiana from Texas, Georgia and Florida nurseries and being sold in Louisiana at garden shows and similar events. Only a small undetermined number of olive trees were being sold at retail in Louisiana. Production of olive trees for retail sales or orchard establishment were not being grown in Louisiana. However, there has been and continues to be major interest in olives in the Gulf States – this being quantified by several small to medium orchards being planted in Alabama and Texas in recent years. Home gardeners were also requesting to purchase olive trees from Louisiana garden centers, where availability of plants were very limited. Previous Project(s). This project did not build on any previously funded SCBGP or SCBGP-FB.

Project Approach:

Summary of Activities and Tasks Performed. Project objectives were to (1) obtain olive varieties and establish an orchard for demonstration and variety trial purposes at the LSU AgCenter Hammond Research Station, Hammond, LA, (2) collect initial growth data on trees, (3) develop and disseminate information detailing recommended olive management practices, possible variety recommendation, and any disease/pest issues of concern, and (4) provide outreach opportunities for individuals and businesses interested in olives in Louisiana. All these tasks were performed. Fifteen olive varietals (varieties) were obtained from Texas growers and established in a replicated orchard at the LSU AgCenter Hammond Research Station in the spring of 2015 (see orchard plot plan). Growth data has been collected on the trees (ornamental value, winter/cold injury, survival rate, plant height, plant width, stem caliper, early fruiting). Insect and disease pressure was observed. Information (management practices, varietals being studied,

insect/disease/weed issues) was disseminated via field days (Louisiana Nursery and Landscape Association, LSU AgCenter and Louisiana Fruit and Vegetable Grower Association industry events), master gardener tours, master gardener appreciation days, articles in Louisiana Agriculture magazine, Louisiana Nursery and Landscape Association newsletter articles, LouGarden email group postings, Facebook and LinkedIn social media sites, LSU AgCenter ornamental horticulture e-mail newsletter, in-person group home gardener, master gardener and industry presentations (master gardener state conference, industry and master gardener plant materials conferences, Gulf States Horticultural Expo, etc.), and at horticulture academic meetings (American Society for Horticultural Science). This information constituted considerable outreach efforts to individuals and businesses. Contributions and Roles of Project Partners. The Louisiana Fruit and Vegetable Growers Association (LFVGA) held an olive and fig day at the LSU AgCenter Hammond Research Station in May 2016 to showcase olive research project to 75 horticulture industry members. LSU AgCenter entomologist Dennis Ring worked with principal investigator on insect monitoring. LSU AgCenter plant pathologist worked with principal investigator on disease monitoring. LSU AgCenter horticulturist worked with the principal investigator on orchard establishment / layout / initial cultural practices. The Louisiana Nursery and Landscape Association (LNLA) invited project participants to make presentations on olives at horticulture industry plant conferences and at the Gulf States Horticultural Expo. LNLA and LFVGA members participated via in-person, phone calls and e-mails pertaining questions about growing and selling olive trees. The Master Gardeners of Greater New Orleans used our PowerPoint presentation for their educational presentations on olives to home gardening groups.

Goals and Outcomes Achieved:

Activities Performed to Achieve Goals and Outcomes. Goals were: retail garden centers to sell or carry inventory of olive trees; wholesale nursery growers to consider production or brokering of olive trees; home gardeners and nursery/garden center industry to be more knowledgeable about olive tree care, varieties and recommended cultural practices; promote the production and sale of Louisiana olives by publishing research into the best types of olive trees to raise and the best cultivation techniques for production in Louisiana. Activities performed in an attempt to achieve these goals and outcomes were: Field days and open house events at the LSU AgCenter Hammond Research Station featured olive information and orchard tours. Tours were also provided to master gardener groups. Surveys of home gardeners and master gardeners were conducted. Surveys of nursery growers and garden centers were conducted. Communication about our olive work occurred via social media, news articles, newsletters, in person visits and at academic horticulture meetings. PowerPoint presentations were developed and delivered approximately 35 times to varied audiences. Olives were showcased at two master gardener appreciation days. A Louisiana Vegetable and Fruit Growers Association olive and fig day was held at the Hammond Research Station. Olive information was presented at Louisiana State Horticulture Society annual conferences and at LSU AgCenter / Louisiana Nursery and Landscape Association plant material conferences and at the Gulf States Horticultural Expo. Progress Made Toward Goals and Outcomes. Some

progress towards goals and objectives was included in the summary of activities and tasks performed under the project approach section. The following progress was made toward goals and outcomes: (1) Initially, a Louisiana master gardener's survey found that 85% had not grown olives, 49% planned to grow olives, only 4% of respondents had adequate olive growing knowledge, 82% would attend an olive educational program or field day and 89% of respondents indicated olives had Louisiana potential. (2) A later survey of Louisiana master gardeners found that 33% had now grown olives, 70% planned to grow or plant olives, 40% felt they had adequate olive growing knowledge, 50% had attended an olive educational program (35% more said they still planned to attend an olive educational program if an additional one could be provided), and 95% of respondents indicated olives had Louisiana potential as either a specialty crop or a landscape tree. (3) 70% of surveyed Louisiana master gardeners said they interested in olives for fruit production, while 33% said they were most interested in using olives as a landscape tree. 74% of respondents were interested in dual purpose plantings. (4) A home gardener survey found that over 95% of individuals attending a presentation on olives had not grown olives before. The same percentage indicated they had very little to no olive growing, management practices knowledge. Based on a concluding survey, 60% felt they had adequate knowledge and 55% said they would plant at olive(s) soon. Most felt olives were best as a tree with landscape, ornamental potential but they still desired a tree for fruit production and desired processing information. This exceeds our target of 33%. (5) PowerPoint presentations were developed. One on cultural practices and one on olive harvesting and processing. Approximately 30 in-person (group meeting) presentations (1500 participants) were given on olive cultural practices. Approximately 5 in-person (group meeting) presentations (150 participants) were given on olive harvesting/processing. (6) Olive findings, observations were published to the LSU AgCenter website and also the social media sites Facebook and LinkedIn. Approximately 30,000 page views, likes, shares, contacts were made. (7) A survey of retail nurseries (primarily via phone calls, in-person discussion, email contacts and Facebook messaging) was used to determine/measure the number of these nurseries planning to add olive trees to sales inventory (relates to the goal of retail garden centers selling or carrying inventory of olive trees; relates to the goal of wholesale nursery growers to consider production or brokering of olive trees; relates to the goal of nursery/garden center industry to be more knowledgeable about olive trees). At project initiation, 20 twenty medium to large independent garden centers (primarily in the Lafayette, Baton Rouge, Covington, Hammond, New Orleans market areas) verbally or e-mail surveyed did not have olive trees as part of their typical inventory (relates to the goal of retail garden centers selling or carrying inventory of olive trees; relates to goal of wholesale nursery growers to consider production or brokering of olive trees). In late 2016 and 2017, approximately 35 independent retail garden center locations were surveyed for their current status on selling olive trees or having olive trees on inventory during the year. The vast majority (65%) carry olives trees – mostly in small quantities (10-20 three gallon containers; 2-3 garden centers reported selling 50-100 annually). Typical retail price is $35-45 per tree. This would only amount to $17,500-20,000 in retail sales. Garden centers not carrying olives were generally those in north Louisiana (Ruston, Shreveport). A mass merchandiser garden center (Lowes) carries olive trees regularly in stores in south Louisiana, although the number typically inventoried and sold is unclear. Our benchmark

was for 5 garden centers to regularly sell olive trees. (8) One wholesale nursery grower in Louisiana is now producing 20,000 olive trees annually in 3-gallon containers. This is about $400,000 in sales annually. (9) At project initiation, only one article on olives had been published by the LSU AgCenter (fall 2014 Horticulture Hints by David Himelrick). The following articles have now been published or distributed: • LSU AgCenter Ornamental E-News Update (Late April 2015) – Olives Planted • LSU AgCenter Ornamental E-News Update (Late May 2015) – Evaluating Olives • LSU AgCenter Ornamental E-News Update (Late May, Early June 2016) – Olive Day Report • LSU AgCenter Ornamental E-News Update (October 2017) – Olive First Year Evaluation • LouGarden E-Mail Group – Louisiana Agriculture Article on Olives (September 2017) • LSU AgCenter Landscape News – May 2015 – Olive Research Project • American Society for Horticultural Science, Southern Region - First Year Olive Observations (February 2017) • American Society for Horticultural Science – First Year Olive Observations (September 2017) • Louisiana State Horticulture Society Journal – Researching Olives in Louisiana (2016) • Several Facebook Posts (2015-2017) • Louisiana Agriculture Magazine (Summer 2017) – Growing Olives in Louisiana: An Initial Evaluation These above publications have minimal circulation of 51,875. Our target, benchmark was to provide 100 Louisiana nursery grower/garden center businesses with information on olive tree varieties, care recommendations and cultural practices (450 nursery growers, garden centers receive the LSU AgCenter ornamental e-news). Olive research was featured at the landscape horticulture industry field days for retailers, landscapers and growers at the Hammond Research Station in 2015 (attendance 355), 2016 (attendance 225) and 2017 (attendance 185). (10) Horticultural observations on varietals, orchard planting: • Louisiana's humid climate and high annual rainfall totals pose significant challenges to the Mediterranean olive tree, but occasional winter arctic cold blasts pose the most risk to growing olives in Louisiana long-term. • Although olives require a certain amount of vernalization (cool but not cold) during winter, temperatures that drop below 15-20 degrees can cause severe injury to olives, especially young trees with small trunks. • Result trends are apparent in observation of varietals in the research orchard. The evaluation orchard at Hammond experienced exactly the type of harsh climactic swings plants routinely endure every few years in Louisiana. March and August 2016 brought historic flooding at the station, with standing water in the olive orchard during the August event. Surprisingly, most olive varietals appeared to be unaffected by the historic rainfall totals in 2016. The research station has sandy soil that drains well, so this probably helped in their resilience. While some preliminary evidence has pointed to possible root rot fungal pathogens in a few specimens, those particular trees actually died before the major floods as a result of a leaky irrigation valve at the lowest elevation of the planting area. • While the 2015-2016 winter was mild, the 2016-2017 winter season concentrated all its frigid nastiness in one weekend in January 2017. Unseasonably warm weather yielded to an arctic front that pushed south and dropped nighttime temperatures to 22 degrees two nights in a row. The resulting damage of burned leaves and bark splitting on some varietals was expected, but a surprising number of trees pulled through with barely any damage. • As with any new orchard planting, the disturbed soil exploded with extremely high weed pressure. Although a number of herbicides are labeled for use around olives, the trees are nonetheless quite sensitive to

certain active ingredients, such as glyphosate. In Louisiana, typical recommendations are to keep the orchard floor clean of weeds and leaf matter. That goal was achieved but caused damage through herbicide drift to some of the smaller olive trees. • Damaging insect pressure was not widespread, with black scale (Saissatia oleae) insects being the most common. Winter temperatures and an application of horticultural oil and carbaryl insecticide significantly reduced the population. Sharpshooters and snails were observed. In addition, olives have been added to the list of species susceptible to the emerald ash borer. • Anglandau, Arbequina (the most sold and grown varietal in Louisiana), Bouteillan, Grossane, Manzanilla and Picual appear to be the best-established varietals. Arbosana, Frantoio, Koroneiki and Mission established well but suffered greater cold damage as shown by splitting bark or excessive defoliation. Mission and Koroneiki appear to be recovering better than others. Bouteillan, Grossane and Picual are the best varietals for ornamental/landscape value. Comparison of Actual Accomplishments with Goals Established. Goals were: retail garden centers to sell or carry inventory of olive trees; wholesale nursery growers to consider production or brokering of olive trees; home gardeners and nursery/garden center industry to be more knowledgeable about olive tree care, varieties and recommended cultural practices; promote the production and sale of Louisiana olives by publishing research into the best types of olive trees to raise and the best cultivation techniques for production in Louisiana. All goals were accomplished. More retailers, garden centers now carry, sell olive trees. Wholesale growers have increased production (at least one major grower), Home gardeners and industry professionals are more knowledgeable about olives. Baseline Data for Outcomes. • Garden center selling 100 trees could generate $3,000 in sales. • Grower selling 1000 trees could generate $18,000-25,000 in sales. • Provide 100 nursery growers, garden centers with olive information. • Have 5 garden centers regularly carry olive trees in inventory. • 33% home gardeners to desire to plant olive trees. • 100 people to review initial research results. • Users of LSU AgCenter olive research at project initiation is zero – new effort.

Beneficiaries:

Description of Groups/Operations Benefiting from Project Accomplishments are Louisiana master gardeners which includes 2500 home horticulture volunteers providing community service on behalf of the LSU AgCenter, members of the Louisiana Nursery and Landscape Association (Louisiana's largest organization for retail garden centers, nursery growers and landscapers), members of the Louisiana Fruit and Vegetable Growers Association (commercial fruit, vegetable and specialty crop growers).

Quantitative Data / Economic Impact: 845 industry professionals (LNLA, LFVGA members) attending field days about olives. Publications reach a minimum of 51,875 individuals. Nursery growers are selling at least $400,000 of olive trees annually in Louisiana. Garden centers are selling at least $25,900 of olive trees annually in Louisiana.

Lessons Learned:

Positive and Negative Results / Project Conclusions: There was a significant impact in advancement of olive knowledge and acceptance among Louisiana master gardeners.

Unexpected Outcomes / Results: There were no unexpected outcomes, results. We thought consumer and commercial interest in olives would increase as a result of this project, which it did. There were no really significant unexpected outcomes in data collection, orchard maintenance, etc. We were surprised with the success of many olive trees in the research orchard after the August 2016 flood with inundated the orchard for 48-60 hours. Weed pressure was also considerable. Lessons Learned from Unachieved Outcomes / Goals. There were no unachieved outcomes, goals in this project.

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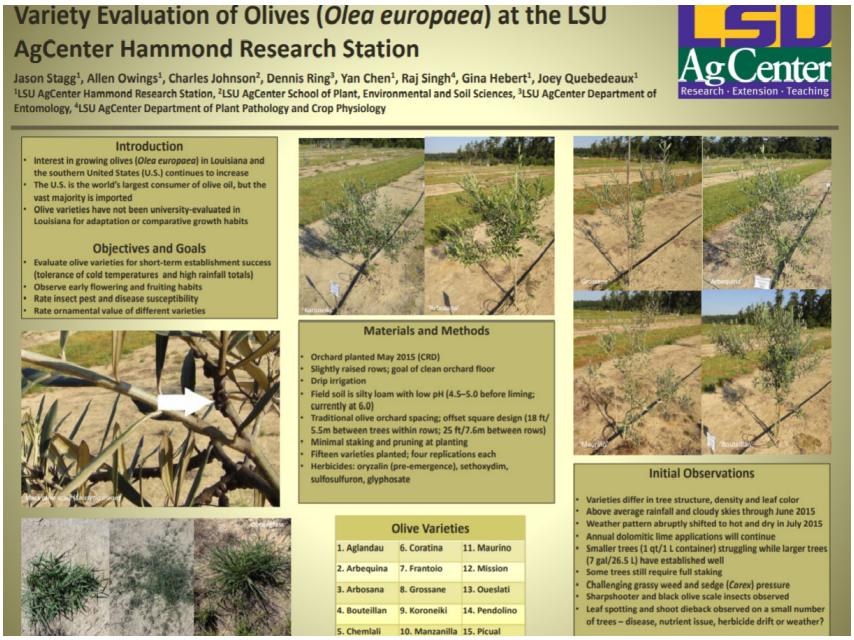
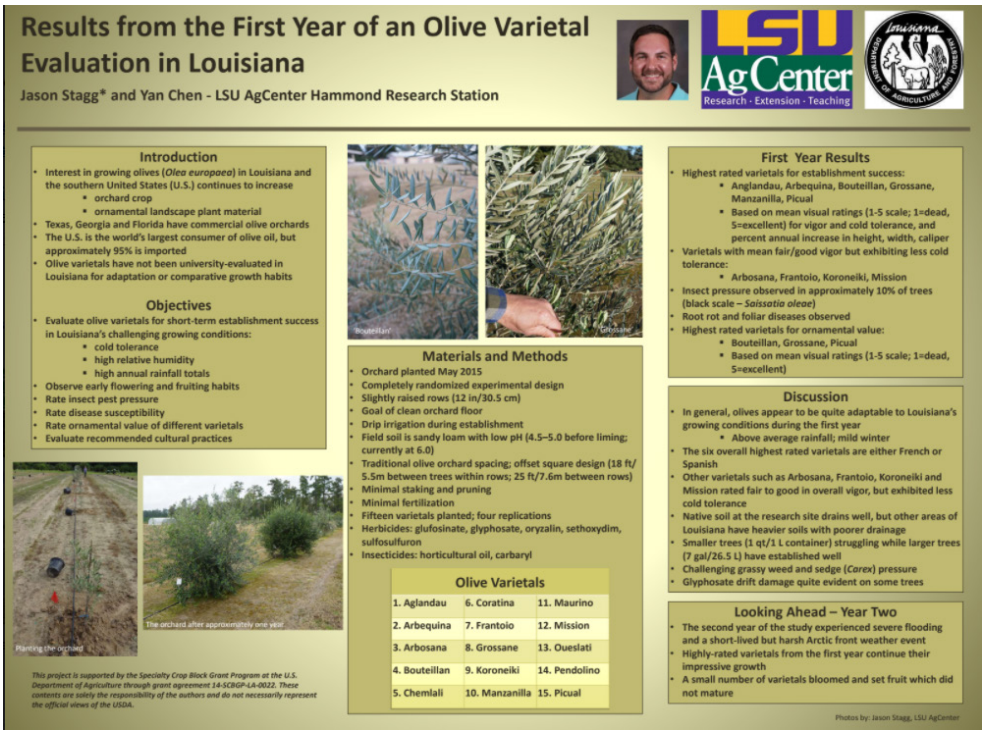
Additional Information:

Several publications, PowerPoint presentations (as PDFs) and related handouts were developed. Evaluation of Edible Olives for Adaptation to Louisiana (PowerPoint as PDF) Olive Harvesting and Processing Practices (PowerPoint as PDF) available by file attachment upon request.


Variety Evaluation of Olives (Olea europaea) at the LSU AgCenter Hammond Research Station
Jason Stagg[1], Allen Owings[1], Charles Johnson[2], Dennis Ring[3], Yan Chen[1], Raj Singh[4], Gina Hebert[1], Joey Quebedeaux[1]
[1]LSU AgCenter Hammond Research Station, [2]LSU AgCenter School of Plant, Environmental and Soil Sciences, [3]LSU AgCenter Department of Entomology, [4]LSU AgCenter Department of Plant Pathology and Crop Physiology
LSU AgCenter Research · Extension · Teaching
Introduction
Interest in growing olives (Olea europaea) in Louisiana and the southern United States (U.S.) continues to increase
The U.S. is the world's largest consumer of olive oil, but the vast majority is imported
Olive varieties have not been university-evaluated in Louisiana for adaptation or comparative growth habits
Objectives and Goals
Evaluate olive varieties for short-term establishment success (tolerance of cold temperatures and high rainfall totals)
Observe early flowering and fruiting habits
Rate insect pest and disease susceptibility
Rate ornamental value of different varieties
Materials and Methods
Orchard planted May 2015 (CRD)
Slightly raised rows; goal of clean orchard floor
Drip irrigation
Field soil is silty loam with low pH (4.5–5.0 before liming; currently at 6.0)
Traditional olive orchard spacing; offset square design (18 ft/ 5.5m between trees within rows; 25 ft/7.6m between rows)
Minimal staking and pruning at planting
Fifteen varieties planted; four replications each
Herbicides: oryzalin (pre-emergence), sethoxydim, sulfosulfuron, glyphosate
Olive Varieties
1. Aglandau 6. Coratina 11. Maurino
2. Arbequina 7. Frantoio 12. Mission
3. Arbosana 8. Grossane 13. Oueslati
4. Bouteillan 9. Koroneiki 14. Pendolino
5. Chemlali 10. Manzanilla 15. Picual
Initial Observations
Varieties differ in tree structure, density and leaf color
Above average rainfall and cloudy skies through June 2015
Weather pattern abruptly shifted to hot and dry in July 2015
Annual dolomitic lime applications will continue
Smaller trees (1 qt/1 L container) struggling while larger trees (7 gal/26.5 L) have established well
Some trees still require full staking
Challenging grassy weed and sedge (Carex) pressure
Sharpshooter and black olive scale insects observed
Leaf spotting and shoot dieback observed on a small number of trees – disease, nutrient issue, herbicide drift or weather?


Results from the First Year of an Olive Varietal Evaluation in Louisiana
Jason Stagg* and Yan Chen - LSU AgCenter Hammond Research Station
LSU AgCenter Research · Extension · Teaching
Introduction
Interest in growing olives (Olea europaea) in Louisiana and the southern United States (U.S.) continues to increase
orchard crop
ornamental landscape plant material
Texas, Georgia and Florida have commercial olive orchards
The U.S. is the world's largest consumer of olive oil, but approximately 95% is imported
Olive varietals have not been university-evaluated in Louisiana for adaptation or comparative growth habits
Objectives
Evaluate olive varietals for short-term establishment success in Louisiana's challenging growing conditions:
cold tolerance
high relative humidity
high annual rainfall totals
Observe early flowering and fruiting habits
Rate insect pest pressure
Rate disease susceptibility
Rate ornamental value of different varietals
Evaluate recommended cultural practices
Planting the orchard
The orchard after approximately one year
This project is supported by the Specialty Crop Block Grant Program at the U.S. Department of Agriculture through grant agreement 14-SCBGP-LA-0022. These contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.
Materials and Methods
Orchard planted May 2015
Completely randomized experimental design
Slightly raised rows (12 in/30.5 cm)
Goal of clean orchard floor
Drip irrigation during establishment
Field soil is sandy loam with low pH (4.5–5.0 before liming; currently at 6.0)
Traditional olive orchard spacing; offset square design (18 ft/ 5.5m between trees within rows; 25 ft/7.6m between rows)
Minimal staking and pruning
Minimal fertilization
Fifteen varietals planted; four replications
Herbicides: glufosinate, glyphosate, oryzalin, sethoxydim, sulfosulfuron
Insecticides: horticultural oil, carbaryl
Olive Varietals
1. Aglandau 6. Coratina 11. Maurino
2. Arbequina 7. Frantoio 12. Mission
3. Arbosana 8. Grossane 13. Oueslati
4. Bouteillan 9. Koroneiki 14. Pendolino
5. Chemlali 10. Manzanilla 15. Picual
First Year Results
Highest rated varietals for establishment success:
Anglandau, Arbequina, Bouteillan, Grossane, Manzanilla, Picual
Based on mean visual ratings (1-5 scale; 1=dead, 5=excellent) for vigor and cold tolerance, and percent annual increase in height, width, caliper
Varietals with mean fair/good vigor but exhibiting less cold tolerance:
Arbosana, Frantoio, Koroneiki, Mission
Insect pressure observed in approximately 10% of trees (black scale – Saissatia oleae)
Root rot and foliar diseases observed
Highest rated varietals for ornamental value:
Bouteillan, Grossane, Picual
Based on mean visual ratings (1-5 scale; 1=dead, 5=excellent)
Discussion
In general, olives appear to be quite adaptable to Louisiana's growing conditions during the first year
Above average rainfall; mild winter
The six overall highest rated varietals are either French or Spanish
Other varietals such as Arbosana, Frantoio, Koroneiki and Mission rated fair to good in overall vigor, but exhibited less cold tolerance
Native soil at the research site drains well, but other areas of Louisiana have heavier soils with poorer drainage
Smaller trees (1 qt/1 L container) struggling while larger trees (7 gal/26.5 L) have established well
Challenging grassy weed and sedge (Carex) pressure
Glyphosate drift damage quite evident on some trees
Looking Ahead – Year Two
The second year of the study experienced severe flooding and a short-lived but harsh Arctic front weather event
Highly-rated varietals from the first year continue their impressive growth
A small number of varietals bloomed and set fruit which did not mature
Photos by: Jason Stagg, LSU AgCenter

PROJECT SIX TITLE: ENHANCEMENT OF PROFESSIONALISM AND MARKETING PROGRAMS FOR LA NURSERY AND LANDSCAPE INDUSTRY

SUBGRANTEE: LOUISIANA NURSURY AND LANDSCAPE ASSOCIATION

Project Summary:

This project endeavored to meet the need of providing timely nursery and landscape education and marketing information to licensed and permitted professionals in the industry in Louisiana. LNLA has been, and still is, doing this for its own 400 or so members, but this grant project enabled LNLA to reach more of the 4,500 or so (varies somewhat from year to year) professionals in the industry. Many of these non-member professionals in Louisiana had limited knowledge of or contact with sources of LSU AgCenter recommendations and LNLA information for their businesses, especially those new to the industry. This project sought to reach those individuals, as well as LNLA members, to increase their knowledge levels and adoption of good agricultural practices.

In past decades, gardening was among the top two or three hobbies among U.S. and Louisiana residents. More recently, gardening is barely rated in the top ten. This project endeavored to encourage consumers to enjoy gardening, enhance their existing landscapes, and ultimately contribute to the profitability of nursery & landscape professionals in Louisiana.

This project was not built on a previously funded project with the SCBGP or SCBGP-FB.

Project Approach:

Four semi-annual newsletters were created, printed, and mailed to Louisiana licensed landscape architects, landscape horticulturists, nursery growers, irrigation contractors and commercial pesticide applicators (Category 3 Ornamentals & Turf). Various authors, including LSU AgCenter faculty and LNLA members contributed articles and information for each 20-page newsletter.

We conducted two surveys, one in January 2017 and a later one in summer 2017 at the end of the project, to measure the effect of this project. Of those who responded to the surveys, 93% claimed they gained knowledge as a result of the newsletters; 42% claimed they chose different plants or varieties of plants used in their businesses as a result of information received in the newsletters; 26% claimed they made changes in their business growing or landscaping practices as a result of information received in the newsletters; and 26% claimed they changed their advertising/marketing/promotion for their business as a result of information received in the newsletters.

Of those professionals who responded by the second survey, 63% stated their business income increased by 5% or more during the time period of the project. Another 29% claimed their business income increased, but by less than 5%.

Newspaper and radio ads were created with the theme "Buy it, plant it, grow it, love it" for use in a mass media campaign aimed at consumers. A marketing specialist was contracted to create the ads, with the input and approval of the LNLA Marketing Committee, and to recommend and secure the most beneficial combination of 84 newspapers and 45 radio stations statewide. The ads were run multiple times in Spring and Fall of the years of the project. When additional funding became available in Spring 2017, more radio ads and Facebook and Google ads were run. All ads included the LNLA website address to facilitate consumers' finding LNLA members for the gardening and landscape products and services they may desire.

We conducted two surveys: one in early January, and a later one in summer 2017 at the end of the project. Of those professionals who responded by the second survey, 63% stated their business income increased by 5% or more during the time period of the project. Another 29% stated their business income increased, but by less than 5%.

Goals and Outcomes Achieved:

The goal of the newsletters was to provide education on good agricultural practices and to present marketing information. The survey results indicate almost all readers gained knowledge (93%), many made changes in their types or varieties of plants (42%), and about one fourth of the recipients made changes in their practices of production or landscaping (26%), and/or marketing (26%) as a result of the newsletters. Although not all recipients made changes in their production and/or marketing practices, many did, so the project is deemed to have been successful.

The goal of the entire project was to increase nursery & landscape professionals' business income by at least 5%. A substantial number (63%) reported they did. Since there was a significant increase in the positive responses, comparing the ones from before the additional funding (31%) to those afterwards (63%), that additional funding had a very significant positive outcome by affording additional outreach. The use of social media in the latter campaign yielded much higher results than radio and newspapers alone.

There was no beginning benchmark for this project, because no data had been collected prior to this project determining income levels of the respective businesses. Actual sales is extremely difficult to get from producers, questions in the survey were directed at determining percentages of increase during the time period of this project.

Beneficiaries:

The primary beneficiaries of this project were the 4,500 nursery growers, who grow and sell plants; landscape horticulturists, who install and/or maintain business and/or residential landscapes; landscape architects, who design landscapes for businesses and residences; irrigation contractors, who install and/or maintain irrigation systems for landscapes; and commercial ornamental & turf pesticide applicators, who control pest problems in landscapes using various techniques, including pesticide applications.

Secondary beneficiaries were consumers who showed an increase in gardening interest by the increased income experienced by professionals. They also increased their knowledge of recommended practices, plant materials, and sources of professionals to aid in their gardening or landscaping efforts by visiting the LNLA website, where timely news articles and a listing of LNLA members by their business types was available. The number of "hits" on the LNLA website increased from a 3 month average of 985 before the project to 1,974 during the last 3 months of the project. This indicates many more people became aware of the website during the project and utilized the site.

Another impact of the project was in the 12% increase of professionals asking to be added to the LSU AgCenter horticulturist email distribution list as a direct result of the project. The solicitation for professionals to be put on the list was included in each newsletter. This indicates the desire of those individuals to become more knowledgeable about recommended practices, safety and/or events that are available for them to attend.

Lessons Learned:

The major lesson learned by project staff was the impact gained by using social media in a mass media campaign to the public. Facebook reported there were 139,430 people reached through the Facebook ads with 3,326 link clicks. Google reported there were 3,326 clicks with 370,500 impressions.

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Additional Information:

Sample newsletter cover and survey.

LOUISIANA Nursery & Landscape

Since 1954

SPECIAL INDUSTRY OUTREACH, EDUCATION, MARKETING NEWS

January 2017

buy it, plant it, grow it, love it!

LNLA.org

Louisiana Nursery & Landscape Association

ldaf.state.la.us

buy it, plant it, grow it, love it!

We hope you will visit our website at www.lnla.org and click in the upper right hand corner of the first home page onto N&L Professionals to find our professionals home page. There you can find many more educational articles, upcoming events, and other items of interest for the nursery & landscape industry. If you are not already a member of LNLA, we invite you to become a member to receive benefits listed in an article in this newsletter and to support this industry. A membership application is located inside this newsletter. Our LNLA Annual Meeting & Breakfast will be on January 19th at the Gulf States Horticultural Expo in Mobile, Alabama. All LNLA members are invited to attend. Come join us there.

We hope you have enjoyed and learned from the four semi-annual newsletters that have been mailed. We hope they have and will benefit your business by increasing your knowledge and potential for increased revenues in the future.

If you want to receive educational information on a more frequent basis from LSU AgCenter, including research results on ornamentals and turf, please email Dr. Allen Owings, LSU AgCenter horticulturist, at aowings@agcenter.lsu.edu to be added to his email list. This service and education is free to industry professionals. When you contact him, please tell him you heard about this from this newsletter.

This publication by the Louisiana Nursery & Landscape Association provides information on improved agricultural production practices and marketing assistance and was supported by the U.S. Department of Agriculture's (USDA) Agricultural Marketing Service through grant agreement 14-SCBGP-LA-0022. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.

To Louisiana Nursery & Landscape Professionals

PLEASE TAKE A FEW MINUTES TO ANSWER THE 6 QUESTION SURVEY INSIDE THE BACK COVER OF THIS NEWSLETTER. PLEASE RETURN IT BY FEBRUARY 1, 2017.

This is the fourth and final newsletter coming to you from Louisiana Nursery & Landscape Association (LNLA) funded by a USDA Specialty Crop Block Grant through Louisiana Department of Agriculture & Forestry. The ads shown here appeared in newspapers throughout Louisiana in Fall of 2015 and Spring and Fall of 2016. This was part of a grant-funded mass media campaign conducted by LNLA to promote business for its members. The ads encouraged consumers to visit our website, where they can find our members, who sell products or services to consumers, listed by business categories. Radio spots with the same theme of Buy it, Plant it, Grow it, Love it, also ran during Fall 2015 and Spring and Fall of 2016.

NURSERY AND LANDSCAPE SURVEY

PLEASE CHECK ONE ANSWER PER QUESTION. THANK YOU for your participation in this survey.

During Fall 2015, and Spring and Fall 2016, newsletter ads like those on the front cover of this newsletter and radio ads were run with the theme: Buy it, plant it, grow it, love it. The purpose was to encourage people to spend more on nursery and landscape products and services.

1. Comparing your business income from before the Fall of 2015 to now, did your income increase?
   ____ Yes, by 5% or more
   ____ Yes, but less than 5% increase
   ____ No increase

This is the fourth and final semi-annual newsletter mailed to Louisiana nursery and landscape license or permit holders since summer/fall of 2015. The purpose was to increase knowledge and/or marketing opportunities for those receiving them.

2. Did your business make any changes in its growing or landscaping practices, as a result of information received in the newsletters?
   ____ Yes, changes were made as a result of the newsletter(s)
   ____ No changes were made as a result of the newsletter(s)
   ____ Changes were made, but not as a result of the newsletter(s)
   ____ Changes were not made, but decisions were reinforced by information received
   ____ Undecided

3. Did your choice of plants, or varieties of plants, used in your business change, as a result of information received in the newsletter(s)?
   ____ Yes, different plants or varieties were chosen as a result of the newsletter(s)
   ____ Different plants have been chosen, but not as a result of the newsletter(s)
   ____ No change in plants chosen has occurred in the past year and a half
   ____ No change in plants chosen has occurred, but decisions were reinforced by information received
   ____ Undecided

4. Did your advertising/marketing/promotion for your business change in any way as a result of information received in the newsletter(s)?
   ____ Yes, changes were made as a result of the newsletter(s)
   ____ Changes were made, but not as a result of the newsletter(s)
   ____ No changes were made
   ____ No changes were made, but decisions were reinforced by information received
   ____ Undecided

5. Did you gain any knowledge as a result of the newsletter(s)?
   ____ Yes
   ____ No
   ____ Undecided

6. Please indicate what type of horticultural business you are engaged in:
   ____ Landscape architect
   ____ Landscape horticulturist
   ____ Retail plant nursery or garden center
   ____ Wholesale plant nursery
   ____ Ornamentals & Turf pesticide applicator

Please mail completed survey by February 1 to: LNLA, 11050 Hwy 441, Amite, LA 70422
OR scan and email to: anniecoco400@gmail.com