Bulletin 1184 August 2010

Operational Characteristics of Nurseries and Greenhouses *in the Northern Gulf of Mexico States*

MAFES

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Operational Characteristics of Nurseries and Greenhouses in the Northern Gulf of Mexico States

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This research was supported in part by the U.S. Department of Labor, Employment, and Training Administration and the U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service. It was approved for publication as MAFES Bulletin 1184 of the Mississippi Agricultural and Forestry Experiment Station. This bulletin was published by the Office of Agricultural Communications, a unit of the Division of Agriculture, Forestry, and Veterinary Medicine at Mississippi State University.

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Introduction

The nursery and greenhouse industry in the northern Gulf of Mexico states generates significant economic impact to the regional economy. Hall et al. (2005) estimated that the annual economic impact of the industry in the region amounted to $615.9 million with Alabama, Mississippi, and Louisiana contributing $411 million, $55.6 million, and $149.3 million, respectively. The industry also provided 6,753 jobs and generated $17.1 million in indirect business taxes across these three states. As the value of horticulture production in the northern Gulf of Mexico states increases over time, it is expected that nursery and greenhouse growers will improve production efficiency, expand markets for horticulture products, further adopt mechanized/automated production technologies, and improve working conditions and workers' safety.

A survey of nurseries and greenhouses was conducted in the northern Gulf of Mexico states as a part of a research program undertaken by the Mississippi Agricultural and Forestry Experiment Station and the U.S. Department of Labor entitled *Enhancing Labor Performance of the Green Industry in the Gulf South*. The socioeconomic survey consisted of eight parts: worker demographic characteristics, nursery characteristics, nursery automation, greenhouse automation, labor and capital markets, pesticide and chemicals, working conditions, and respondent characteristics. The overall goal of the survey was to develop a socioeconomic profile of horticulture workers and to evaluate the impact of automation on their employment, earnings, safety, skill levels, and retention rates (Posadas et al., 2004). The socioeconomic characteristics of workers and working conditions were presented in Posadas et al. (2005, 2010). Posadas et al. (2008) described the current levels and socioeconomic impact of mechanization and automation.

Updated information on the operational characteristics of nursery and greenhouse operations are useful for researchers, specialists, growers, lenders and investors. A group of agricultural economists and horticulture scientists (Hinson et al., 2008) prepared enterprise budgets using the Mississippi Budget Generator for several woody ornamental plants grown in containers in USDA Plant Hardiness zones 8 and 9.

The overall goal of this bulletin was to compare the economic and technical characteristics of participating nurseries and greenhouses in the northern Gulf of Mexico states by type of operation and by annual gross sales. This information on the operational characteristics of nurseries and greenhouses should assist researchers, specialists, growers, lenders and investors in preparing enterprise and partial budgets for nursery and greenhouse operations.

Materials and Methods

The socioeconomic survey of wholesale nurseries and greenhouses located in the northern Gulf of Mexico states (Mississippi, Alabama, and Louisiana [Posadas et al., 2009]) was conducted between December 2003 and March 2005. Official lists of certified nurseries were retrieved from the Mississippi Department of Agriculture and Commerce (2003), the Alabama Department of Agriculture and Industries (2004), and the Louisiana Department of Agriculture and Forestry (2005). Additional information about the growers was retrieved from industry buyer's guides (Alabama Nursery and Landscape Association, 2004; Louisiana Nursery and Landscape Association, 2005) and an earlier draft of an Extension Service reference guide (Johnson and Wells, 2007). Only the wholesale growers were included in selecting the random samples of 50 growers in every state.

The detailed procedures involved in selecting the respondents were described in Posadas et al. (2008). The respondents to the survey were the owners and/or operators of the selected wholesale nurseries and greenhouses. Eighty-seven Nursery Automation Survey Forms (NASF) were completed from personal interviews with nurseries (N=21), greenhouses (N=22), and mixed nurseries and greenhouses (N=44) in Mississippi (32), Louisiana (29), and Alabama (26).

The operational characteristics included in the survey were total acreage, acreage under production, acreage used in open field production, greenhouse production area, number of greenhouses for production, number of greenhouses for overwintering, number of greenhouses heated, years since establishment, type of business organization, annual gross sales, number of workers employed, and types of products produced.

The statistical comparison of the operational characteristics of nurseries and greenhouses by type of operation and by annual gross sales was performed by using the General Linear Model univariate and multivariate procedures and Chi-square tests (SPSS 16 for Windows, SPSS Inc., Chicago). The types of operations included three major categories: nursery only, greenhouse only, and mixed nursery and greenhouse operations. The size of the nursery and greenhouse operations was measured by the reported annual gross sales, which included the following four categories: small-sized (less than $250,000), medium-sized ($250,000–$499,999), large-sized ($500,000–$999,999), and very large-sized ($1,000,000 or more) (Hoppe et al., 2007).

Results and Discussion

Production Space

When asked about the acreage used in their nursery or greenhouse operations, the participating owners/operators provided data on total acreage, acreage under production, and acreage used for open field production (Table 1). The total acreage reported by a typical nursery or greenhouse operation was 21.5 acres with significant differences observed by type of operation and by annual gross sales. Nursery-only (35.9 acres) and mixed nursery/greenhouse (22.8 acres) operations had more acreage than greenhouse-only (3.8 acres) operations. The total acreage among nurseries or greenhouses with higher annual gross sales was generally higher than those operations in the lower sales categories. Operations with annual gross sales of more than $1 million had an average of 127.3 acres, as compared with 4 acres among those operations with annual gross sales less than $250,000. In another study, Posadas et al. (2008) showed that each additional acre placed under production would raise annual gross sales of nurseries and greenhouses in the northern Gulf of Mexico states by an average of $959 per year.

The actual acreage used in production averaged 63% of the total number of acres with significant differences observed among different types of operations. Nursery-only operations devoted a higher percentage (75.9%) of their total acreage under production than greenhouse-only (52.5%) and mixed operations (61.5%). There were no significant variations in the percentage of total acreage under production among nursery and greenhouses operations with different annual gross sales.

The owners/operators provided the following data on greenhouse space used in production during the interviews: total production area (square feet), total number of greenhouses, number of greenhouses for

Table 1. Selected technical characteristics of nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Technical characteristic	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Total number of acres per operation [1]	35.9 c	3.8 a	22.8 b	**21.5**	4.0 A	16.1 A	15.0 A	127.3 B
Number of acres under production per operation [1]	23.1 c	1.5 a	13.5 b	**13.0**	2.3 A	10.3 A	8.8 A	77.1 B
Percent of total acreage under production [1]	75.9 b	52.5 a	61.5 ab	**63.0**	62.0 A	66.1 A	66.0 A	59.7 A
Number of acres under container production per operation [1]	0.8 a	0.0 a	8.8 a	**4.5**	0.9 A	3.4 A	6.8 A	22.3 B
Number of acres under in-ground field production per operation [1]	22.3 b	0.0 a	0.2 a	**5.9**	0.4 A	6.5 B	0.0 A	39.1 C
Number of acres under pot-in-pot production per operation [1]	0.0 a	0.0 a	1.3 a	**0.6**	0.2 A	0.0 A	0.0 A	4.6 B
Total number of open field production acres per operation [1]	23.1 c	0.0 a	10.3 b	**11.0**	1.6 A	9.9 A	6.8 A	66.0 B
Total greenhouse production area per operation (sq ft) [1]	0.0 a	27,227.0 ab	50,777.7 b	**31,560.9**	9,934.1 A	13,461.3 A	58,168.9 A	147,666.7 B
Number of production greenhouses per operation [1]	0.0 a	6.9 a	14.5 a	**8.8**	2.3 A	4.4 A	17.2 A	41.8 B
Number of overwintering greenhouses per operation [1]	0.0 a	3.5 a	9.6 a	**5.5**	0.7 A	2.9 A	6.4 A	34.2 B
Number of heated greenhouses per operation [1]	0.1 a	6.5 b	7.2 b	**5.2**	1.8 A	3.8 A	10.3 B	19.8 C

[1] Numbers in the same row under the same heading followed by the same letter are not significantly different at P≤0.05.

overwintering, and number of heated greenhouses (Table 1). Greenhouse-only operations maintained an average of 6.9 greenhouses, while mixed operations kept 14.5. Larger operations maintained more greenhouses for production and overwintering, and they heated more greenhouses than the smaller operations. Greenhouse-only and mixed operations allocated 3.5 and 9.6 greenhouses for overwintering, respectively.

Business Characteristics

In order to determine how long the companies had been in business, each owner/operator was asked the year his or her nursery or greenhouse was established. The participating nurseries and greenhouses had been in operation for an average of 23 years (Table 2). There were no significant differences observed in the number of years since establishment among the different types of operations. Those nursery and greenhouse operations that had been in business longer, however, belonged to the higher annual gross sales categories.

The owners/operators were asked about the type of business organization used in their nurseries and greenhouses. More than half (54%) of the participating nurseries and greenhouses were organized as sole proprietorships (Table 2). Approximately 30% were corporate business organizations. The rest were organized as partnerships (8%), limited liability corporations (5%), and cooperatives (2%).

The owners/operators were asked about their annual gross sales during the year prior to the survey. The majority (57%) of the participating operations reported annual gross sales below $250,000 (Table 2). Seventy-five percent of the small-sized operations were organized as sole proprietorships. Approximately 19% of the participating operations were medium-sized with annual gross sales between $250,000 and $500,000. Half of the medium-sized operations were organized as corporations, while 44% were sole proprietorships. The remaining 24% were large-sized and very large-sized growers, which reported annual, gross sales exceeding $500,000. Most of the large operations were organized as corporations and limited liability corporations.

Table 2. Selected business characteristics of nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Economic characteristic	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Number of years since establishment [1]	19	19	27	**23**	17 A	27 AB	37 B	31 B
Type of business organization (%): [2]								
Corporations	18	36	33	**30**	10	50	80	50
Partnerships	14	14	2	**8**	10	6	0	0
Sole proprietorships	68	50	48	**54**	75	44	20	0
Limited liability corporations	0	0	10	**5**	2	0	0	30
Cooperatives and others	0	0	5	**2**	2	0	0	10
Annual gross sales (%): [2]								
Below $250,000	71	68	44	**57**	—[3]	—	—	—
$250,000–$499,999	24	18	17	**19**	—	—	—	—
$500,000–$999,999	0	14	17	**12**	—	—	—	—
$1,000,000 and above	5	0	22	**12**	—	—	—	—

[1] Numbers in the same row under the same heading followed by the same letter are not significantly different at P≤0.05.
[2] Pearson chi-square values are significantly different at P≤0.05 by annual gross sales.
[3] — = Not applicable.

Workforce

The owners/operators were asked about the number of full-time and part-time workers employed in their nurseries and greenhouses. On average, each operation employed 4.8 full-time workers and 2.4 part-time workers (Table 3). The number of full-time workers varied significantly by annual gross sales. The nurseries and greenhouses with higher annual gross sales employed more workers than those with lower sales. The number of part-time workers significantly differed by type of operation and by annual gross sales. Mixed operations employed more part-time workers than nursery-only or greenhouse-only operations. Operations with higher annual gross sales employed more full-time and part-time workers than those operations with lower annual sales.

Full-time equivalent (FTE) was computed as the sum of the number of full-time workers and half the number of part-time workers. The number of FTE workers required to operate these nurseries and greenhouses differed significantly by type of operation and by annual gross sales (Table 3). The nursery-only and greenhouse-only operations employed fewer FTEs than the mixed operations. The larger operations employed more FTEs than the smaller operations. Posadas et al. (2008) showed that as the number of acres under pro-

Table 3. Number of workers in nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Economic characteristic	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Number of full-time workers per operation [1]	3.4	2.9	6.4	**4.8**	1.7 A	4.0 A	5.5 A	19.1 B
Number of part-time workers per operation [1]	0.8 a	0.9 a	4.0 b	**2.4**	0.8 A	1.3 A	4.4 B	9.7 C
Number of full-time equivalent workers per operation [1]	3.8 a	3.3 a	8.5 b	**6.1**	2.1 A	4.7 B	7.7 B	24.0 C
Average FTE per acre [1]	0.8 a	1.7 b	1.0 a	**1.1**	1.0 B	1.7 C	1.1 B	0.7 A
Average acres per FTE [1]	3.9 c	1.2 a	2.9 b	**2.7**	2.1 A	3.3 B	1.9 A	5.1 C

[1] Numbers in the same row under the same heading followed by the same letter are not significantly different at P≤0.05.

duction increased, so did the number of workers and man-hours employed. They found that for every additional acre placed under production, an additional 0.12 workers per year or 344 man-hours per year would be needed by the growers. More detailed information about the nursery and greenhouse workers and their working conditions in the northern Gulf of Mexico states were discussed in Posadas et al. (2005, 2010).

Products

The owners/operators were asked about the types and sizes of plant products their nurseries and greenhouses produced. The respondents selected the following items of different sizes: liners in individual pots, liners in trays, plants in pots, and plants in baskets.

For liner products sold in pots, significant variations in preferences were observed in three of the pot sizes among the three types of operations (Table 4). However, there were no significant variations observed among operations with different annual gross sales. The top five pot sizes mostly produced by all the nurseries and greenhouses were the 6-, 4-, 8-, 2-, and 3-inch pots (in descending order of preference). Similar sizes of liner products in pots were selected by the greenhouse-only and mixed operations with a slightly different order of preference. The 6-inch pot was the size of liner product most preferred by the nursery-only operations.

For liner products sold in trays, nursery and greenhouse operators/owners reported their most preferred sizes were the 36-, 18-, 72-, and 6-cell trays (in descending order of preference) (Table 5). The greenhouse-only and the mixed operations mostly produced the 36- and 18-cell trays. Very few nursery-only operations produced any of the liner products in trays.

For products in 1-gallon and larger pots, significant differences were observed in size preferences by type of operation (1-, 3-, and 5-gallon pots) and by annual gross sales (3-, 7-, and 30-gallon pots) (Table 6). The top five pot product sizes that were most preferred by nursery-only and mixed operations included 1-, 3-, 5-, 7-, and 15-gallon pots (in descending order of preference). Approximately 14% of greenhouse-only operations preferred the 1-gallon pot size. About 12% of the mixed operations produced 30-gallon pots. The largest operations seemed to prefer the 3-, 1-, 7-, 30-, and 5-gallon pot sizes.

For products in baskets, the most commonly produced size by greenhouse-only operations (73%) was the 10-inch basket (Table 7). Approximately 43% of the mixed operations also produced the 10-inch basket. On average, 41% of all the owners/operators preferred the 10-inch basket. However, there were no significant differences observed in the preferences for the 10-inch basket among operations broken down by annual gross sales.

Table 4. Types of liner products in pots sold by nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Type of product	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Percent of operations selling liners in 2-inch pots [1]	5	41	31	**27**	35	6	30	20
Percent of operations selling liners in 3-inch pots	5	23	10	**12**	17	0	10	10
Percent of operations selling liners in 4-inch pots [1]	9	86	41	**44**	40	38	80	50
Percent of operations selling liners in 5-inch pots	0	0	5	**1**	0	6	0	0
Percent of operations selling liners in 6-inch pots [1]	23	68	52	**49**	42	63	70	40
Percent of operations selling liners in 8-inch pots	18	36	36	**31**	25	56	40	20
Percent of operations selling liners in 10-inch pots	0	18	10	**9**	8	13	20	0
Percent of operations selling liners in 12-inch pots	0	0	5	**2**	0	0	10	2

[1] Pearson chi-square values are significantly different at P≤0.05 by type of operation.

Table 5. Types of liner products in trays sold by nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Type of product	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Percent of operations selling liners in 6-cell trays [1]	0	0	5	**2**	0	0	0	20
Percent of operations selling liners in 18-cell trays [1,2]	5	23	36	**24**	10	50	40	30
Percent of operations selling liners in 20-cell trays	0	0	2	**1**	0	0	10	0
Percent of operations selling liners in 32-cell trays	0	0	2	**1**	0	0	2	0
Percent of operations selling liners in 36-cell trays [1]	5	36	36	**28**	23	25	50	40
Percent of operations selling liners in 48-cell trays	0	5	0	**1**	0	5	0	1
Percent of operations selling liners in 72-cell trays	0	5	14	**8**	10	6	0	0

[1] Pearson chi-square values are significantly different at P≤0.05 by annual gross sales.
[2] Pearson chi-square values are significantly different at P≤0.05 by type of operation.

Table 6. Types of products in pots sold by nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Type of product	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Percent of operations selling plants in 1-gal pots [1]	46	14	57	**43**	33	44	70	50
Percent of operations selling plants in 3-gal pots [1,2]	32	5	41	**29**	19	19	40	70
Percent of operations selling plants in 5-gal pots [1]	27	0	19	**16**	17	6	10	30
Percent of operations selling plants in 7-gal pots [2]	18	0	17	**13**	8	0	10	40
Percent of operations selling plants in 15-gal pots	14	0	21	**14**	13	6	10	30
Percent of operations selling plants in 30-gal pots [2]	0	0	12	**6**	0	6	10	30
Percent of operations selling plants in 45-gal pots	0	0	7	**4**	2	6	0	10
Percent of operations selling plants in 65-gal pots	0	0	2	**1**	0	0	2	1

[1] Pearson chi-square values are significantly different at P≤0.05 by type of operation.
[2] Pearson chi-square values are significantly different at P≤0.05 by annual gross sales.

Table 7. Types of products in baskets and other forms sold by nurseries and greenhouses that participated in the socioeconomic survey in the northern Gulf of Mexico region from December 2003 to March 2005.

Type of product	Type of operation			All operations	Annual gross sales			
	Nursery only	Greenhouse only	Mixed operation		Less than $250,000	$250,000–$499,999	$500,000–$999,999	$1,000,000 and above
Percent of operations selling plants in 8-inch baskets	0	0	2	**1**	0	0	10	0
Percent of operations selling plants in 10-inch baskets [1]	5	73	43	**41**	33	50	70	30
Percent of operations selling plants in 12-inch baskets	0	5	5	**4**	2	6	10	0
Percent of operations selling in bonsai	0	0	2	**1**	0	0	0	10
Percent of operations selling palms in ground	5	0	0	**1**	0	6	0	0

[1] Pearson chi-square values are significantly different at P≤0.05 by type of operation.

Summary and Implications

The authors would like to caution the readers that the findings presented in this bulletin were based on a sample of 87 nursery and greenhouse operations in the northern Gulf of Mexico states. Type of growing operation significantly affected the land area devoted to plant production. The typical average sampled nursery and greenhouse operation occupied approximately 21.5 acres per operation with 63% or 13 acres under production. Nursery operations had more land area, averaging 35.9 acres per operation for container production, in-ground field production, or pot-in-pot production. Greenhouse operations devoted less land (averaging 3.8 acres) to operate total greenhouse space (averaging 27,227 square feet) for plant production and overwintering.

The typical nursery and greenhouse had been in operation for 23 years. Most of these companies were organized either as sole proprietorships (54%) or corporations (30%). The majority of the participating nurseries and greenhouses (57%) reported annual gross sales less than $250,000. These operations required both full-time and part-time workers — depending on the season — averaging about 1.1 FTE per acre. Labor hiring decisions are crucial in ensuring the survival of these operations given the tightening in the supply of available labor and willingness of people to work in the nursery and greenhouse industry in the northern Gulf of Mexico states.

When growers made production decisions, one of the most crucial elements in the process was the choice of which plant sizes to grow. These decisions had serious implications on the labor, materials, and supplies that would be required to operate efficient production lines. The five most commonly produced liner products included 2-, 3-, 4-, 6-, and 8-inch pots and liners in 18- and 36-cell trays. The top five potted products most frequently selected by the growers included plants in 1-, 3-, 5-, 7-, and 15-gallon pots. The participating nursery and greenhouse growers in the northern Gulf of Mexico states mostly preferred plants in 10-inch baskets to other basket sizes.

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