An Economic and Agronomic Profile of Florida's Sod Industry in 2003

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ABSTRACT

Information is presented on production, employment, marketing, and product quality and price as a result of a survey of the Florida sod industry for the year 2003, the fourth in a series of surveys since 1992. Total sod production in Florida was estimated to be 92,950 acres. Sixty-four percent of Florida sod acreage was St. Augustinegrass of which more than two-thirds (69%) was Floratam. Bahiagrass comprised 24 percent of sod in production in 2003 and bermudagrass and centipedegrass were at 6 percent and 5 percent, respectively. Nearly three-quarters (73%) of Florida sod production occurred on sandy soils. The majority of sod production was in south Florida. Harvested sod accounted for 68 percent of the sod in production and medium-sized farms harvested the highest percentage of their production acres (82%). The in-field value for all varieties totaled $405 million, while harvested sod was valued at $307 million. Levels of mechanization and employment remained the same over the last three years for the majority of sod farms. The survey showed that 96 percent of all producers expected to maintain or increase current sod production, indicating optimism about future demand.

KEY WORDS: sod production, harvested sod, farm size, mechanization, farm income, farm expenses, marketing, shipping

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

An Economic and Agronomic Profile of Florida's Sod Industry in 2003

J.J. Haydu[1], L.N. Satterthwaite[2] and J.L. Cisar[3]

INTRODUCTION

Florida was the fourth most populous state in the U.S. with 17.2 million people in 2003 and a growth rate of 2.4 percent annually (Office of Economic and Demographic Research, 2005). Due, in part, to these two factors, sod has become an increasingly important component of Florida's urban landscapes. The affinity homeowners have for green lawns, combined with the need for high-level maintenance, has resulted in a very large, robust and economically important turfgrass industry. Results of a comprehensive economic impact study conducted in 1992 (Hodges et al., 1994) underscored the diversity and magnitude of the industry. The total turfgrass area used and maintained in Florida in 1992 was about 4 million acres with 75 percent of this area in the residential (household) sector. Turfgrass industry employment was 185 thousand full-time and part-time workers or 130 thousand full-time equivalents. Water used for turfgrass irrigation in the commercial sectors was about 1.8 billion gallons per day with 58 percent from groundwater sources. Consumers spent $5 billion on turfgrass maintenance or about $1,200 per acre. Sales of turfgrass products and services by producers and commercial distributors totaled $6.5 billion with $2.1 billion in cash expenses for purchased items. Turf-related (non-land) assets in equipment, irrigation installations and buildings had a book value of $8.6 billion. Value-added to Florida's economy by all sectors of the turfgrass industry totaled $7.3 billion with golf courses contributing 35 percent, and service vendors and households contributing 21 percent each.

Market demand for sod can be roughly estimated by examining the number of new housing starts. The U.S. Census Bureau estimated 156.8 thousand single family housing starts and 56.7 thousand multi-family housing starts in Florida in 2003 (U.S. Census Bureau, 2004). Assuming sod would be used on 0.25 acres per single family unit (which includes both individual lot and "common areas"), this figure translates into 39,213 acres of sod required annually for this market. Assuming half the area allotted for sodding for single-family units and common areas would be sodded for multi-family housing units and their common areas (or 0.125 acres per unit), this equates to 7,089 acres, for a total of 46,302 acres of sod needed. Roughly another 20 percent of sod not included in this calculation is targeted for other outlets — including golf courses, commercial and non-profit institutions, and re-sodding of existing homes — making total annual demand in 2003 estimated to be 55,562 acres statewide.

In late 2004 another University of Florida survey on sod production and marketing was completed. The purpose of this study was to provide sod businesses, allied firms, industry leaders, university researchers and specialists, and state policy makers with current agronomic and economic information on this important agricultural sector. This report begins with a discussion of the methodology employed in the survey and then examines research findings in

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the areas of production, employment, marketing, product quality/price information and perceived firm- and industry-level problems.

METHODOLOGY

The population for the 'Florida Sod Production Survey–2003' was constructed from several sources — the Florida Turfgrass Association membership, members of the Florida Sod Growers Cooperative, the University of Florida/Institute of Food and Agricultural Sciences' *Turf Dollars and Sense* newsletter mailing list, the University of Florida's Department of Environmental Horticulture turfgrass web page, names provided by County Extension Agents, and a compilation from previous lists of sod producers. The objectives were to develop as complete and accurate a list as possible and to obtain information from a statistically representative sample of firms.

Due to the quantity of information requested, mail surveys were the instrument of choice. Three mailings were conducted, at roughly five-week intervals beginning in January 2004. One hundred thirty-nine questionnaires were sent in the first mailing; however with numerous additions and subtractions to the mailing list, the number of actual sod producers was reduced to 107. The most common reasons for elimination from the list were: firms had gone out of business, addresses were undeliverable (addressee unknown or forwarding order expired), or respondents did not fit our definition of a sod producer — they were plug producers or in a business related to sod such as distribution, landscape services, or a nursery business that sold sod. A total of 59 completed surveys were eventually returned, representing a 55 percent response rate.

To facilitate comparisons over time, questionnaires were designed to be consistent with three earlier surveys. The questionnaire was divided into four major sections — production, marketing, product quality, and firm and industry problems. The data from the returned questionnaires were entered into a *Quattro Pro* spreadsheet for compilation and analysis.

All farms were grouped into four size categories based on acres in production and are defined as follows:

- Small = 0–499 acres
- Medium = 500–999 acres
- Large = 1,000–1,999 acres
- Very large = ≥2,000 acres

Results of the 2003 survey indicate that 59 growers produced approximately 65,000 acres of sod in 2003 (Table 1). However, since the survey responses did not represent total industry production, several procedures were used to develop an industry-wide estimate. First, by comparing returned questionnaires with the population lists, it was determined that all ten producers in the 'very large' category — those with more than 2,000 acres of sod — were included within the survey sample. These growers are also commonly known by other producers and state trade associations who further confirmed numbers in this class. With the very large group accounted for, the remaining 66 non-responding producers were assumed to comprise 47 small (71%), 10 medium (15%) and 9 large-sized firms (14%). This assumption was based on the authors' working knowledge of the industry, input from producer associations, and recognition that in most agricultural sectors, larger sized firms tend to produce the majority of output. Adding the non-responding farms to each size category (e.g. small firms: 31 + 47 = 78),

Table 1. Number of survey respondents, the production acreage reported in each size group and calculated expansion factors, 2003.

Farm size (acres)	Acreage reported	Number of respondents	Number of farms of this size	Expansion factor
Small (1–499)	6,910	31	78	2.52
Medium (500–999)	9,528	15	25	1.67
Large (1000–1999)	3,750	3	12	4.00
Very large (≥2000)	44,625	10	10	1.00
Total	64,813	59	125	

then dividing by the number of original respondents in each farm size, an expansion factor was generated for each group (e.g. small: 78 producing farms ÷ 31 responding farms = 2.52). These figures were then used to expand the sample aggregates for all major variables estimated.

RESULTS

Acres Grown and Harvested

Information on Florida sod production by grass type is shown graphically in Figure 1. More detailed information is presented in Table 2 on total sod acreage, farm size, soil type and grass varieties. Using the appropriate expansion factors, total sod produced in Florida in 2003 was estimated to be 92,990 acres. Of this total, 64 percent (59,711 acres) was comprised of St. Augustinegrass, 24 percent (21,975 acres) constituted bahiagrass, bermudagrass represented 6 percent (5,417 acres), centipedegrass followed at five percent (4,310 acres) and area of zoysiagrass was one percent (1,234 acres). This suggests that St. Augustinegrass, whose percent share remained nearly the same as in 2000 (Haydu, et. al., 2002) has not bounced back to the previous market share held in 1996 when it accounted for 72 percent of all grass types grown (Haydu, et. al., 1998). Bahiagrass production also remained at a significant level, primarily due to the continued construction of new roads and the refurbishment of existing roads and highways by Florida's Department of Transportation. Bahiagrass is useful as a roadside cover because it is highly drought tolerant, requires little maintenance and, with its deep root system, offers effective erosion control.

Farm Size and Varietal Comparisons. Farms comprising the largest size category (8 percent of all firms) dramatically increased their share of total industry output from less than a third to nearly one-half (48%), while all other size classes reduced their share of production.

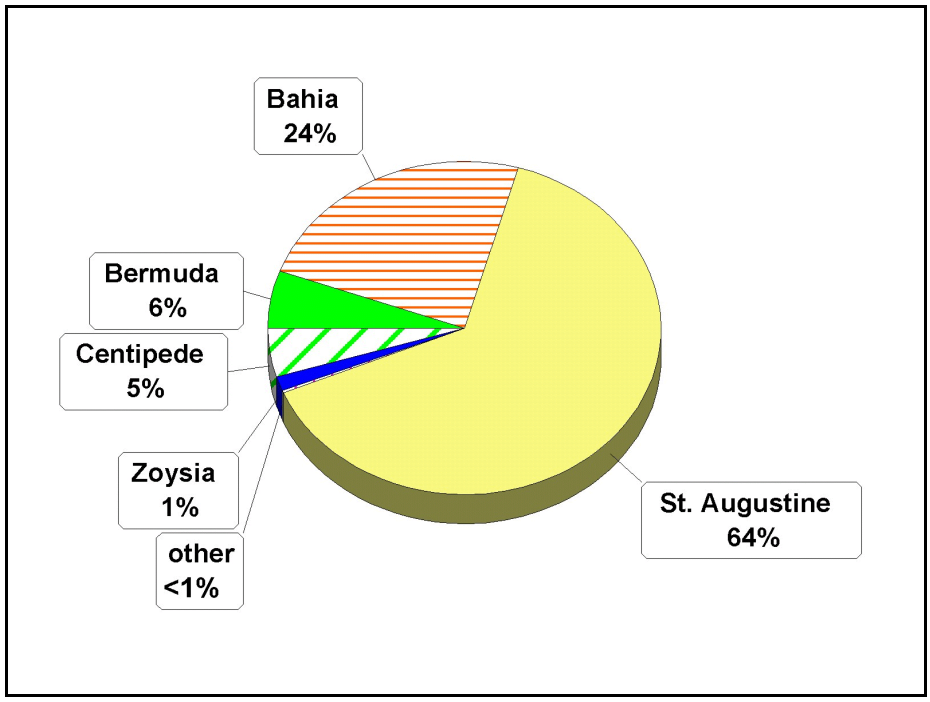

Figure 1. Types of grasses grown in Florida in 2003 — as a percent of total production.

Production from the large farm size category fell from 29 percent in 2000 to 16 percent in 2003, the largest reduction of any size class. This may be partially explained by the fact that farms have continued to get larger over time, suggesting that some farms from the large category have moved into the largest size class. Market share for medium-sized firms fell moderately from 20 percent to 17 percent, while share for the smallest class of producers fell from 21 percent to 19 percent.

From a marketing perspective, it is useful to examine how producers of various size classes alter their product mix over time. Each grass variety has different production characteristics, such as longer or shorter growing periods, more or less disease resistance, and greater or lesser tolerance to drought stress. Similarly, each grass represents a unique market niche. St. Augustinegrass is targeted primarily for the homeowner market, centipedegrass and bermudagrass are grown for athletic fields and golf courses, and bahiagrass is used for erosion control along the state's many roads and highways. What a producer ultimately decides to grow will be influenced by both production and marketing characteristics, including the extent of a firm's physical and capital resources.

For the smallest farms, the share of St. Augustinegrass of their total grass production fell from 65 percent in 2000 to 55 percent in 2003, closer to the 52 percent share in 1996. Bahiagrass also lost ground since 2000, falling from 15 percent to 13 percent, yet still above the 9 percent in 1996. Bermudagrass increased from 6 percent to 15 percent, back to slightly above its

share (13%) in 1996. Centipedegrass rose slightly from 12 to 14 percent, although still significantly below its 24 percent share in 1996.

Table 2. Total ***estimated*** acres of sod grown in Florida in 2003 — by farm size (small: 0–499; medium: 500–999; large: 1,000–1,999; very large: ≥2,000), soil type (sand vs. muck vs. clay) and grass variety.

Farm size/ Soil type	**Acres in production**							
	St. Augustine	Bahia	Bermuda	Centipede	Zoysia	Other	Total	Share
Small								19%
Muck	1,514	-----	189	43	212	-----	1,958	
Sand	7,734	1,194	2,328	1,799	302	-----	13,357	
Clay	408	-----	83	602	-----	-----	1,093	
Other	-----	1,008	-----	-----	-----	-----	1,008	
Subtotal	9,656	2,202	2,600	2,444	514	-----	17,416	
Medium								17%
Muck	3,322	-----	-----	-----	45	47	3,414	
Sand	9,247	142	995	-----	311	144	10,839	
Clay	994	84	134	58	-----	-----	1,270	
Other	344	-----	-----	-----	-----	47	391	
Subtotal	13,907	226	1,129	58	356	238	15,914	
Large								16%
Muck	5,700	-----	-----	-----	-----	-----	5,700	
Sand	6,336	-----	1,040	1,808	120	-----	9,304	
Subtotal	12,036	-----	1,040	1,808	120	-----	15,004	
Very large								48%
Muck	9,873	-----	-----	-----	74	-----	9,947	
Sand	14,239	19,547	648	-----	170	105	34,709	
Subtotal	24,112	19,547	648	-----	244	105	44,656	
Totals								
Muck	20,409	-----	189	43	331	47	21,019	22.6%
Sand	37,556	20,883	5,011	3,607	903	249	68,209	73.4%
Clay	1,402	84	217	660	-----	-----	2,363	2.5%
Other	344	1,008	-----	-----	-----	47	1,399	1.5%
Total	59,711	21,975	5,417	4,310	1,234	343	92,990	
Share	64.2%	23.6%	5.8%	4.6%	1.3%	0.4%		

For medium-sized firms, St. Augustinegrass production rose markedly, from 65 percent in both 2000 and 1996 to 87 percent in 2003. Bermudagrass production declined from 12 to 7 percent, while acreage of all other grasses were two percent or less.

Firms in the large category also experienced notable changes in the share of grass varieties grown. St. Augustinegrass production grew from 59 percent in 2000 to 80 percent 2003, nearly back to its 1996 level of 83 percent. Conversely, bahiagrass production was not reported from any growers in the large size category, indicating a dramatic decline from 33 percent share in 2000. Bermudagrass production remained nearly constant at seven percent while centipedegrass jumped to a twelve percent share in 2003 compared to no reports of production in 2000.

Finally, the share of St. Augustinegrass by the largest producers continued to decline, falling from 73 percent in 2000 to 54 percent in 2003. Bahiagrass production continued to increase from 23 percent in 2000 to 44 percent in 2003, up from 15 percent in 1996. Other grass varieties for producers in this category remained unchanged over the past seven years.

Farm Size and Soil Type. Sod is grown on either sand (mineral) soils or "muck" (organic) soils. Of the roughly 93 thousand acres, 73 percent was produced on sand with the remainder located on muck (23 percent) or clay soils (3 percent) (Table 2). Muck soils are typically found in Florida's Everglades Agricultural Area (EAA) that lies below Lake Okeechobee in the southern part of the state and the low-lying fields surrounding Lake Apopka in the central region.

In terms of acreage, the vast majority of sod for all farm sizes was produced on sand soils — 77 percent for small farms, 68 percent for medium farms, 62 percent for large farms and 78 percent for very large farms. Placement of sod farms in the state was obtained by asking survey respondents to note in which of eight map regions, roughly based on telephone area codes (combined in some instances), their farms were located. Unexpanded acreage located by this procedure is shown in Figure 2 and suggests that the majority of production is concentrated in southern Florida. However, there have been large distributional changes in the amount of grass

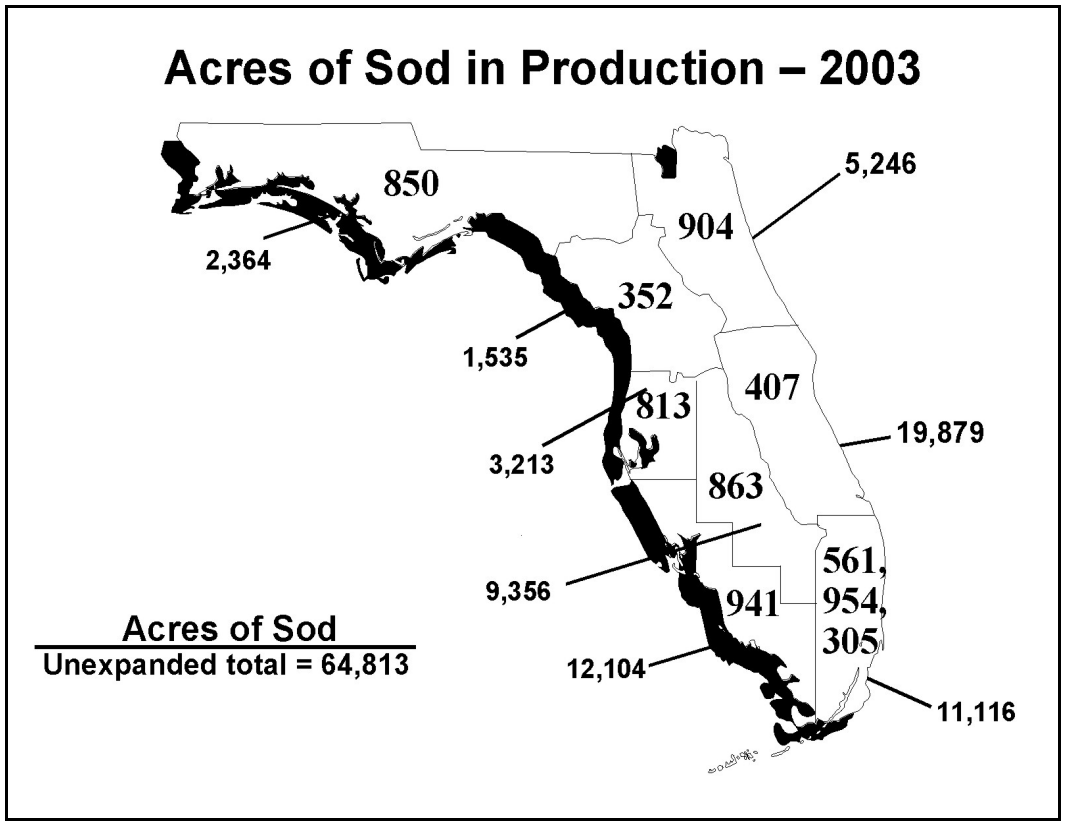

Figure 2. Reported acres of sod production in various regions in Florida in 2003.

grown throughout the state. For instance, the southwest region (941) increased production from about 5,000 acres in 2000 to over 12,000 acres in 2003, a 136 percent increase. Similarly, sod acreage in the northeast (904) and central east (407) grew by 55 percent and 57 percent, respectively. Conversely, acreage in the north central (352) and south central (863) regions each declined by nearly a third. These distributional changes may be the result of several factors, including firms locating closer to markets, some firms going out of business and, in the case of south central, the impact of the Everglades restoration project removing previously available land (roughly 250 thousand acres) in the EAA from production.

Acres Harvested. Acres of sod harvested in 2003 by grass type and farm size are presented in Table 3. Nearly 63,000 acres of sod were harvested of which 80 percent was St. Augustinegrass. Information from this table sheds light onto three areas — firm-level efficiencies in production and sales, market conditions impacting demand, and the wholesale value of the industry. First, knowledge of acres harvested is useful for calculating turnover rates, or the relationship between sales and inventory (ratio of harvested to produced acres) for a given year. Production efficiency is related to two factors, net area stocked per acre (gross area minus areas taken up by roads, drainage ditches/canals and grass left in ribbons for re-propagation) and the amount sold relative to the amount produced as influenced by market demand. Strictly from a technical standpoint, net production area per acre should be relatively constant from year-to-year, except during extended periods of high rainfall or drought. The former could impair harvesting activities and the latter could negatively impact both the supply and demand for sod. Second, market demand also influences quantities harvested in a given year. During periods of strong demand, the total harvestable area should be harvested and sold. Demand for sod is linked closely with housing starts, which is impacted by the general condition of the local and regional economies.

Table 3. Acres of sod harvested in Florida in 2003, by farm size and grass variety.

	Acres Harvested					
Farm Size (acres)	St. Augustine	Bahia	Bermuda	Centipede	Zoysia	Total
Small (0–499)	7,747	1,890	2,222	1,287	280	13,426
Medium (500–999)	11,251	164	1,047	25	296	12,783
Large (1,000–1,999)	9,549	0	523	726	90	10,888
Very large (≥2,000)	21,733	3,312	496	0	198	25,739
Total	50,280	5,366	4,288	2,038	864	62,836
Harvested Percent of Production	84%	24%	79%	47%	70%	68% [a]

[a] Total percent of production (68%) is weighted. It was calculated by multiplying the percent of production harvested for each type of grass by the percent of total production planted in that particular type of grass [e.g. St. Augustine = .842 of production acreage is harvested × 64.2% of total production acreage (see Table 2) = 51%] and summing the resultant percentages.

Given the costs of producing sod, farmers should strive to maximize inventory turnover to reduce unit costs, increase profitability, and avoid the risk of compromising product quality. For example, most St. Augustinegrass varieties in Florida can be produced and ready to sell within 9– 12 months. However, an inability to sell sod that has reached a marketable stage increases

expenses through costs imposed by routine maintenance — such as fertilization, weed and pest control, irrigation and mowing. This is particularly true for St. Augustinegrass, which is susceptible to root decline (Turgeon, 1985). This root "die-back" adversely affects the visual quality of St. Augustinegrass and, therefore, the grass is generally not sold until new root growth begins in the spring, implying a 3- to 4-month dormancy period. Consequently, sound management practices would encourage a timely and thorough harvesting of mature sod fields to avoid unnecessary maintenance costs.

Gross Farm Harvesting Efficiency. In this study, two types of estimates on harvesting efficiency were examined. The first is a "gross" figure and simply compares total acres produced on the farm to total acres harvested. It is a gross estimate because it takes into account the entire farm, including roads, ditches, and buildings. A "net" figure, which examines the amount (in square feet or percentage) per acre of sod that is harvested, is also addressed below.

Overall, 68 percent of all sod that was grown was harvested, although the percentage varied considerably across varieties. Bahiagrass was harvested at the lowest rate, 24 percent of production, while centipedegrass was harvested at 47 percent. Most farms tend to focus on St. Augustinegrass, which has a broad-based market for new home construction and re-sodding existing homes, enjoys a fairly stable price and is relatively easy to sell. St. Augustinegrass also has the highest harvest rate (84%), ranging from 87 percent of total production for medium-sized farms to 54 percent of total production for very large farms. Zoysiagrass — while only 1 percent of production — is also harvested at a fairly high rate (70 percent). Although this grass has a much narrower market, it remains the highest priced grass grown in Florida.

Harvest ratios (Table 4) for various sized farms had a wider spread (58%–80%) than they did three years ago (63%–75%). From conversations with industry leaders, a 75 percent harvest rate is considered reasonable from an efficiency standpoint. Only very large-sized farms were unable to achieve nearly a 75 percent harvest ratio in 2003. They moved from 63 percent in 2000 to the lowest harvest ratio (58%) in 2003, continuing a decline from 75 percent in 1996. One may speculate that, once again, the droughty conditions in Florida contributed to these lower harvest ratios, especially since many of the farms in the very large category produce large expanses of bahiagrass that is particularly susceptible to swings in the marketplace. The survey did not address reasons for less harvesting, but several respondents made comments about the drought as a reason for fewer acres harvested in 2003.

Net Farm Harvesting Efficiency. To better understand harvesting practices of producers, respondents were asked what percent of each acre of sod grown was harvested. For all grass varieties, growers indicated they harvested an average of 80 percent, up slightly from the 78 percent average in both 2000 and 1996. In terms of specific grasses, they harvested approximately 78 percent of each acre of St. Augustinegrass, 85 percent of each acre of bermudagrass and 79 percent of each acre of centipedegrass, leaving the remaining sod for regeneration of later crops.

St. Augustinegrass is the most widely used grass in Florida and, consequently, the most economically important for the industry. A varietal breakdown of St. Augustinegrass is presented as a pie chart in Figure 3. Floratam was the most dominant variety produced in 2003, comprising 69 percent (40,898 acres) of total St. Augustinegrass production. Far down the scale, Common was the second most popular variety representing just 9 percent (5,553), followed by Palmetto with 7 percent (4,180 acres) and Bitterblue with 5 percent (2,773 acres). The remaining St. Augustinegrass varieties — Raleigh, Floralawn, Seville, other, and Delmar —

comprised 10 percent, with Raleigh increasing to 3 percent (from 1% in 2000), and Floralawn and Seville each representing a 2 percent share of the total, as shown in Table 5.

Table 4. Acres of sod grown and harvested in 2003, by farm size and per farm, and ratio of sod harvested to sod grown.

	Acres grown in 2003		Acres harvested in 2003		Acres harvested/ Acres grown
Farm size	Total	Per farm	Total	Per farm	
Small	17,416	223	13,426	172	77%
Medium	15,914	637	12,783	511	80%
Large	15,004	1,250	10,888	907	73%
Very large	44,656	4,466	25,739	2,574	58%
Total	92,990		62,836		
Average		1,349		898	67%

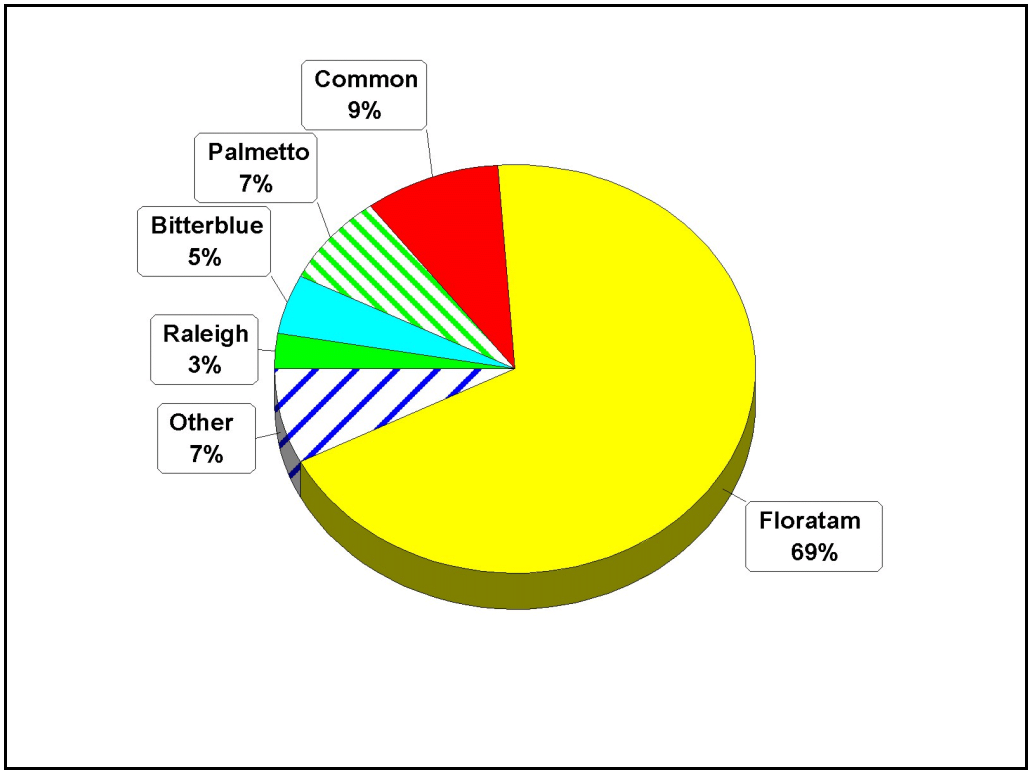

Figure 3. Top five St. Augustinegrass types grown in Florida in 2003 — shown as a percent of total St. Augustinegrass production. Other includes Floralawn, Seville, a mix of other unspecified grass types, and Delmar — in descending order of acres in production.

An interesting question is why Floratam continues to hold such a commanding grip on the market? In a recent market study of sod buyers (developers, landscape firms, sod layers and retail nurseries – unpublished data), respondents stated that although many of the other grasses were good varieties, replacing a "tried and true" product that was considered an industry standard was unlikely to occur. This reluctance stems from the high initial investment absorbed by the buyer (purchase and installation cost) in addition to numerous risks associated with the landscaping business. For instance, in a new housing development project, landscaping is the final activity in a long list of tasks — obtaining permits, site preparation, installing water and sewer, constructing roads and building the homes. After all this is completed, the landscape operation can begin, which involves land preparation, installing irrigation and drainage systems, and establishing landscape plant material. At the very end, sod installation occurs. Given all the previous activities undertaken, cost over-runs and project delays are common. From a producer's viewpoint, this can make planning extremely difficult and increase the risks associated with switching to other varieties that do not have a proven record.

Table 5. St. Augustinegrass production in 2003, presented by farm size and grass varieties.

	St. Augustinegrass acres in production							
Farm size	Bitterblue	Common	Floralawn	Floratam	Palmetto	Raleigh	Seville	Other
Small	665	0	0	7,866	495	179	452	0
Medium	352	643	962	10,383	1,176	0	48	90
Large	603	4,910	412	3,468	1,096	1548	0	0
Very large	1,153	0	63	19,181	1,413	63	863	1498
Total	2,773	5,553	1,437	40,898	4,180	1,790	1,363	1,588

Sod Prices, Industry Value, Price Determination, and Costs of Production

Sod Prices. Farm gate sod prices received by producers in 2003 are shown in Table 6. Average prices, weighted by production volume, ranged from a low 3.7¢ a square foot for bahiagrass to a high of 20.3¢ a square foot for zoysiagrass. The price of St. Augustinegrass was in the middle of this range at 12.0¢ per square foot. In general, sod prices were lower than those received in 2000. This was due largely to the recession beginning in late 2000, which dampened housing starts, and a roughly 15 percent increase in industry supply.

Industry Value. Average prices, weighted by production volume, were used to calculate the value of the sod industry in 2003. Harvest value, the quantities actually sold in 2003, were estimated at $307 million. This is the same as in 2000, in spite of more acres harvested, because of lower prices received. Nevertheless, sod still remains a top-ten agricultural commodity in Florida. Eighty-five percent of harvest value was attributable to St. Augustinegrass ($262 million), only a slight increase from its eighty-one percent share in 2000 and in 1996. Bermudagrass ($19.4 million) was the second most valuable sod variety with a six percent market share. Centipedegrass at $9.2 million and bahiagrass at $8.5 million each had about a

three percent market share, and remained slightly ahead of zoysiagrass ($7.6 million), which maintained a two and a half percent share of the market

Table 6. Sod farm acreage, percent harvested, price per square foot, and weighted harvest value in Florida in 2003 — by major grass variety.

Turfgrass varieties	Total acres (A) in production	Percent of production acres harvested	Range of prices/ft^2	Average price/ft^2	Harvest value [a]
					$ millions
St. Augustine	59,711	84%	$0.09–$0.30	$0.120	$262.2
Bahia	21,975	24%	$0.02–$0.075	$0.037	$8.5
Centipede	4,310	47%	$0.10–$0.18	$0.104	$9.2
Bermuda	5,417	79%	$0.06–$0.18	$0.104	$19.4
Zoysia	1,234	70%	$0.105–$0.30	$0.203	$7.6
Total	92,647				$306.8

[a] Harvest value, assumes percent of gross production acres sold based on results of this study, calculated as [(production acres (A) × percent area harvested) × (43,560 ft^2/A × price/ft^2)].

Price Determination. Given the price differentials across varieties, one might expect producers to concentrate on the highest-priced grasses as seems to be the case with zoysiagrass. However, little zoysiagrass was produced even though it unit value exceeded St. Augustinegrass by nearly 70 percent. The answer essentially lies with basic economics — supply and demand, and potential market share. From the demand side of the equation, St. Augustinegrass has been the preferred grass for home lawns, which constitute 73 percent of all turfgrass used in Florida (Figure 4). St. Augustinegrass, and particularly Floratam, has dominated the market because it is perceived to have desirable product attributes, such as visual attractiveness, good recuperative potential, a certain degree of utility — conserving the soil, allowing infiltration of water and filtering of pollutants — and easy maintenance. Although St. Augustinegrass is not a perfect variety, it has provided these features more consistently over time than other grasses, hence it has succeeded in preserving its "market share". Producers will naturally be drawn to the grass that is easiest to sell while still providing a reasonable and steady profit.

New developments accounted for three-quarters (73%) of Florida's sod sales in 2003 and another 24 percent of sales were for re-sodding existing developments, demonstrating the principal linkage between Florida's population growth and the turfgrass industry. The distribution of buyers is also presented in Figure 4. Forty-seven percent of sales were made to landscape contractors, thirteen percent were made to homeowners, nine percent were made to brokers/wholesalers and eight percent were made to landscape designers. Retail garden centers, golf courses, and sports/athletic fields each consumed about 4 percent of the sod sold. Others (listed as Florida's Department of Transportation, building contractors, used by self, sold to individuals or sold on site and information unavailable) purchased eleven percent of sod harvested.

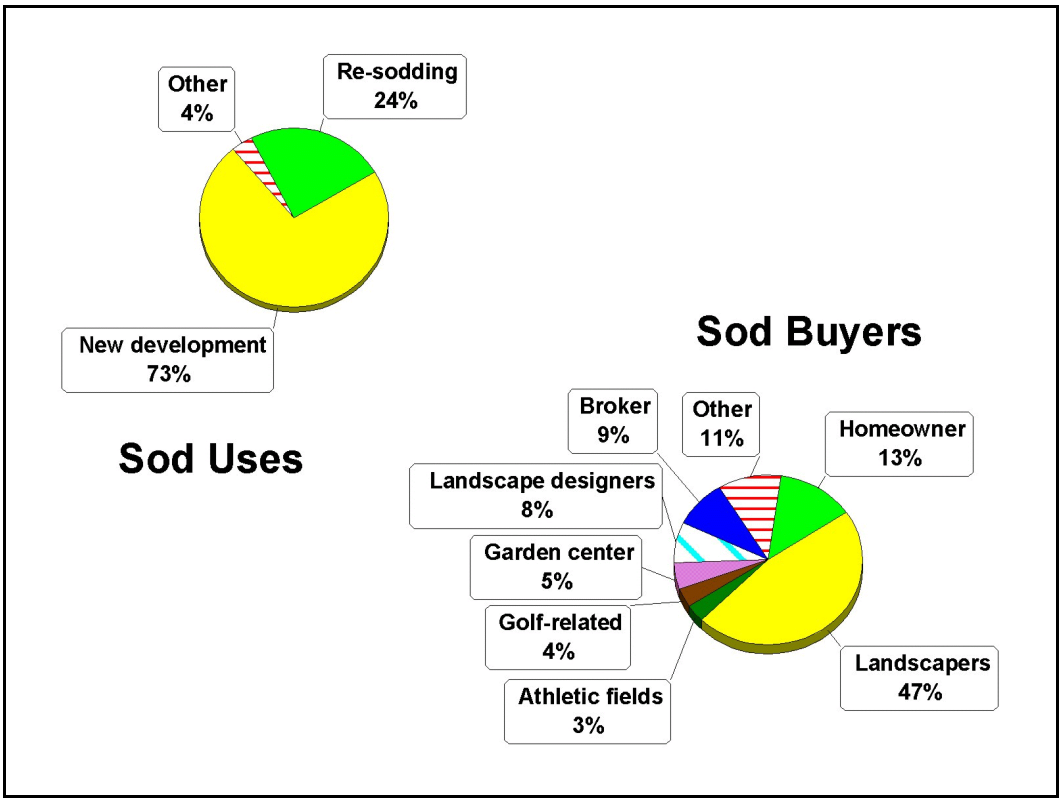

Figure 4. Depiction of how Florida sod was utilized (left) and to whom sod producers sold their product (right) in 2003.

On the supply side of the equation, yield, costs and profitability are the critical variables. Grass varieties differ in yields, but yield effects on profitability can be offset by other factors. The sod production period is from harvest-to-harvest. A fast-growing grass such as bermudagrass has high variable costs due to the extensive use of inputs (fertilizer, pesticides, mowing, etc.) over a short time frame. At least two harvests of common bermudagrass are achievable within a year, as opposed to one for St. Augustinegrass. The interval of sod production also affects fixed costs (e.g., land, buildings, and overhead or administrative costs). Generally speaking, shorter production periods imply higher inventory turnover, implying further that fixed costs on a unit basis (square feet or yards) will be reduced. Exceptional species such as zoysiagrass, which often requires more intensive management because of greater susceptibility to pest and diseases, in the long term will generally be more expensive to produce. Hence, price is only one aspect regarding the economic feasibility of sod production.

Relative to demand, an under-supply of sod would generally imply higher prices while an over-supply would suggest lower prices. Although this research did not explicitly attempt to determine the relationship between supply and demand for Florida sod in 2003, estimates can be obtained by making several assumptions. (The accuracy of the estimate hinges on the reasonableness of the assumptions. Readers can assess for themselves whether or not the assumptions below appear sound; they should also be aware that these are only “estimates” and so are potentially subject to error.)

Recall in the introduction that the U.S. Census Bureau determined that there were 213.5 thousand single and multi-family housing starts in 2003. From this, it was estimated that 46,302

acres of sod would be needed to serve this market. An additional 20 percent of sod from other market outlets, such as golf courses, commercial and non-profit institutions, and the re-sodding market for existing homes, brought total annual demand in 2003 to 55,562 acres statewide. The more that demand exceeds supply, the higher the potential price and the more incentive producers have to maximize their turnover rates. In periods of high supply and low demand, the opposite situation would occur. In 2003, the demand for sod was estimated at 52,923 acres, while supply was estimated to be 53,773 acres (Haydu, et. al., 2002). Consequently, supply and demand were fairly evenly matched. In such cases, economic theory would suggest that an "equilibrium point" has been reached, meaning supply and demand are in balance.

Using harvested acres as a close approximation of supply, 62,836 acres of sod was sold in 2003. In other words, supply exceeded demand by roughly 10,000 acres, or nearly 20 percent. This helps explain why prices declined for nearly all varieties since 2000. Specifically, during the past three years, St. Augustinegrass fell from 15¢/ft^2 in 2000 to 12¢/ft^2, zoysiagrass from 25¢ to 20¢, centipedegrass from 16¢ to 10¢, and bahiagrass from 6¢ to 4¢. Bermudagrass fared the best, but still declined from 11¢ in 2000 to 10¢ in 2003.

Interestingly, when respondents were asked to comment on future production levels, over half (61%) of all growers expect to continue with their current levels of production, 35 percent indicated that they would increase sod acreage, and the remaining 4 percent said they would reduce their acreage. The intention of nearly one-third of sod producers to increase output indicates they remain optimistic about future demand.

Costs of Growing and Selling Sod. A newly included section of the survey in 2000, which was repeated in the 2003 survey, attempted to better understand costs of being in the sod business, without asking producers to spend extensive time reviewing financial records. In order to do so, respondents were asked to estimate the percentage of total costs per acre that are attributable to various growing- and marketing-related activities (Figure 5). Principal costs associated with these activities include materials, labor and equipment. Growing activities accounted for two-thirds (66 percent) of total costs and included land preparation (12 percent), fumigation (3 percent), planting (11 percent) and production (40 percent). Production activities are the largest share because they represent on-going work that begins after planting and continues until harvest, a period of 6–12 months, depending on the grass variety. Principal tasks would consist of fertilization, pest and weed control, mowing (Figure 6) and irrigation.

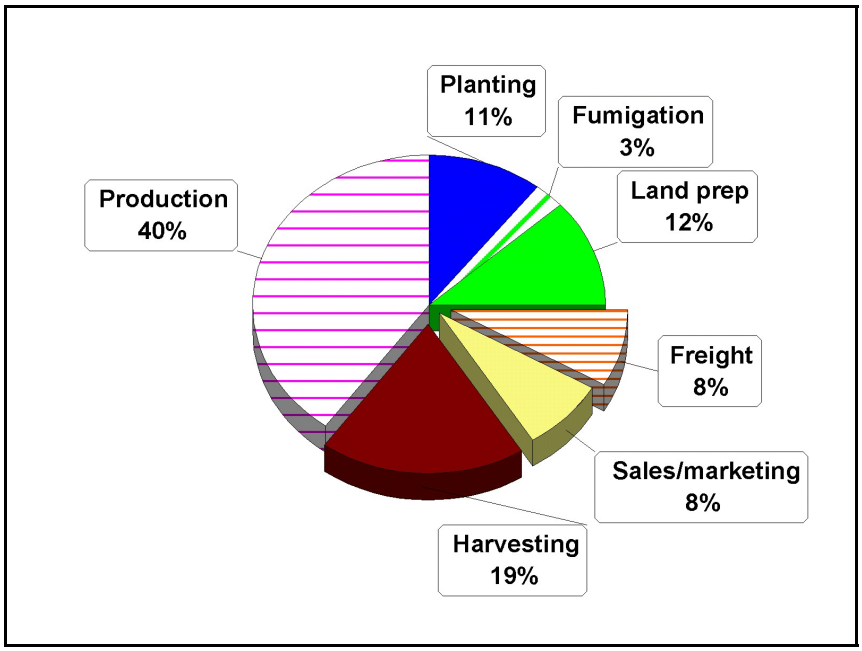

Figure 5. Percentage of 2003 total costs attributable to specific sod growing and selling activities (initial site preparation such as stump removal, ditch construction, pump installation, etc. are not included).

As defined in this report, marketing activities accounted for the remaining 34 percent and include harvesting, sales/marketing, and freight. At nearly one-fifth (19 percent) of total expenses, harvesting comprised over one-half of the "after-growth" costs. Harvesting involves the use of expensive equipment (Figure 7) and considerable labor and does not occur until the sale has been made. Sales and marketing also included collections of accounts receivables and averaged 8 percent of total costs; freight constituted the remaining 8 percent.

Finally, producers were asked how they determine the price they charge for their product (Figure 8). They were given 3 considerations plus an open-ended "other" category and asked to rank each selection in order of importance. A first-choice ranking was given four points, second- place ranking received three points, third place was two points and fourth choice was scored as one point; then total number of points for each choice by all respondents was added to determine the 'weight' assigned to that choice. Interestingly, the majority of producers (51%) indicated the "selling price of other producers" as the principal pricing method (total weight ranking of 173). "Quality of my sod" was classified first by only 19 percent of growers, but 36 percent considered

Figure 6. Sod mower with a 36-foot swath.

Figure 7. Cutting rolls for landscape use with a sod harvester.

it second when adjusting price. This placed it second in overall ranking (weighted at 136) when determining the price to charge for sod. "Cost of production" was ranked first by 29 percent of producers (weighted at 134), and the "current market situation/demand" was written in as the most important pricing consideration by 9 percent of the respondents. Second, third and fourth round rankings are also shown in the stacked bar. Given these results, it is apparent that sod producers use several inter-related methods to arrive at prices for their products.

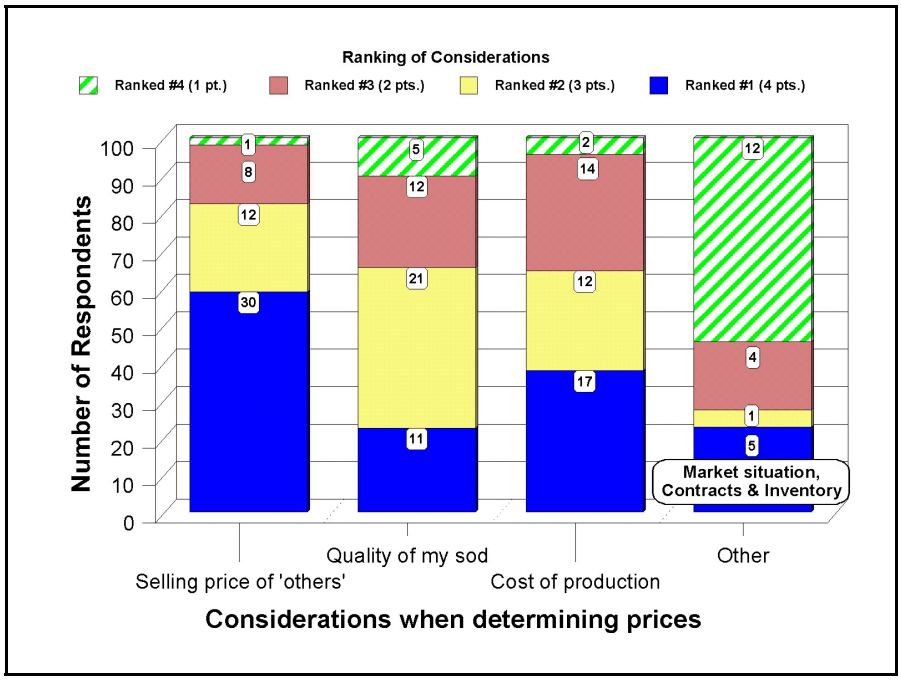

Figure 8. Considerations made by Florida sod producers in 2003 when determining the selling price of sod.

Components of Farm Income

In 2000, seventy-four percent of sod producers replied that their income was generated by sod sales, compared to seventy-three percent in 2003. Forty-six percent claimed sod as their sole source of income compared to 47 percent in 2000. Roughly one-fourth of earned income was from related or alternative agricultural business activities (Figure 9). Food production (cattle, citrus, dairy and vegetables) was the most important (13%) income alternative, remaining nearly the same as in 2000 (14 %). Sod-related services accounted for twelve percent of income, a rise from 9 percent in 2000. These activities included shipping (2.5%), landscape contract services (5%), and miscellaneous services such as installation (3%). Ornamental plant production, which fell from three percent in 1996 to one percent of income in 2000, continued to decline to just under one percent in 2003. An "others" category that included land leasing, sugar production and sales of silage feed, pine straw, etc. increased slightly to just over 2 percent.

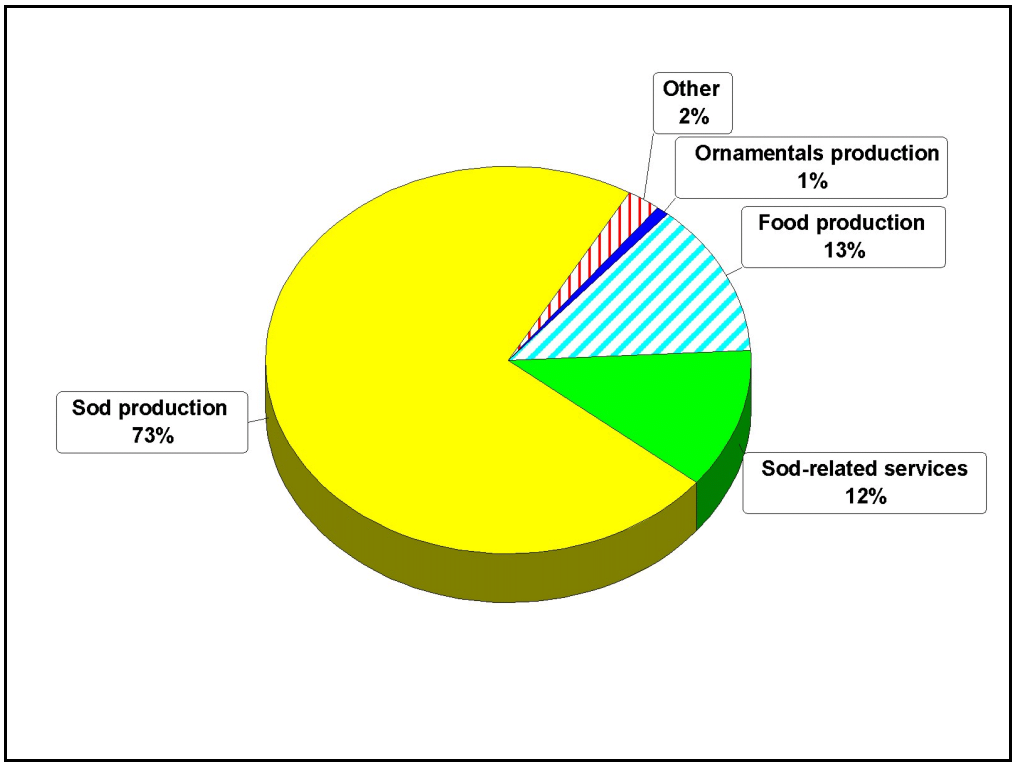

Figure 9. Partitioning of farm income by Florida sod producers in 2003. (Data not weighted by farm size.)

Marketing — Harvesting and Brokering

Just-in-time harvesting of Florida's sod usually coincides with warmer seasonal months, which also facilitates reestablishment in the landscape. Still, compared to more northern states, the harvesting pattern for Florida sod is rather uniform throughout the year. Thirty-one percent of the harvest occurs during the March to May period, 25 percent takes place from June to August, 24 percent is harvested September through November and from December to February,

Florida's drier winter season, 20 percent is harvested (Figure 10). This pattern is consistent with swings in the building construction industry, which experiences peak activity during the spring-through-summer interval. As noted earlier, the bulk of sod is used for landscaping new developments, including residential homes, business offices and government facilities.

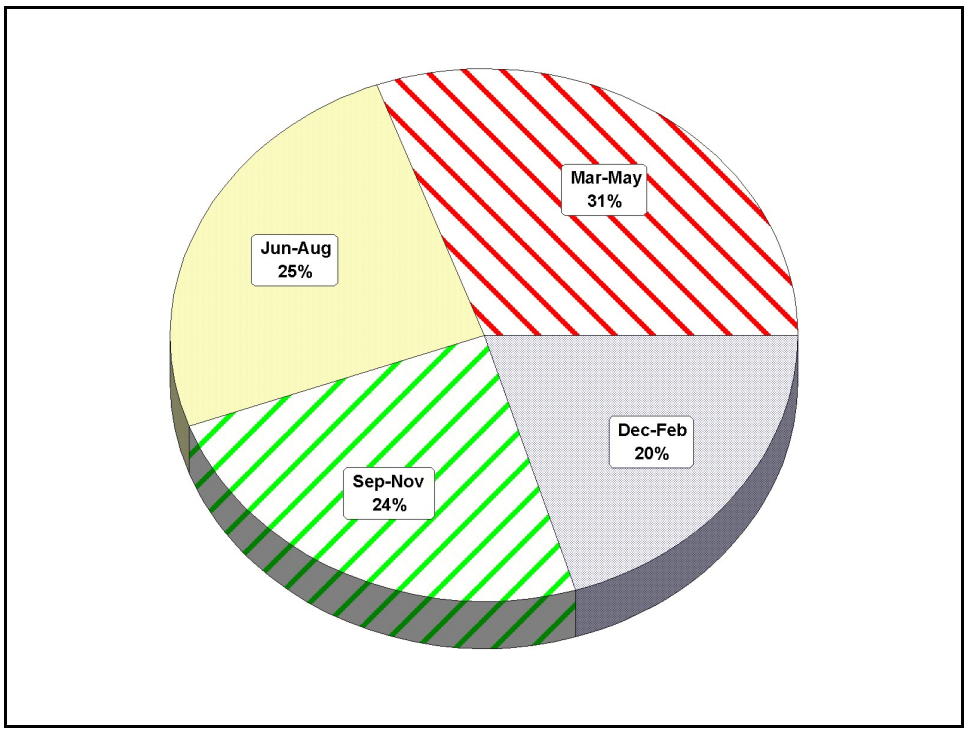

Figure 10. Seasonal harvesting pattern of Florida sod in 2003.

Most Florida sod producers (83%) choose to harvest their own sod rather than contracting to outside firms. Although this percentage grew slightly from 80 percent in 2000, it is still below the 89 percent reported in 1996. Nearly all sod (89%) is strip cut, an increase of five percent from 2000, while the remainder (generally bahiagrass and bermudagrass) is clear cut. With strip-cut sod, harvesting machines remove sections that are roughly 16-inches wide, ideally leaving only a two-inch ribbon of grass between them for reestablishment from stolons. Efficient producers try to remove only ¼ to ½ inch of root zone when cutting sod because thinner pieces are easier to handle, less expensive to transport, and tend to knit-in (produce a thatch) quicker than thicker cut sod (McCarty and Cisar, 1989). Removing only the amount of roots needed for survival of the sod also leaves fields in better shape by reducing topsoil loss. Bermudagrass producers often clear-cut a field because it reestablishes from rhizomes as well as from stolons.

To generate additional income or satisfy demand when their own production is inadequate, some producer's broker sod. Traditionally brokers do not purchase the inventory, nor do they get involved in financing or assume risk. The chief function of a broker is simply to bring buyers and sellers together and to assist in negotiation. One-quarter (26%) of all producers indicated they brokered some sod. The average quantity brokered in 2003 was 2.8 million square feet, down nearly one-third from the average brokered in 2000, with a value of $340 thousand.

Marketing — Shipping

Sixty-nine percent of harvested sod was machine-stacked as opposed to hand-stacked. However, some of the larger producers prefer to use large teams of manual labor for stacking sod. Their reasoning is that, for large-scale operations, current farm equipment is not cost-effective — large labor teams can stack and move sod more quickly than most automatic harvesters (Cisar and Haydu, 1991). In addition, labor often offers more working flexibility. Since many workers are seasonal, the farm does not incur so high an annualized cost of production as it does with automatic harvesters. Purchased machinery becomes part of a firm's fixed costs; thus, even when the equipment is not in use, the owner is still paying for it. On the other hand, growers can employ seasonal labor, as a variable cost of production, only when needed.

Once sod is cut and stacked, ninety-eight percent of it is shipped to its destination within two days. This is due to the highly perishable nature of cut-sod. Sod's vulnerability may also explain the relatively high incidence of truck ownership — sixty percent of respondents indicated that they own their own transportation equipment. Regardless of the fact that so many producers own shipping equipment, half of those responding indicated that, at least some of the time, obtaining trucks for sod delivery when they were needed was a problem. Scheduling difficulties would likely arise during the peak selling months of spring and summer when transport demand is high for other agricultural products as well.

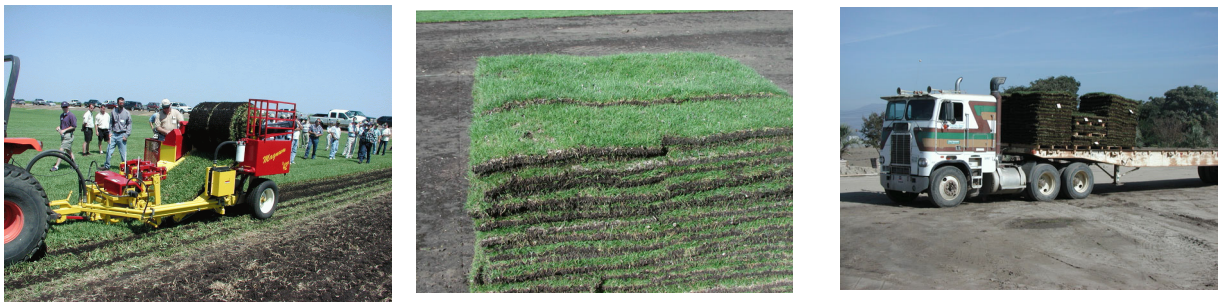

Figure 11. Sod being harvested during a field day event. Sod pieces, consisting of 500 square feet, stacked on a pallet. A truck loaded with sod ready for shipping. (Left to right)

Distance to markets is a critical factor for producers to consider. Sod is a heavy, bulky item that requires prompt attention. These factors greatly impact the potential risk to both buyer and seller. The more distant the markets, the more expensive sod is to ship and the greater the potential for post-harvest losses. Consequently, producers located close to key markets have a clear strategic advantage over producers located farther away. Survey respondents reported that 59 percent of their markets are within 50 miles and another 29 percent of the markets are between 50 and 100 miles away. In other words, most growers were positioned only a few hours from the majority of their markets. Seventy-five percent of the growers also reported that their markets were staying approximately the same distance away from them. Half of the remaining growers' markets were moving closer and the other half were moving farther away. Figure 12 depicts sod sales in Florida and clearly reflects the development 'hot spots' in the state. The

figure also highlights the in-state nature of the sod market in Florida since only 3 percent of sales were reported as being shipped out of Florida.

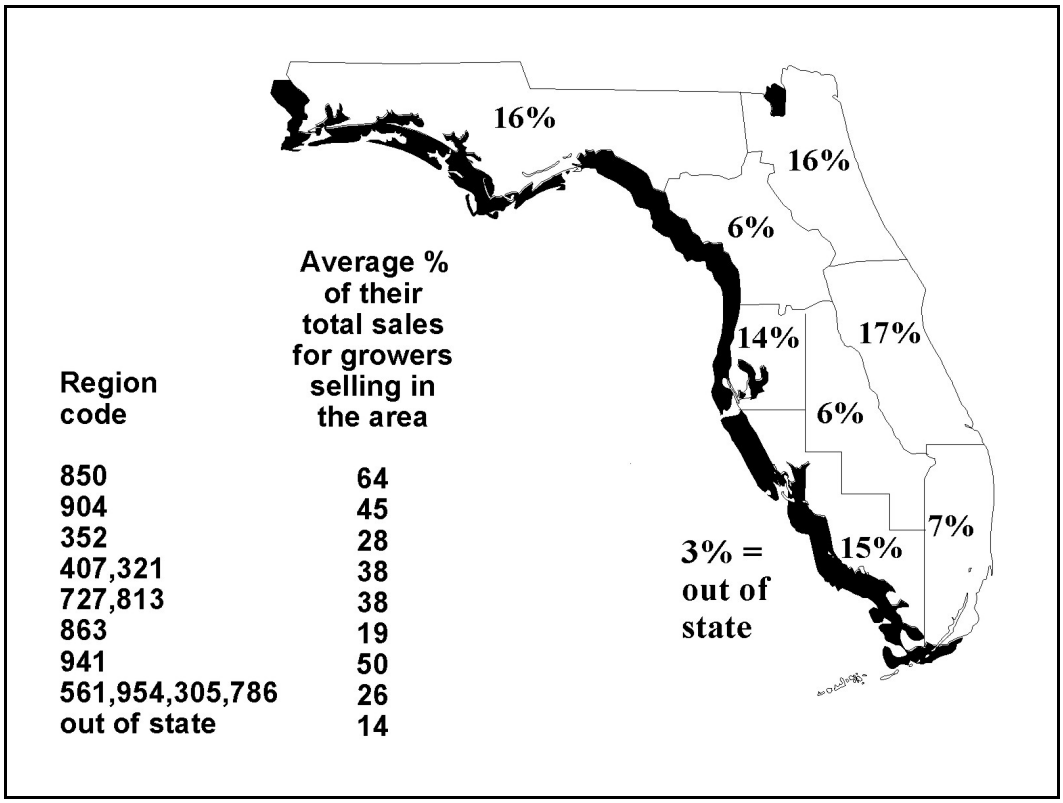

Figure 12. Distribution of 2003 sod sales throughout Florida and the average percent of their total sales that occur in that region for all growers who sell sod in that region.

In 1996, most growers (78%) were optimistic about future conditions and believed that the market for sod in their area would continue to expand. Indeed, in 2000 fifty-two percent of growers responded that there had been an increased market for sod in their area since 1996 and 44 percent anticipated that the market in their area would continue to increase. In 2003, fifty-four percent of growers again responded that there had been an increase in sod demand in their area and were optimistic that the market would continue to increase. Thirty-four percent of growers in 2003 expressed that the market had stayed the same in their area since 2000 and forty-one percent felt that it would continue to remain about the same. Although twelve percent felt there had been a decline in the sod market in their area in the last three years (missing the expectations from the 2000 survey when twenty-six percent believed that the market would decline), only 5 percent expected the market to decrease in their area in the next three years.

Sod Quality

Although turfgrass quality is difficult to measure, Beard (1973) states that characteristics of high quality turfgrass have been established over the years. The six basic components of turfgrass quality he identifies are: uniformity, density, texture, growth habit, smoothness and

color. Beard notes that the relative importance of these features will vary according to the purpose for which the turf is to be used.

In a more general sense, turfgrass quality can be affected at any one (or all) of five major stages: turfgrass breeding, which determines the inherent physical characteristics of the variety; production and cultural practices employed by the grower; harvesting and stacking; shipping and unloading; and after the buyer receives it. In this study, we were interested in factors other than physical properties. In particular, from the producer's perspective, was quality compromised at some point on the farm or after the product was sold and delivered? Moreover, if damage did occur prior to receipt by the buyer, at what stage(s) did it take place (during production, during harvesting and stacking, or during shipping and unloading)?

Although no aspect of the sod production/sales cycle is without potential quality-reducing damage, in 2003 growers believed that fifty-one percent of the damage occurred to sod after the buyer received it, leaving an opportunity for the growers/shippers to improve sod quality for about half the damaged product. Growers responded that one-fifth of the damage (19%) occurred in the field, declining back to the in-field damage reported in 1996. This decrease in in-the-field damage may reflect less severe weather conditions than were experienced in much of Florida in 2000. Damage occurring previous to the buyers' receiving it through harvesting and stacking (15%) remained approximately the same as in 2000 and shipping and unloading damage returned to the same as in 1996 (12%) after an increase in 2000 to 16 percent. These results indicate that both producers and consumers are responsible for reducing turf quality. But more importantly, it suggests that because growers, by their own admission, cause nearly half of all damage to the turfgrass they sell, significant room for improvement still exists. Astute growers can distinguish themselves in a competitive market by addressing some of these quality-compromising issues.

Employment, Mechanization and Farm Expenses

As farms become larger in response to increasing pressures to reduce production costs, agriculture continues to shift towards greater mechanization. This is due to the fact that labor in agriculture normally accounts for a significant share of total cash expenses. This share can vary from 15 to 30 percent, depending on the size of firm and type of commodity being produced (USDA/ERS, 1997). Mechanical devices in agriculture are generally designed for specific functions and for specific crops. For example, wheat harvesters cannot be used for corn and tomato harvesters cannot be used for cotton. Additionally, this specialized equipment is also very expensive. To reduce capital costs per unit of output, large-scale farms emphasize mono-cultural production systems that can efficiently use this specialized equipment.

Labor tends to be much more versatile than machinery and is used for more complex tasks. Hence, labor use per acre will be significantly less for a large wheat farm than for a smaller farm producing small quantities of diversified products. Since sod is a monocultural crop, one would anticipate that there would be a significant substitution of capital for labor in its production. Interestingly, this is not the case. Results of this study indicate that labor remains a critical resource in Florida's sod production industry. When asked whether labor use had changed in the past four years, 25 percent reported that the number of people they employ had increased, while the number of employees had remained the same for 63 percent of respondents, and 12 percent said that labor use had decreased (Table 7).

Unlike fruit and vegetable producers who employ large numbers of seasonal workers, sod farms have year-round production and maintenance activities and rely on permanent labor. Reporting farms employed 1,108 permanent workers, averaging 20 full-time employees per farm. Sixty-five part-time workers were employed by 34 percent of reporting firms, an average of 3.42 part-timers for each firm with part-time help. However, twelve firms, down from seventeen in 2000, reported the use of seasonal labor. This seasonal labor totaled 124 people, less than half the number reported in the last study in 2000. In terms of farm size, the average use of permanent labor ranged from a low of 9.0 persons for small farms to a high of 62 employees for the very largest farms. The respondents from the large-sized farms were the only group to indicate they did not employ any part-time or seasonal help in 2003.

Table 7. Full-time, part-time and seasonal employment figures for various-sized sod farms in 2003 and changes in employment numbers compared to three years ago.

	Average number of workers employed			Percent change in number of employees from 3 years ago		
Farm size	Full-time	Part-time	Seasonal	Increase	No change	Decrease
Small	8.7	1.5	3.3	26%	65%	10%
Medium	24.1	1.1	1.0	25%	56%	19%
Large	26.7	0.0	0.0	0%	100%	0%
Very Large	62.0	0.3	0.8	29%	57%	14%
Average	19.8	1.2	2.2	25%	63%	12%

To obtain a more complete picture of the substitution of capital for labor, a question was asked whether the level of mechanization had changed over the past three years. Just over one-third of all surveyed firms indicated their farms were more mechanized now, while the remaining two-thirds stated that the level of mechanization had not changed (Table 8). Three years ago the large-sized farms reported the smallest increase in mechanization and this time 67 percent of them reported the use of more mechanization. As in 2000, no respondent reported a decrease in mechanization in 2003.

Changes in operating expenses were also examined (Table 9). Nearly all producers (82%) affirmed that costs had grown over the past three years with an average increase of 15 percent or about 5 percent annually, nearly the same as in 2000. In 1996, 90 percent of growers said that costs had increased; the average increase at that time was also 21 percent for a five-year period, or a little more than 4 percent annually. In 2003, all but the very largest farms experienced nearly the same average percent of cost increase — about 16 percent or just above 5 percent annually. The smallest change in 2003 occurred with the very largest farms, which reported an 11 percent rise in the past three years. Nine percent of all farms reported a cost decrease with the average amount being 12 percent over three years.

Table 8. Changes in mechanization on various-sized sod farms in 2003 compared to three years earlier.

	Average change in mechanization since 2000		
Farm size	Increased	No change	Decreased
Small	32%	68%	0%
Medium	38%	62%	0%
Large	67%	33%	0%
Very Large	29%	72%	0%
Average	35%	65%	0%

Table 9. Changes in operating expenses of various-sized sod farms in 2003 compared to three years earlier.

	Operating expense change from 3 yrs. ago				
Farm size	Percent of growers with cost increase	Average amount of cost increase	Percent of growers with no cost change	Percent of growers with cost decrease	Average amount of cost decrease
Small	84%	16%	6%	10%	9%
Medium	81%	15%	12%	6%	5%
Large	67%	16%	33%	0%	n.a.
Very Large	86%	11%	0%	14%	25%.
Average	82%	15%	9%	9%	12%

Firm and Industry Problems

In this last section of the survey, producers were asked to identify the three most serious problems they face from an individual business standpoint, as well as the three most challenging problems from an industry standpoint. Results were then grouped into categories that were representative of the types of answers. Five broad areas affecting individual businesses were identified as financial, production-related, regulatory/environmental, personnel, and marketing (Figure 13). Each respondent's most important problem counted as 3 points, second most

important problem was weighted as 2 points and the third most important problem was given 1 point. Points scored for each problem were then summed to give weighted ranking. Of the five broad classifications, the most prominent (a weight of 89) related to financial concerns such as fuel and insurance costs, excessive labor costs, prohibitive equipment costs, fly-by-night competition and taxes. This was also the primary concern regarding individual businesses of growers three and seven years ago. Marketing or economic concerns, taking a clear second place in 2003 when three years ago it nearly tied for second place after being fifth-ranked in 1996, continued to worry producers. Some marketing or economic problems listed were availability of product, distribution/delivery problems, answering questions and educating the public and government, and reliable service such as on-time delivery and loading of delivery trucks when they arrive. With a weight of 55, personnel-related issues were ranked third. These involved problems like deficient production skills of workers and their inability to hire enough employees with a legal status. Production considerations were second in 2000 but, with a weight of 49, dropped to fourth in 2003. Typical production issues were weeds, mole crickets and insects, weather and maintenance of sod in the field. Regulatory or environmental type concerns, as in 2000, ranked last with a weight of 42. This is a far cry from its "tied-for-second" position in 1996. Whether this is from resignation or enlightenment, it may indicate a capacity to work within the system. Regulatory issues included the loss of methyl bromide, water restrictions at the receiving end and dealing with government agencies.

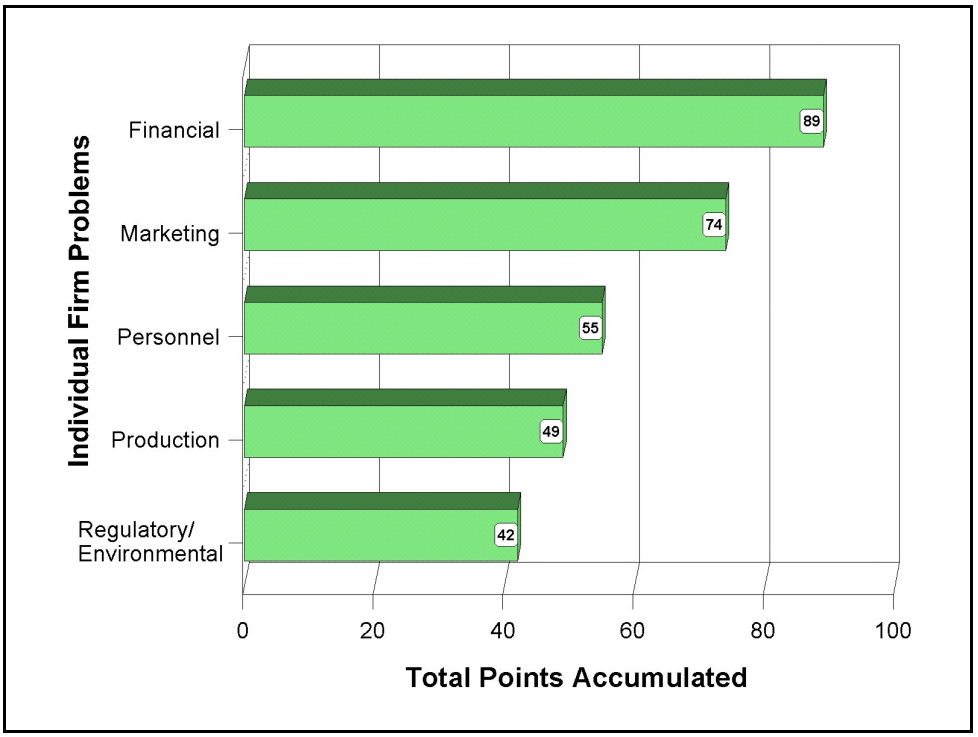

Figure 13. Weighted responses of survey participants when asked about the three most important problems faced by the respondent's business.

The five categories identified for firms are the same as the industry because of the inter-related nature of the issues; however, their rankings differ from those of individual business

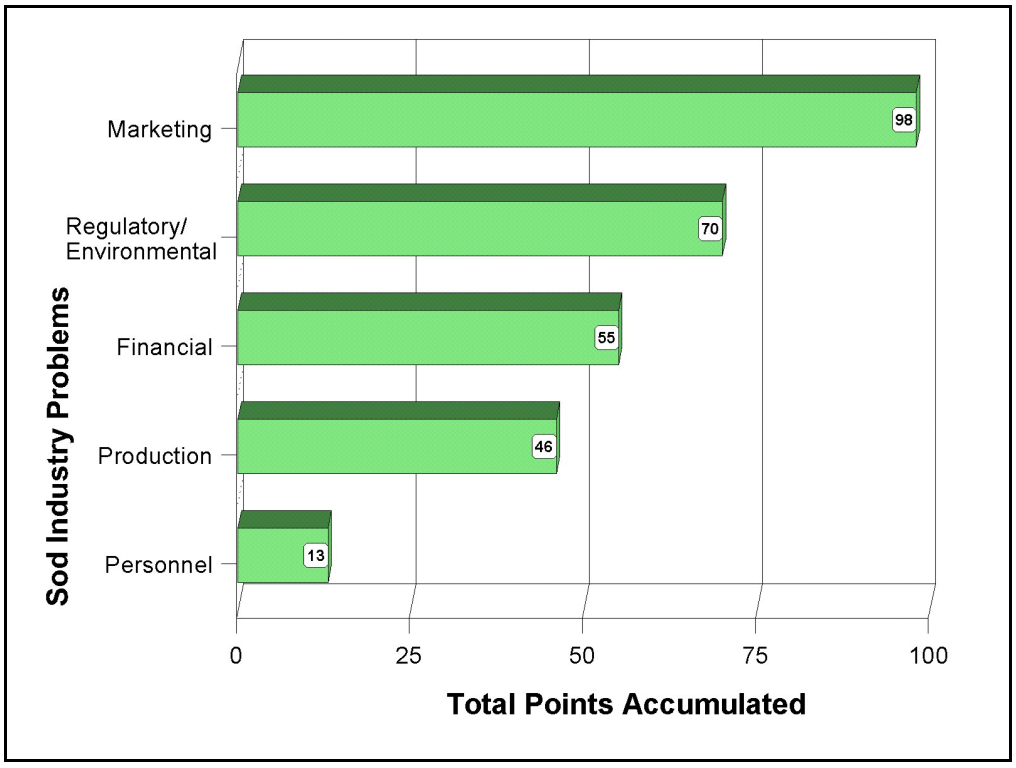

Figure 14. Weighted responses of survey participants when asked about the three most important problems facing the sod industry.

concerns (Figure 14). There were significant changes in rankings in 2003 compared to 2000 and 1996. Whereas production issues have ranked first in previous years, they ranked fourth this year with a weighted rank of 46. Surprisingly, marketing concerns drove its ranking from fourth place in 2000 to a commanding first-place ranking in 2003 with a weight of 98. Issues expressed about marketing included overproduction, price undercutting, lack of advertising and competition. Regulatory/environmental issues, maintaining a strong second place with a weight of 70, were combined this year into one category because of their inter-related nature according to the comments from survey respondents. Wording such as "restricting sod usage because of water shortage" was used by several growers. Financial problems continue to plague sod producers, but perhaps no more so than any other industry. Finally, personnel concerns continued its fifth place finish again in 2003.

A few industry-related issues not expressed from the firm perspective included the taxing of the aquifer, the quality of sod, and the need for a drought-resistant grass from a production standpoint. Regulatory concerns included water issues, and financial concerns included vagabond buyers running up credit. Marketing concerns at the industry level included the strength of the economy while personnel issues at the industry level included labor availability.

SUMMARY

Roughly 125 producers comprised Florida's sod production industry in 2003, producing an estimated 93,000 acres of sod and harvesting nearly 63,000 acres. Of the total quantity of sod produced, 73 percent was grown on sand-based soils while 23 percent was produced on muck soils, particularly around Lake Okeechobee. St. Augustinegrass accounted for 64 percent of total

production, followed by bahiagrass (24 percent), bermudagrass (6 percent), centipedegrass (5 percent) and a nearly insignificant amount of zoysiagrass (1 percent). In terms of St. Augustinegrass, Floratam dominated all grass varieties.

Although sod utilizes numerous market outlets, most (73 percent) was sold to the new housing market, 24 percent was targeted for re-establishing existing home lawns, and the remaining went for "other uses". To handle all the various tasks related to the production and selling of sod, the industry uses substantial labor. The average farm employed nearly 20 full-time, one part-time and two seasonal workers. This number represented an employment increase for 25 percent of the farms compared to three years ago and "no change" for 63 percent of the farms.

Florida sod producers harvested and sold most of the grass grown, varying from a low of 24 percent for bahiagrass to a high of 84 percent for St. Augustinegrass. Sod prices, lower than those of 2000, ranged from nearly 4 cents per square foot for bahiagrass to 20 cents for zoysiagrass. St. Augustinegrass held the middle ground at 12 cents per square foot. Using these prices in conjunction with harvest figures, the study estimated the farm gate value of sod at $307 million in 2003, the same value as in 2000. Sod production maintains its place as a major agricultural commodity in Florida.

Finally, producers identified several problems that affected business performance. The most significant problems for individual businesses were financial-related issues such as fuel and insurance costs, dishonest businesses and excessive labor costs. An ability to acquire adequate "legalized" labor was also cited as a difficulty. Problems facing the industry as a whole were perceived to be marketing-related (overproduction, lack of advertising, lack of consumer education) and regulatory-related (mainly water issues).

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APPENDIX

The following pages are the survey instrument.

Dear Florida Sod Producer**:

Good day to you!

This survey is part of our efforts to provide economic trend information that will be useful to the Florida sod industry. Previous surveys — conducted in 1987, 1992, 1997 and 2001 — not only gave us valuable information for those years but, when put together, showed us how the industry has changed over time. This year's survey continues this effort by extending economic information for 2003.

In this survey, general questions are asked about your Florida sod production operation. Please limit your responses to Florida only, even if you have operations out-of-state. Although questions are non-sensitive in nature, all individual responses will be kept strictly confidential.

Each participant will receive a copy of the report resulting from this survey as soon as it is published. As a sod producer, this analysis should provide you with information that will help you in your efforts to operate in the competitive market that you face.

Thank you for your time and cooperation. We appreciate it and look forward to receiving your completed survey in the near future.

**If we have your name on our list by mistake, please tell us so in the comments area (inside back cover) and mail this back to us and we'll remove your name from our survey mailing list. Thanks, we appreciate your assistance.

UNIVERSITY OF FLORIDA
IFAS

_____

Sod Growers' Production and Marketing Survey – 2004

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Mid-Florida and Ft. Lauderdale Research and Education Centers

Please circle the letter or fill in the blanks as appropriate for each item. When completed, use tape to seal the booklet, and drop it in the mail (postage is provided). Thank you for your time and comments.

Florida Production

1. How many acres of sod did you have in production in 2003?

   _____ **acres produced**

   Compared to your production 3 years ago (2000), has your production acreage …

   a) Increased b) Stayed the same c) Decreased

   If changed, by how much? _____ %

2. How many acres of sod did you harvest in Florida in 2003?

   _____ **acres harvested**

   Compared to 3 years ago (2000), has the amount of sod that you harvested …

   a) Increased b) Stayed the same c) Decreased

   If changed, by how much? _____ %

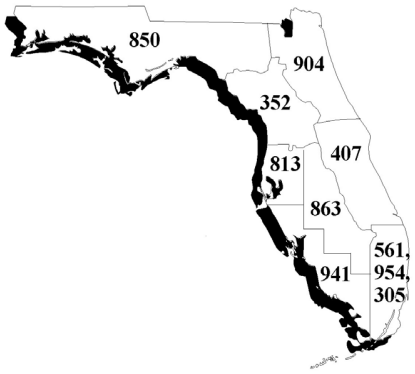
3. Please list major grasses grown as a percent of total production and average selling price (farm gate price) of each.

Grass	Percent	Avg. sales price (price/ft^2)
Bahia	_____ %	_____
Bermuda	_____ %	_____
Centipede	_____ %	_____
St. Augustine	_____ %	_____
Zoysia	_____ %	_____
other	_____ %	_____
	100%	

4. What percent of the St. Augustinegrass you grow is each of the following types?

St. Augustinegrass Type	Percent
Bitterblue	_____ %
Common	_____ %
Delmar	_____ %
Floralawn	_____ %
Floratam	_____ %
FX-10	_____ %
Palmetto	_____ %
Raleigh	_____ %
other	_____ %
St. Augustinegrass total	100%

5. Please indicate what percent of your total Florida sod farm acreage is located in each map area.



Map area	Percent of total acreage	
850	_____	%
904	_____	%
352	_____	%
407,321	_____	%
727,813	_____	%
863	_____	%
941	_____	%
561, 954, 305	_____	%
Total acreage of sod farms	100%	

6. As a percent of the total (100%), on which type of soil is your sod produced?

a) Muck _____ % b) Mineral (sand) _____ %

c) Clay _____ % d) Other _____ %

7. How many people work for you in each of the following capacities?

a) Full time _____ b) Part time _____

c) Seasonal _____

Compared to 3 years ago, has the number of people you employ …

a) Increased b) Remained the same c) Decreased

If changed, by what percent? _____

8. In general, is your farm becoming more mechanized?

a) Yes, more mechanized

b) Staying the same

c) No, less mechanized

9. Compared to 3 years ago, have your operating expenses/acre …

a) Increased b) Stayed the same c) Decreased

If your operating expenses have changed, by what percent did they change? _____ %

10. Please indicate the percentage of your business' total costs per acre attributable to each of the following activities (do not include initial site preparation, e.g. stump removal, ditch construction, pump installation, etc.):

Activity	Percent of Total Costs
Land preparation (weed control, disking, etc.)	_____ %
Fumigation	_____ %
Planting (sod + labor + equipment)	_____ %
Production (fert., pesticides, labor, etc.)	_____ %
Harvesting	_____ %
Sales, marketing, collections (include appropriate portion of salaries of employees responsible for these activities)	_____ %
Freight	_____ %
	100%

11. Do you plan to change the number of acres that you have in sod production in the next 3 years?

a) Yes, increase acreage by _____ %

b) No, stay the same

c) Yes, decrease acreage by _____ %

12. Did you broker (purchase for resale) any sod from Florida in 2000? a) Yes b) No

If yes, how much? _____ ft^2 purchased

_____ $ value purchased

13. Please indicate the percentage of your business' total annual sales generated by the following categories:

	Enterprise	Percent of Total Sales
a)	Sod production	_____ %
b)	Sod-related services	
	Distributor (shipping)	_____ %
	Farm supplies (equip., fert., pesticides)	_____ %
	Landscape contract services	_____ %
	Landscape maintenance services	_____ %
	Other (please specify)	
	_____	_____ %
c)	Food production . . . . . (Cattle, citrus, dairy, vegetables, etc.)	_____ %
d)	Ornamentals production . . . . . (Bedding plants, foliage, woodys, etc.)	_____ %
e)	Other (please specify)	
	_____	_____ %
		100%

Marketing/Harvesting Questions

14. What percentage of your total Florida harvest occurs in each of the following time periods? (Total = 100%)

    Mar–May _____ % Jun–Aug _____ %

    Sep–Nov _____ % Dec–Feb _____ %

15. What percent of your total sod harvested is done by each of the following methods? (Total = 100%)

    a) Clear cut _____ % b) Strip cut _____ %

Harvesting Efficiency:

16. For each acre (43,560 ft^2) of the following sod types that you harvest, roughly how many square feet are sold? [Feel free to use the **percent/acre** if you wish.]

    St. Augustine _____ ft^2 or %

    Bermuda _____ ft^2 or %

    Centipede _____ ft^2 or %

17. What percent of your harvested sod is stacked for shipment by each of these methods? (Total = 100%)

    a) Machine stacked _____ %

    b) Hand stacked _____ %

18. What percent of your sod is harvested by each of the following? (Total = 100%)

    a) Harvest own _____ %

    b) Contract harvest _____ %

Marketing/Shipping Questions

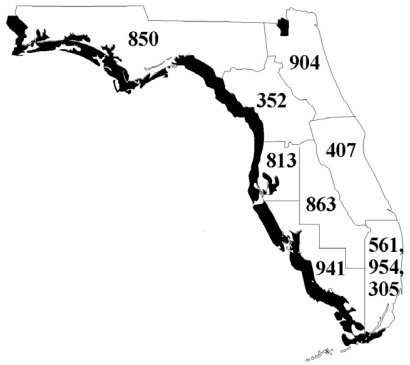
19. After cutting and stacking, how many days before sod is shipped to its destination? (Please indicate percentage of total shipments in each category. Total = 100%)

    a) 1–2 days _____ %

    b) 3–4 days _____ %

    c) More than 4 days _____ %

20. Indicate what percent of your total sales from production in Florida are shipped to each area designated on the following map.



Map area	Percent of total sales	
850	_____	%
904	_____	%
352	_____	%
407,321	_____	%
727,813	_____	%
863	_____	%
941	_____	%
561,954,305,786 .	_____	%
Outside Florida . .	_____	%
	100%	

21. What percent of your total market is located in each of the following distances from you? (Total = 100%)

a) Within 50 miles _____ %

b) 50 to 100 miles _____ %

c) Over 100 miles _____ %

22. In general, how are your market locations changing?

a) Moving closer b) Staying the same c) Moving away

23. Who uses your sod?

	Percent	
New developments (e.g. commercial, housing)	_____	%
Re-sodding existing developments	_____	%
Other	_____	%
	100%	

24. To whom do you sell your sod? Please specify percentages.

	Percent of total
Retail garden center or chain	_____ %
Landscape contractor	_____ %
Broker/Wholesaler	_____ %
Homeowner	_____ %
Golf	_____ %
Other (specify on the line below)	_____ %
_____	100%

25. Compared to 3 years ago (2000) , has the market for turfgrass in your area …

a) Increased b) Stayed the same c) Decreased

If changed, by how much? _____ %

In the next 3 years, do you anticipate that the market in your area will …

a) Increase b) Stay the same c) Decrease

26. Do you own your own truck(s) for shipping sod?

a) Yes b) No

If no, or if yes and you also hire other trucks, is it difficult to obtain a truck when you need it?

a) Yes b) Sometimes c) No

Quality/Price Questions

27. What percent of quality-reducing damage occurs to sod at each of the following locations?

In the field	_____ %
Harvesting/stacking	_____ %
Shipping/unloading	_____ %
After buyer receives it	_____ %
	100%

28. How do you determine what price to charge for your sod? Please rank these items from 1 to 4. (1 = used most often, 2 = used second most often, etc.)

Cost of production	_____
Selling price of "others"	_____
Quality of my sod	_____
Other (please specify below)	_____

_____

Individual Business Problems

29. Please identify, in order of importance, the 3 most difficult problems you face ***as a business***.

1st _____

2nd _____

3rd _____

Industry Problems

30. Identify, in order of importance, the 3 greatest problems facing the ***sod production industry***.

1st _____

2nd _____

3rd _____

Comments: (e.g. What question(s) would you like to have asked for the next survey?)

_____

_____

_____

Thank you for your participation!

(Please tape to seal)

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