

An Economic and Agronomic Profile of Florida's Sod Industry in 1996

J.J. Haydu, L.N. Satterthwaite and J.L. Cisar

Economic Information Report EIR 98-x

Food & Resource Economics Department
Agricultural Experiment Stations and
Cooperative Extension Service

Institute of Food and Agricultural Sciences
University of Florida, Gainesville 32611

August 1998

An Economic and Agronomic Profile of Florida's Sod Industry in 1996

J.J. Haydu, L.N. Satterthwaite and J.L. Cisar

University of Florida, Institute of Food and Agricultural Sciences
Central Florida Research and Education Center-Apopka, Apopka, FL
and Ft. Lauderdale Research and Education Center, Ft. Lauderdale, FL

ABSTRACT

Information is presented on production, employment, marketing, and product quality and price as a result of a survey of the 1996 Florida sod industry. Total sod production in Florida was estimated to be 53,050 acres. Seventy-two percent of Florida sod acreage is St. Augustinegrass, 80% of which is Floratam, with Bitterblue and Floralawn at 8% and 5%, respectively. Bahiagrass comprised 10% of sod in production in 1996 and bermudagrass and centipedegrass were at 8% and 9%, respectively. Over half (62%) of Florida sod production occurs on sandy soils. The majority of sod production is in south Florida. Harvested sod accounted for 72% of the sod in production and all farms, regardless of size, harvested approximately the same amount per acre (69%–75%). The in-field value for all varieties totaled \$271 million, while harvested sod was valued at \$199 million. Sod farms increased both the levels of mechanization and employment over the last five years. The survey showed that 94% of all producers expect 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

ABSTRACT	i
INTRODUCTION	1
METHODOLOGY	2
RESULTS.....	3
Acres Grown and Harvested.....	3
Sod Prices, Price Determination and Industry Value	9
Components of Farm Income	12
Marketing	13
Harvesting and Brokering	13
Shipping	15
Sod Quality.....	17
Employment, Mechanization and Farm Expenses.....	18
Firm and Industry Problems.....	20
SUMMARY.....	22
LITERATURE CITED	23

LIST OF TABLES

Table 1. Total acres of sod grown in Florida, by farm size, soil type and grass variety, 1996 data.	4
Table 2. Acres of sod harvested in Florida by farm size and grass variety, 1996 data.	6
Table 3. Acres of sod planted and harvested, by farm size and per farm, and ratio of sod harvested to sod planted, 1996 data.	7
Table 4. St. Augustinegrass production, presented by farm size and grass varieties, 1996 data. ...	9
Table 5. Sod farm acreage, percent harvested, price per square foot, and harvest value in Florida by major grass variety, 1996 data.	10
Table 6. Full-time, part-time and seasonal employment figures for various-sized sod farms in 1996 and changes in employment numbers compared to five years ago.	18
Table 7. Changes in mechanization on various-sized sod farms in 1996 compared to five years earlier.	19
Table 8. Changes in operating expenses of various-sized sod farms in 1996 compared to five years earlier.	20

LIST OF FIGURES

Figure 1.	Types of grasses grown in Florida — shown as a percent of total production	3
Figure 2.	Reported acres of sod production in various regions in Florida in 1996.....	5
Figure 3.	Top four St. Augustinegrass types grown in Florida in 1996 — shown as a percent of total St. Augustinegrass production.....	8
Figure 4.	Considerations made by Florida sod growers when determining how much sod to produce in subsequent years.....	11
Figure 5.	Considerations made by Florida sod producers when determining the selling price of sod	12
Figure 6.	Partitioning of farm income by Florida sod producers in 1996	13
Figure 7.	Seasonal harvesting pattern of Florida sod in 1996	14
Figure 8.	Distribution of sod sales throughout Florida and the percent of their total sales by growers who sell sod in the various area code regions	16
Figure 9.	Depiction of how Florida sod was utilized and to whom sod producers sold their product in 1996.....	17
Figure 10.	Weighted responses of survey participants when asked about the three most important problems faced by the respondent's business.....	21
Figure 11.	Weighted responses of survey participants when asked about the three most important problems facing the sod industry.....	22

An Economic and Agronomic Profile of Florida's Sod Industry in 1996

J.J. Haydu¹, L.N. Satterthwaite² and J.L. Cisar³

INTRODUCTION

Florida is the fourth most populous state (14.5 million in 1995) and has a growth rate of nearly 2 percent annually (1996 Florida Statistical Abstract). Due, in part, to these two factors, sod has become an increasingly important component of Florida's urban landscapes. However, the same warm weather that has drawn people to Florida is also both a boon and a bane to turfgrass management — precipitating ideal conditions for vigorous growth, but also providing an environment conducive to the proliferation of pests and diseases. 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 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 is another approach to gauging economic importance. Demand for sod can be roughly estimated by examining the number of new housing starts. The University of Florida's Bureau of Economic and Business Research (1997) estimated 610.3 thousand housing starts between 1996–2000, averaging 122 thousand annually. Assuming 0.33 acres per household (which includes both individual lot and “common areas”), this figure translates into 40,000 acres of sod required annually for new housing starts. An additional 34 percent of sod not included in this calculation is targeted for other outlets, including golf courses, commercial and non-profit institutions, and the re-sodding market for existing homes (Figure 9 of this report), making total annual demand nearly 54,000 acres statewide.

In late 1997, 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

¹ Professor and Extension Economist, and ² Senior Statistician, respectively, Central Florida Research and Education Center, Apopka, FL, 2807 Binion Road, Apopka, FL 32703-8504, tel (407) 884-2034, fax (352) 392-9359, email jjh@icon.apk.ufl.edu.

³ Professor and Turf Coordinator, Ft. Lauderdale Research and Education Center, tel (954) 475-8990, fax (954) 475-4125, email jlci@gnv.ifas.ufl.edu.

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

METHODOLOGY

The sample for the 1997 Florida Sod Production Survey 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 around the state, and a compilation from previous lists of sod survey recipients. The objectives were to develop as complete and accurate a list as possible and to obtain a statistically representative sample of firms.

Due to the quantity of information requested, mail surveys were the instrument of choice. Three mailings were instituted, at roughly six-week intervals beginning in April 1997. Of the original 160 questionnaires sent in the first mailing, the list of actual sod producers was reduced to 96. 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 51 completed surveys were eventually returned, and production and harvest information was received from one additional firm, representing a 54% response rate.

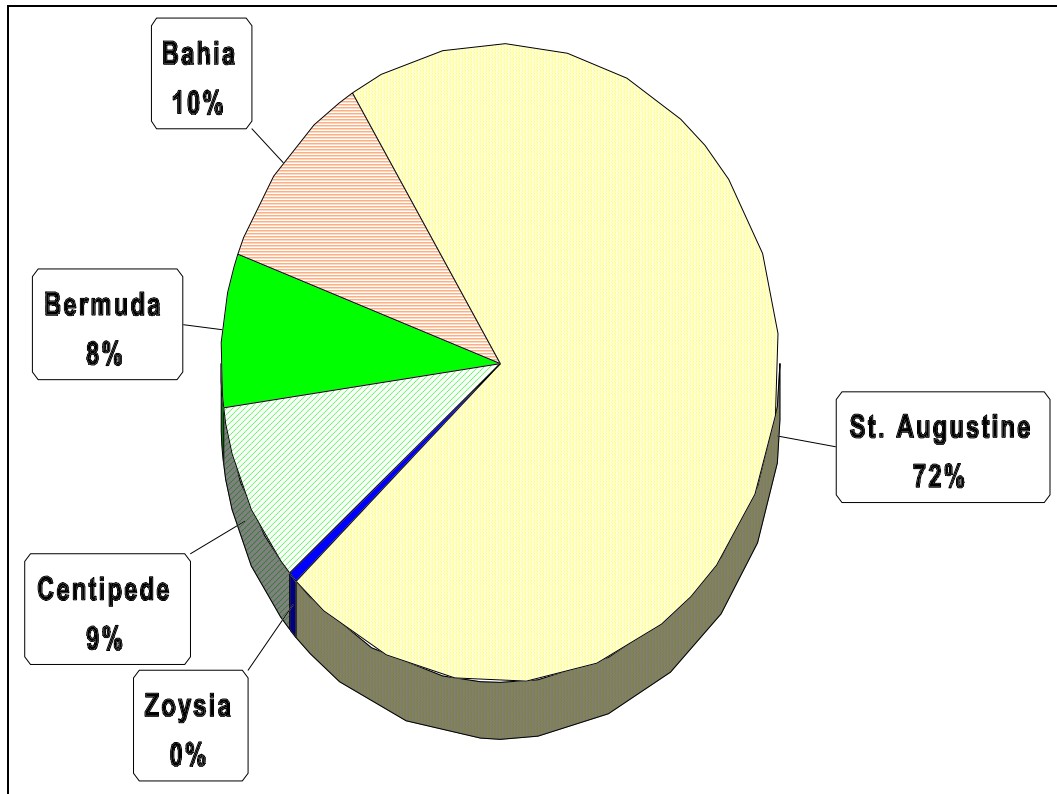
To facilitate comparisons over time, questionnaires were designed to be consistent with two earlier sod surveys. However, adjustments were made for questions from the previous studies that had been unclear or provided marginal responses. The questionnaire was divided into four major sections — production, 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.

Results of the 1997 survey indicate that 52 growers produced nearly 40,000 acres of sod in 1996. However, since the survey responses did not represent total industry production, several procedures were employed to develop an industry-wide estimate. First, through a process of elimination (comparing returned questionnaires with the population lists), it was determined that the largest category of producers (those with more than 2,000 acres of sod) were included within the survey sample. With the largest group eliminated from the total, the remaining 44 producers were assumed to comprise 35 small (80% of 44), 7 medium (15% of 44) and 2 large-sized firms (5% of 44). This assumption was based on the authors' working knowledge of the industry and the fact that in most agricultural sectors, a small number of larger producers generally account for the majority of the output. Adding the new farms to each size category (e.g. small firms: $35 + 31 = 66$), then dividing by the number of original respondents in each farm size, an expansion factor was generated for each farm size group (e.g. small: $66 \div 31 = 2.129$; medium: $16 \div 9 = 1.778$; and large: $9 \div 7 = 1.286$). These figures were then used to expand the sample aggregates for all major variables being estimated.

RESULTS

Acres Grown and Harvested

Information on Florida sod production by grass type is shown graphically in Figure 1 and data are presented in terms of total acreage, farm size, soil type and grass varieties in Table 1. Total



sod produced in Florida in 1996 was estimated to be 53,050 acres. Of this total, 72% (38,258 acres) was comprised of St. Augustinegrass, ten percent (5,490 acres) constituted bahiagrass, centipedegrass followed closely at nine percent (4,879 acres), while bermudagrass represented 8 percent (4,163 acres) and expanded acres of zoysiagrass were nearly insignificant at one-half of 1 percent (260 acres). This information suggests that St. Augustinegrass has become more important over the past 10 years because in 1987 this grass was estimated to comprise only 56 percent of total production (Haydu and Cisar, 1992).

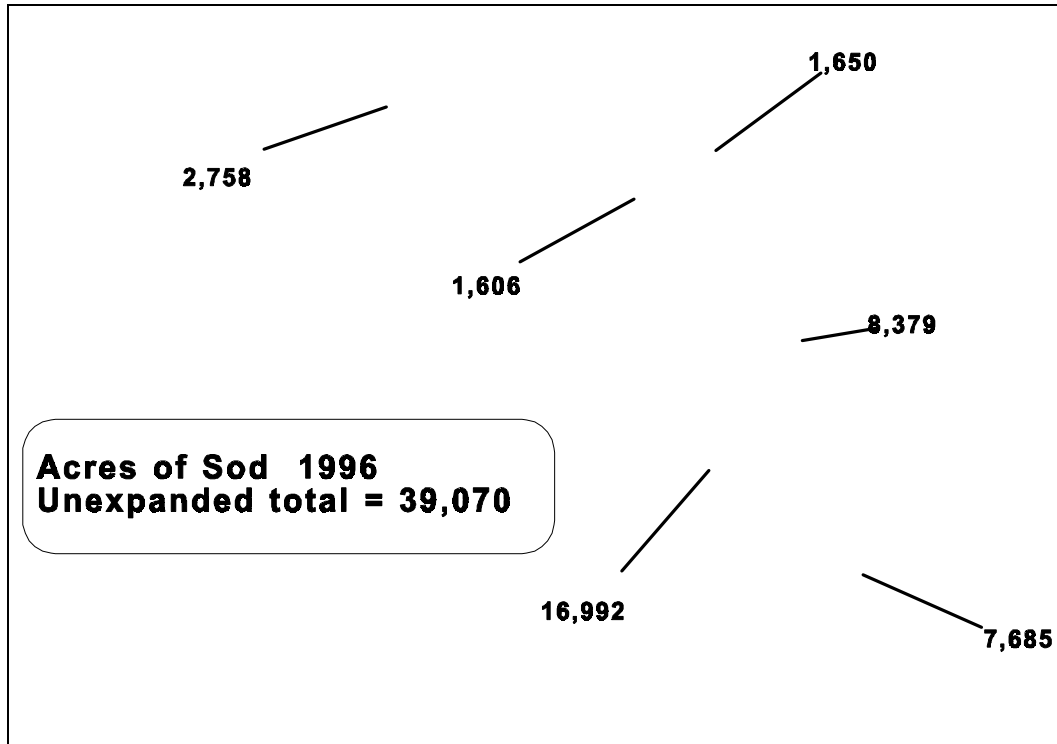
Table 1. Total acres of sod grown in Florida, by farm size (small: 0–499; medium: 500–999; large: 1,000–1,999; very large: $\geq 2,000$), soil type (sand vs. muck) and grass variety, 1996 data.

Farm size/ Soil type	Acres in production					Total	Percent
	St. Augustine	Bahia	Bermuda	Centipede	Zoysia		
Small							
Muck	1,088	0	66	0	0	1,154	
Sand	4,941	1,145	1,471	2,810	98	10,465	
Subtotal	6,029	1,145	1,537	2,810	98	11,619	22%
Medium							
Muck	2,445	0	0	0	0	2,445	
Sand	4,838	0	1,666	2,059	140	8,703	
Subtotal	7,283	0	1,666	2,059	140	11,148	21%
Large							
Muck	6,514	220	0	0	0	6,734	
Sand	4,412	1,812	303	0	22	6,549	
Subtotal	10,926	2,032	303	0	22	13,283	25%
Very large							
Muck	9,200	153	657	0	0	10,010	
Sand	4,820	2,160	0	10	0	6,990	
Subtotal	14,020	2,313	657	10	0	17,000	32%
Totals							
Muck	19,247	373	723	0	0	20,343	38%
Sand	19,011	5,117	3,440	4,879	260	32,707	62%
Total	38,258	5,490	4,163	4,879	260	53,050	
Percent	72%	10%	8%	9%	0%	100%	100%

Distribution of production acres by farm size — defined as: small = 0–499; medium = 500–999; large = 1,000–1,999; and very large = $\geq 2,000$ — is also shown in Table 1. At fifty-seven percent, large (25 percent) and very large (32 percent) farms formed the majority of industry output. Medium-sized growers contributed 21 percent and the smallest growers provided 22 percent of statewide production.

Sod is grown on either sand (mineral) soils or “muck” (organic) soils. Of the roughly 53 thousand acres, 62 percent was produced on sand with the remainder (38 percent) located on muck soils. The latter are typically found in southern Florida’s Everglades Agricultural Area (EAA) and the low-lying fields surrounding Lake Apopka in the central portion of the state.

Small- and medium-sized farms were generally situated on sand soils (90% of acres for small and 78% for medium), whereas the larger two farm sizes were located on muck lands (51% for large and 59% for very large). A rough placement of sod farms in the state was obtained by asking survey respondents to note in which of seven 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.



In terms of grass varieties cultivated, the proportion planted in St. Augustinegrass appears to increase directly with farm size — 52 percent of total production for small farms, 65 percent for medium-sized farms, and 82 percent for each of the larger two categories. A possible explanation for this relationship is that big farms with their large volumes and competitive prices tend to dominate the extensive market for new housing construction, which includes sales to both developers and landscape contractors. Huge quantities of sod are required to cover common areas and roadsides, as well as the lawns for numerous single- or multiple-family dwellings. Smaller producers lean toward diversifying production and serving several markets simultaneously, thereby reducing risk to the firm.

Acres of sod harvested in 1996 by grass type and farm size are presented in Table 2. The information in this table sheds light onto three areas — firm-level efficiencies in production and sales, market conditions impacting demand, and the (total) wholesale value of the industry. First,

knowledge of acres harvested is useful for calculating the turnover rate or the relationship between sod sales and sod inventory (the 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 that could impair harvesting activities. Muck soils tend to retain water, which can make the ground too soft for the operation of heavy harvesting equipment. Second, market demand also influences quantities harvested in a given year. During periods of strong demand, the total net area should be harvested and sold. Demand for sod is

Table 2. Acres of sod harvested in Florida by farm size and grass variety, 1996 data.

Farm size	Acres Harvested					Total
	St. Augustine	Bahia	Bermuda	Centipede	Zoysia	
Small	4,362	766	1,335	1,554	51	8,068
Medium	5,789	0	1,622	779	60	8,250
Large	7,555	1,510	217	0	19	9,301
Very large	11,461	741	477	7	0	12,686
Total	29,167	3,017	3,651	2,340	130	38,305
Harvested Percent of Production ^a	76%	55%	88%	48%	50%	72%

^a Total percent of production (72%) 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 = .76 of production acreage is harvested × .72 of total production acreage (see Table 1) = 55%] and summing the resultant percentages.

linked closely with housing starts, which is impacted by the general condition of the local and regional economies. New developments constitute roughly three-quarters of Florida's total sod market (Haydu and Cisar, 1992). The supply of sod is the other side of the equation affecting demand and price. The greater the difference between supply and demand, 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. Third, because sod must be sold immediately after harvest due to perishability, acres harvested also represent farm gate sales (producers will not cut their sod unless a sale has been firmly established) that in turn can be used to estimate the wholesale value of the industry. This last item is discussed later in this manuscript.

Since sod requires year-round maintenance and care, farmers should strive to maximize harvested acres to reduce unit costs and increase profitability. For example, 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.

In this study, 72% of all sod grown was harvested; however, the percentage of each grass type harvested varied widely. Centipedegrass was harvested at the lowest rate, 48% of production, while bermudagrass was harvested at 88% of production, probably due to the method of harvesting¹. The largest farms tend to focus on grasses that have the highest harvest rates — St. Augustinegrass (76%), bahiagrass (55%) and bermudagrass (88%) — while 20% of the harvest of the smallest farms are grasses that are harvested at lower percentages — centipedegrass (48%) and zoysiagrass (50%). The reasons for these size-related patterns were not addressed by the survey.

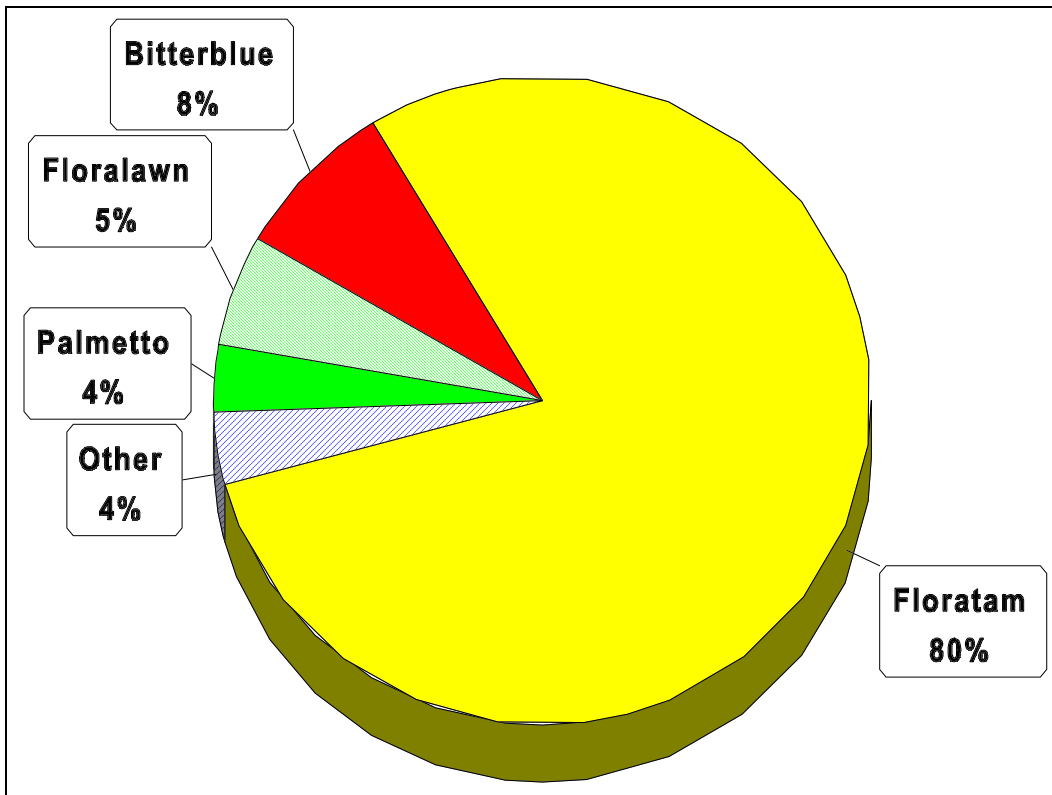
Harvest ratios for all size farms are nearly equal (Table 3). From conversations with industry leaders, a 75 percent harvest rate is considered reasonable from an efficiency standpoint.

Table 3. Acres of sod planted and harvested, by farm size and per farm, and ratio of sod harvested to sod planted, 1996 data.

Farm size	Acres planted in 1996		Acres harvested in 1996		Acres harvested/ Acres planted
	Total	Per farm	Total	Per farm	
Small	11,619	176	8,068	122	0.69
Medium	11,148	697	8,250	516	0.74
Large	13,283	1,476	9,301	1,033	0.70
Very large	17,000	4,250	12,686	3,172	0.75
Average	13,263	260	9,576	188	0.72

St. Augustinegrass is the most widely used grass (76% of total harvest) 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

¹ Unlike St. Augustinegrass, bermudagrass is commonly clear-cut because it is able to re-establish from rhizomes as well as stolons (McCarty and Cisar, 1989).



produced in 1996, comprising 80 percent (30,415 acres) of total production. Far down the scale, Bitterblue was the second most popular variety representing just 8 percent (3,053), followed by Floralawn with 5 percent (2,065 acres) and Palmetto with 4 percent (1,359 acres). The remaining St. Augustinegrass varieties — Common, Delmar, FX-10, Raleigh and other — comprised 3 percent, with Raleigh being the only named variety accounting for over 1 percent of this total, as shown in Table 4.

An interesting question is why Floratam continues to hold such a commanding grip on the market? Are other varieties that much inferior? 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 to be 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.

Table 4. St. Augustinegrass production, presented by farm size and grass varieties, 1996 data.

Farm size	St. Augustinegrass acres in production								
	Bitterblue	Common	Delmar	Floralawn	Floratam	FX-10	Palmetto	Raleigh	Other

Small	575	0	224	26	4,386	11	494	194	119
Medium	1,515	0	20	124	4,841	0	295	276	210
Large	505	0	0	1,915	7,958	0	547	0	0
Very large	458	240	0	0	13,230	0	23	0	92
Total	3,053	240	244	2,065	30,415	11	1,359	470	421

Within the landscaping segment — which includes activities such as land preparation, installing irrigation and drainage systems, and establishing landscape plant material — sod laying is positioned at the end of the project. With all these numerous activities, cost over-runs and delays are common. As a result, the initiation of landscaping gets pushed back further and further, making planning largely ineffectual. Hence, from a landscaper's perspective, the considerable risk and uncertainty surrounding this process mitigates incentives to switch to other varieties. For instance, since landscapers must frequently wait until the last minute to purchase sod, they face the likelihood of not being able to obtain it when needed. There is also the potential risk of product losses — once cut, sod is perishable and requires constant watering during the month-long establishment phase. Changing to another variety only adds additional risks, such as the prospect that the grass will develop insect or disease problems and have to be replaced, thereby, eliminating any potential profit.

Sod Prices, Price Determination and Industry Value

Farm gate sod prices received by producers in 1996 are shown in Table 5. Prices ranged from a low 5.1¢ a square foot for bahiagrass to a high of 18.2¢ a square foot for zoysiagrass. The price of St. Augustinegrass was in the middle of this range at 12.8¢ per square foot. Prices were used to calculate the value of the sod industry in 1996. Harvest value, the quantities actually sold in 1996, were estimated at \$199 million. Eighty-one percent of harvest values were attributable to St. Augustinegrass. Bermudagrass was the second most valuable sod commodity, followed by centipedegrass and bahiagrass. With small acreage, zoysiagrass comprised an insignificant market share within the industry — six-tenths of one percent.

Given the price differentials across varieties, one might expect producers to concentrate on the highest-priced grasses. For example, why produce so little zoysiagrass when its unit value exceeds St. Augustinegrass by nearly 50 percent? A short answer is supply and demand. From the demand perspective, St. Augustinegrass is the preferred grass for home lawns, which constitute 75 percent of all turfgrass used in Florida (Hodges et al., 1994). St. Augustinegrass, Table 5. Sod farm acreage, percent harvested, price per square foot, and harvest value in Florida by major grass variety, 1996 data.

Turfgrass varieties	Total acres in production	Percent of production acres harvested	Price/ft ²	Harvest value ^a
				\$ thousands
St. Augustine	38,258	76%	\$0.128	\$162,119
Bahia	5,490	55%	\$0.051	\$6,708
Centipede	4,879	48%	\$0.101	\$10,303
Bermuda	4,163	88%	\$0.120	\$19,150
Zoysia	260	50%	\$0.182	\$1,031
Total	53,050			\$199,310

^a Harvest value, assumes percent of gross production acres sold based on results of this study, calculated as $\{(\text{production acres} \times \text{percent area harvested}) \times (43,560 \text{ ft}^2 \times \text{price/ft}^2)\}$.

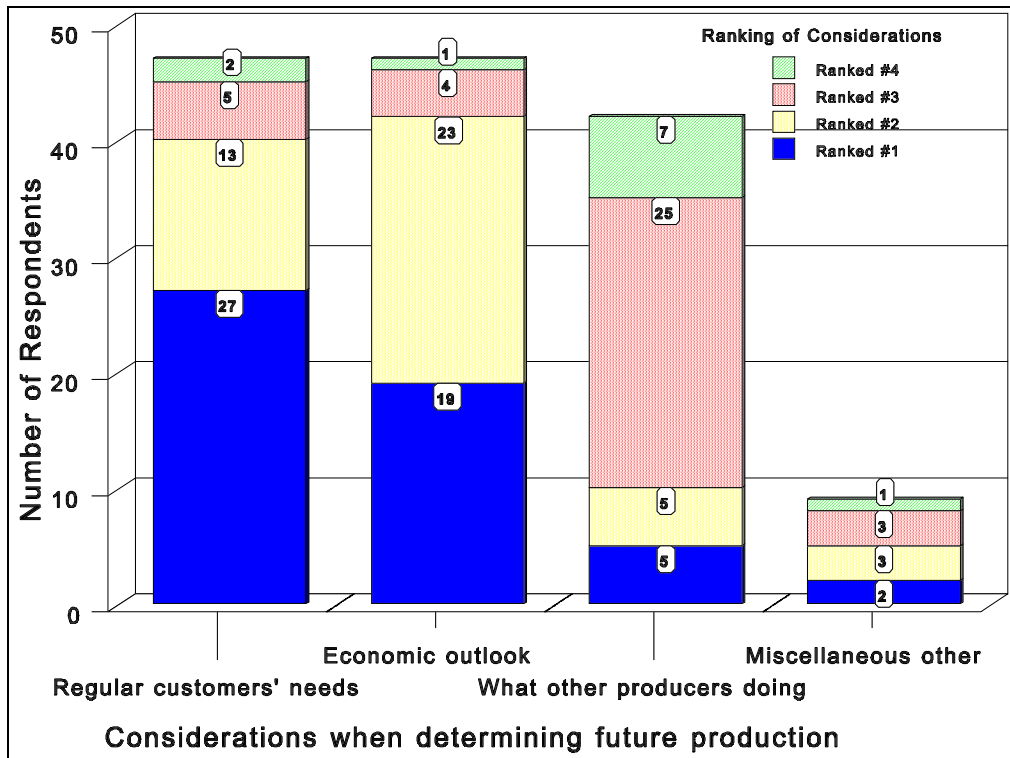
and particularly Floratam, has dominated the market because it provides the most value to consumers. Some useful attributes of a good turfgrass include visual attractiveness, good recuperative potential, a certain degree of utility — conserving the soil, allowing infiltration of water and filtering of pollutants — and easy maintenance. Regarding the latter, an ideal turfgrass would: entail little mowing and not be hard on equipment, require minimal irrigation and fertilization, be resistant to pests and diseases, not be too invasive, and be tolerant to cold and heat stresses. 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.

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 interval of sod production 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. Interval of sod production also affects fixed costs (e.g., land, buildings, and overhead or administrative costs). Generally speaking, shorter production periods imply greater yields per unit time, implying further that fixed costs on a yield basis (square feet or yards) will be reduced. Exceptional species, such as zoysiagrass that generally requires more intensive management over long production intervals (typically 1.5 years or more), will generally always be more expensive to produce. Hence, price is only one aspect regarding the economic feasibility of sod production.

Earlier it was noted that the supply of sod (relative to demand) also impacts prices. An under-supply of sod implies higher prices while an over-supply suggests lower prices. This research did not attempt to determine the precise position of supply and demand for Florida sod in 1996, but it did seek information on producers’ intentions regarding future production levels. Over half (56%) of all producers expect to increase sod acreage, 38 percent indicated they would maintain current levels of production, and the remaining 6 percent said they would reduce their acreage. The

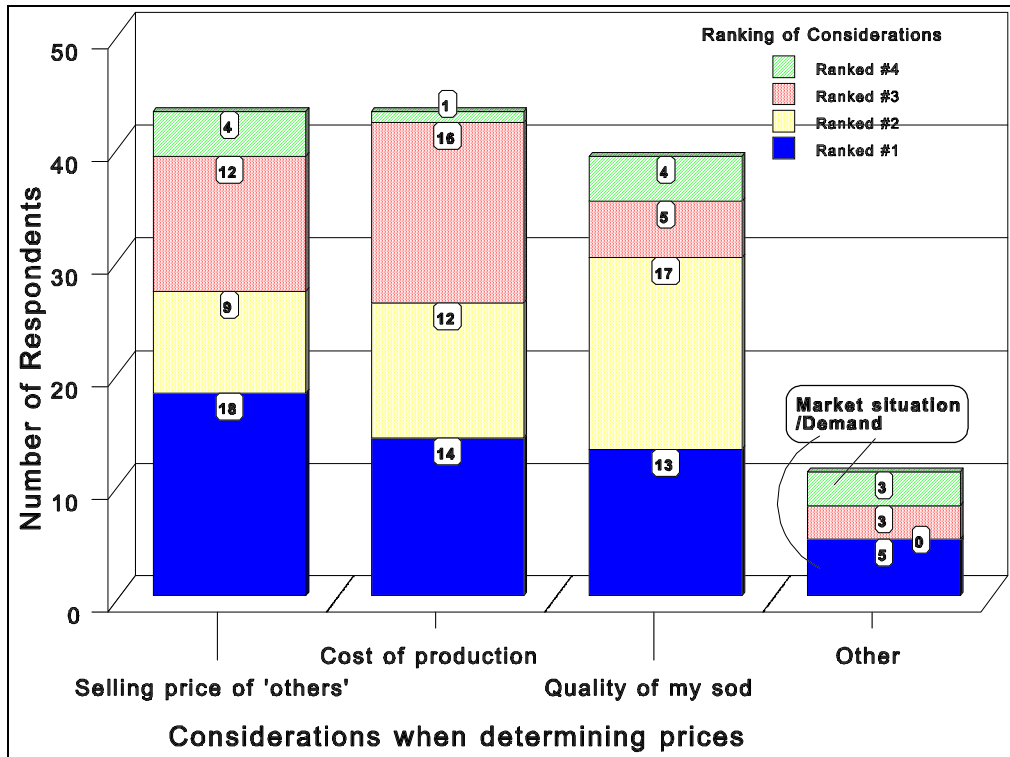
intention of so many producers to increase production levels indicates they are optimistic about future demand. Price increases between 1992 and 1996 support this optimism. During this period the two most important grasses improved in value considerably — St. Augustine increased 60%, from 8¢ to 13¢ per square foot, and bermudagrass rose by a third, from 9¢ to 12¢/ft².

When asked what process they use to decide future production levels, the first-ranked reason by 50% of respondents was to “keep communicating with my regular customers” and the first-ranked reason by 35% of respondents was to “keep abreast of economic outlook information” (Figure 4). Only nine (9) percent indicated that they looked at what other producers were doing. This may indicate that sod producers try to use more objective information for critical decisions. The approach of “doing what others do” is controversial because it positions the producer in concert with other growers — both when the industry over- and under-produces. Utilizing more independent, objective information (such as economic outlook data and purchasing intentions of customers) provides the advantage of anticipating potential pitfalls and strategic opportunities before they occur.



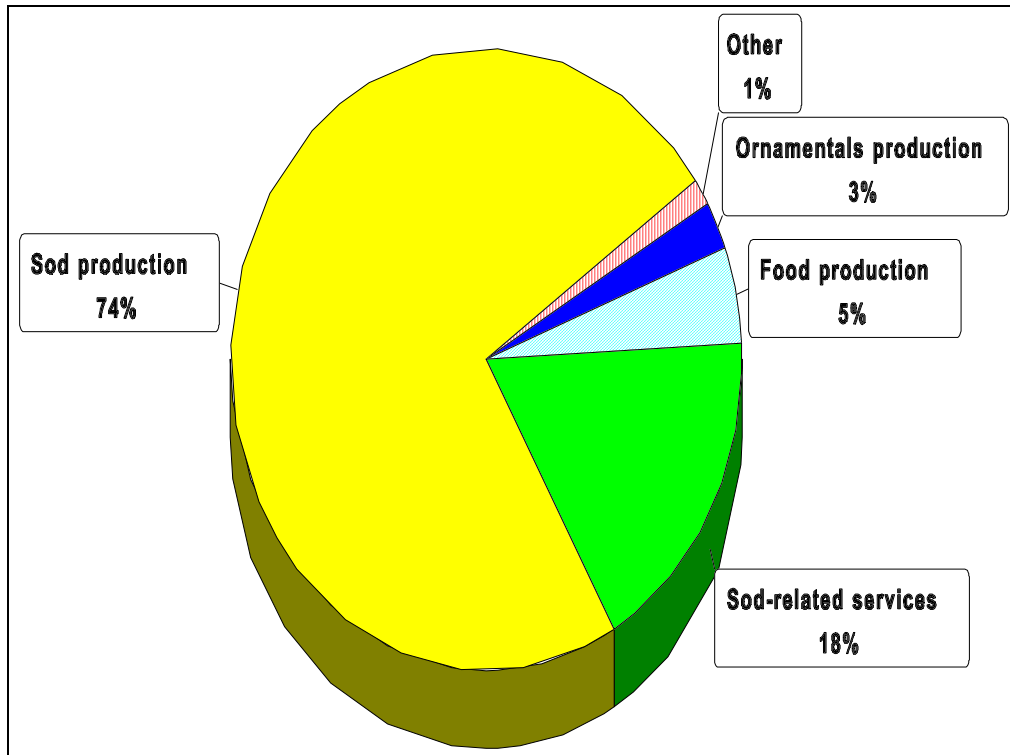
Finally, producers were asked how they determine the price they charge for their product (Figure 5). They were given 3 choices plus an open-ended “other” category and asked to rank each selection in order of importance. Interestingly, the majority of producers (36%) indicated the “selling price of other producers” as the principal pricing method. “Cost of production” was

ranked first by 28 percent of producers; “quality of my sod” was classified first by 26 percent of growers, and the “current market situation/demand” was written in as the most important pricing strategy by 10 percent of the respondents . Second, third and fourth round rankings are also shown in the stacked bar in Figure 5. Given these results, it is apparent that sod producers use several inter-related methods to arrive at prices for their product.



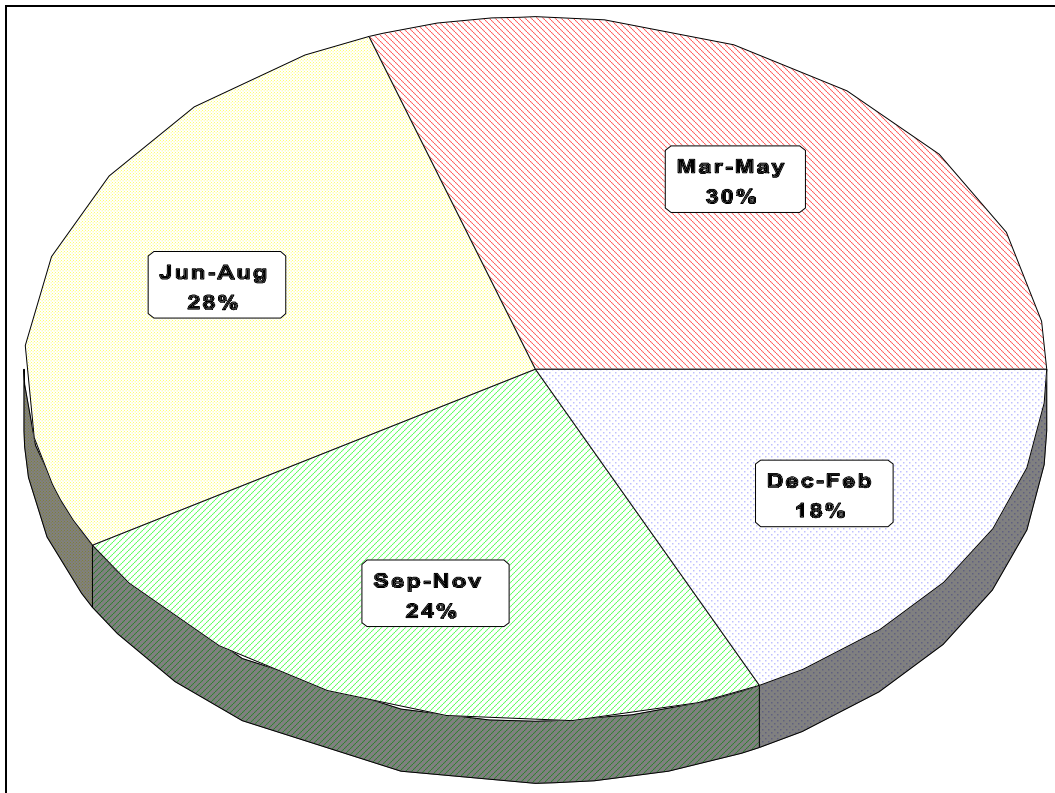
Components of Farm Income

Although most (74%) income was generated by sod sales and 42% of respondents claimed it as their sole source of income, roughly one-fourth of earned income was from related or alternative agricultural business activities (Figure 6). Sod-related services was the most significant alternative activity and accounted for 18 percent of income. These activities included shipping (5%), landscape contract services (5%), landscape maintenance services (2%) and other miscellaneous services such as installation and plug/sprig activities (5%). Food production (cattle, citrus, dairy and vegetables) was the second most important (5%) income alternative followed by ornamentals production at 3% of income. An “others” category that included land leasing and sales of silage feed, pine straw and eggs was just over 1 percent.



Marketing - Harvesting and Brokering

Just-in-time harvesting of Florida's sod coincides with the high growth periods, which also facilitates sod reestablishment in the landscape. Thirty percent of the harvest occurs during the March to May period, 28 percent takes place from June to August, 24 percent is harvested September through November and from December to February, Florida's drier winter season, 18 percent is harvested (Figure 7). This pattern is consistent with that of 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.



Most Florida sod producers (89%) choose to harvest their own sod rather than contract it to outside firms. Nearly all sod (84%) is strip cut, while the remainder (generally bahiagrass and bermudagrass) is clear cut. With strip-cut sod, harvesting machines remove sections that are 12- to 16-inches wide and leave two-inch ribbons of grass between them for reestablishment from stolons. Efficient producers try to remove only $\frac{1}{4}$ to $\frac{1}{2}$ inch of root zone when cutting sod since thin-cut pieces are easier to handle, less expensive to transport, and tend to knit-in (produce a thatch) quicker than thick-cut sod (McCarty and Cisar, 1989). Bermudagrass producers often clear-cut a field because it reestablishes from rhizomes, as well as from stolons. According to survey respondents, they harvested approximately 78% of each acre produced, leaving the remaining sod for regeneration of later crops. For nearly half of the respondents, quantities harvested per acre have remained constant in the past 5 years. An additional 40 percent indicated they have increased the amount harvested per acre and only 12 percent reported a decrease in harvest per acre.

To generate additional income or satisfy demand when their own production is inadequate, some producers brokered 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 to assist in negotiation. Nearly one-third (31%) of all producers indicated they brokered some sod. The average quantity brokered in 1996 was 1.4 million square feet with a value of \$106 thousand.

Marketing - Shipping

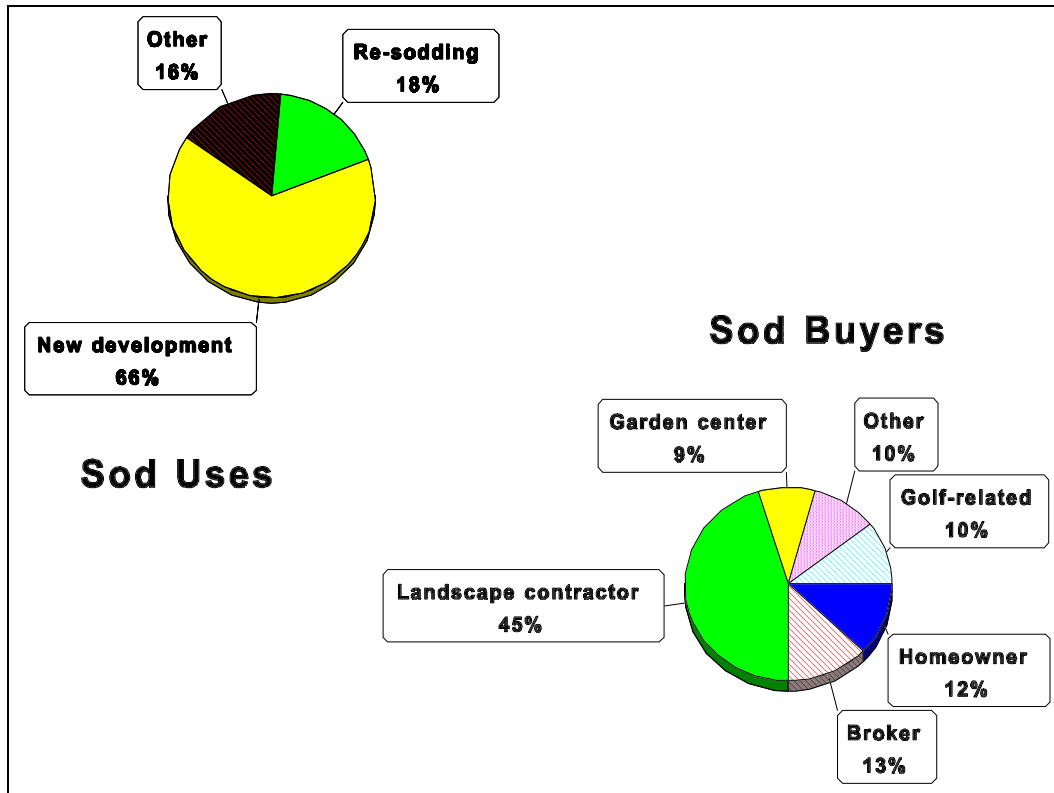
Nearly three-quarters of harvested sod is machine-stacked, while the remaining quarter is hand-stacked. Interestingly, some of the largest producers prefer to use large teams of manual labor for stacking sod. Their reasoning is that, for large-scale operations, current farm equipment is not cost-effective — large labor teams can cut, stack and move sod more quickly than 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, nearly 100% of it is shipped to its destination within 2 days. This is due to the highly perishable nature of cut-sod. The vulnerability of sod may also explain the relatively high incidence of truck ownership — sixty-two percent of respondents indicated that they own their own transportation equipment. Regardless of the fact that nearly two-thirds of the respondents own transportation equipment, nearly half of those surveyed indicated that obtaining trucks for sod delivery at the time they were needed was sometimes 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.

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 55% of their markets are within 50 miles and another 32% 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. Eighty-three percent of the growers also reported that their markets were staying approximately the same distance away from them as compared to five years ago. Half of the remaining growers' markets were moving closer and the other growers' markets were moving farther away. Figure 8 depicts the relationship between population growth and sod sales in Florida, clearly reflecting the development 'hot spots' in the state. The figure also highlights the in-state nature of the sod market in Florida since only 1% of sales were reported as being shipped out of Florida.

Area code	% of all sales	% of sales of growers selling in the area
		44
850	6	18
904	9	16
352	8	39
407	24	22
813	13	35
941	22	51
561,954,305	17	13
out of state	1	

New developments accounted for two-thirds (66%) of Florida's sod sales in 1996 and another 18% of sales were for re-sodding existing developments, demonstrating the principal linkage between Florida's population growth and the turfgrass industry (Figure 9). The distribution of buyers is also presented in Figure 9. Twelve percent of sales were made to homeowners, 45% to landscape contractors and 13% were made to brokers/wholesalers. Golf courses, retail garden centers and others (listed as Florida's Department of Transportation, building contractors, athletic fields and municipalities) each purchased about 10% of the sod sold. Most growers (78%) were optimistic about future conditions and believed that the market for sod in their area would continue to expand.



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? Additionally, 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, growers believed that half of the damage occurred to sod after the buyer received it. Nineteen percent of the quality reduction occurred in the field, another 19% of the damage took place during the harvesting and stacking process and 12% of the damage was attributed to the shipping/unloading process. 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 roughly half of all damage to the turfgrass they sell, significant room for improvement 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 growing 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 monocultural 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 amounts of diversified products. Since it is a monocultural crop, one would anticipate that there would be a significant substitution of capital-for-labor in sod 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 five years, 42 percent reported that the number of people they employ had increased, nearly the same percent (40%) claimed it had remained the same, and 18 percent said that labor use had decreased (Table 6). The large-sized farm category showed the largest change in the past five years, roughly twice that of the other farm sizes.

Table 6. Full-time, part-time and seasonal employment figures for various-sized sod farms in 1996 and changes in employment numbers compared to five years ago.

Farm size	Number of workers employed			Change from 5 years ago		
	Full-time	Part-time	Seasonal	Increase	No change	Decrease
Small	5.6	1.2	0.4	39%	42%	19%
Medium	21.3	2.6	0.0	33%	44%	22%
Large	26.9	1.3	1.9	71%	29%	0%
Very Large	77.0	0.0	0.0	33%	33%	33%
Average	15.7	4.3	4.5	42%	40%	18%

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. Fully

90 percent of all employees on Florida's sod farms were full-time. Specifically, a total of 817 full-time workers were employed in 1996, representing nearly 16 people per farm. Sixty-eight part-time workers were employed by 16 of the 50 reporting firms, an average of 4.25 part-timers for each firm with part-time help. Only six firms reported the use of seasonal labor, totaling 27, and averaging 4.5 persons per reporting firm. In terms of farm size, the use of permanent labor ranged from a low of 5.6 persons for small farms to a high of 77 employees for the very largest farms. The largest producers were also the only group to indicate they did not employ any part-time or seasonal help.

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 five years. Half of all surveyed firms indicated their farms were more mechanized now and the other half maintained that the level of mechanization had not changed (Table 7). Little difference was apparent by farm size, with the exception that the two larger farm sizes indicated greater changes than did the two smaller sizes. Of more interest, however, was the fact that sod farms increased both the levels of mechanization and employment during the same period. This is largely explained by an expansion of the industry, particularly in terms of total acreage planted in sod — since 1992 an increase from 46 thousand acres to 53 thousand, a growth of roughly 3 percent annually. With the exception of the large-size category, which grew by nearly 20%, the average size of farms changed little — the smallest and largest groups both declined by about 10 percent and the middle-sized farms grew by 6 percent.

Table 7. Changes in mechanization on various-sized sod farms in 1996 compared to five years earlier.

Farm size	Mechanization on farm since 5 yrs. ago		
	Increased	No change	Decreased
Small	48%	48%	3%
Medium	44%	56%	0%
Large	57%	43%	0%
Very Large	67%	33%	0%
Average	50%	48%	2%

Changes in operating expenses were also examined (Table 8). Nearly all producers (90%) affirmed that costs had grown over the past five years with an average increase of 21 percent, a little more than 4 percent annually. The largest cost increases were reported for the large-size farm group — nearly 40 percent or 8 percent annually. The smallest change occurred with the very largest farms who experienced a 15 percent increase in the past five years. Six percent of all

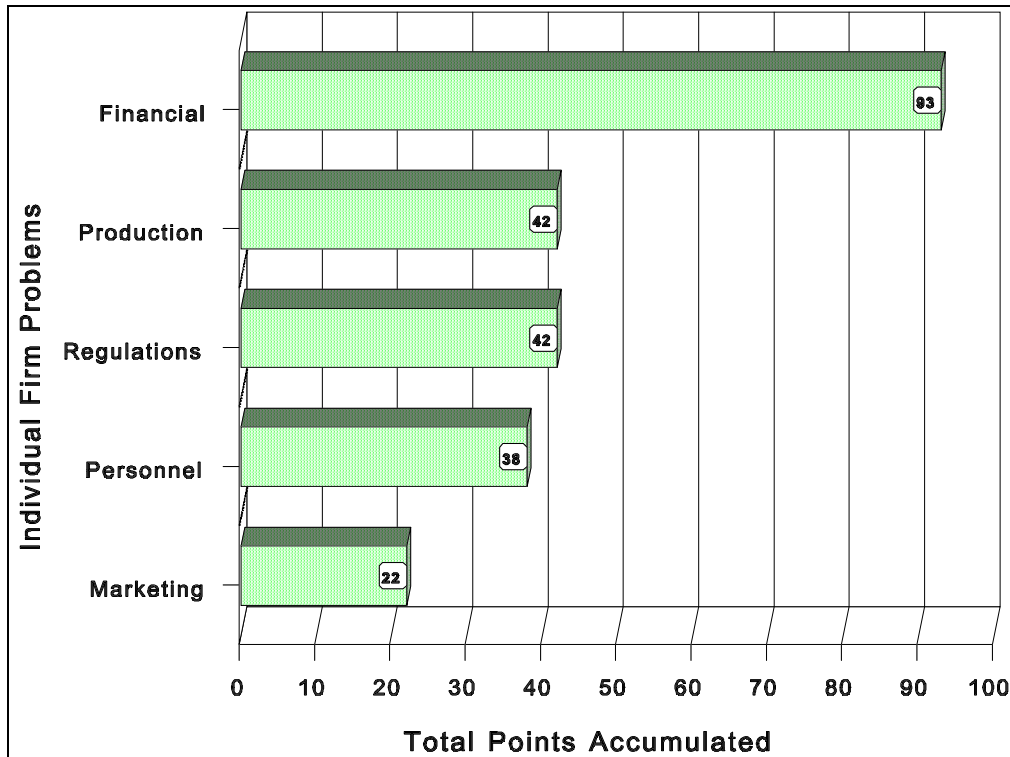
farms reported a cost decrease with the average amount being 8% over five years.

Table 8. Changes in operating expenses of various-sized sod farms in 1996 compared to five years earlier.

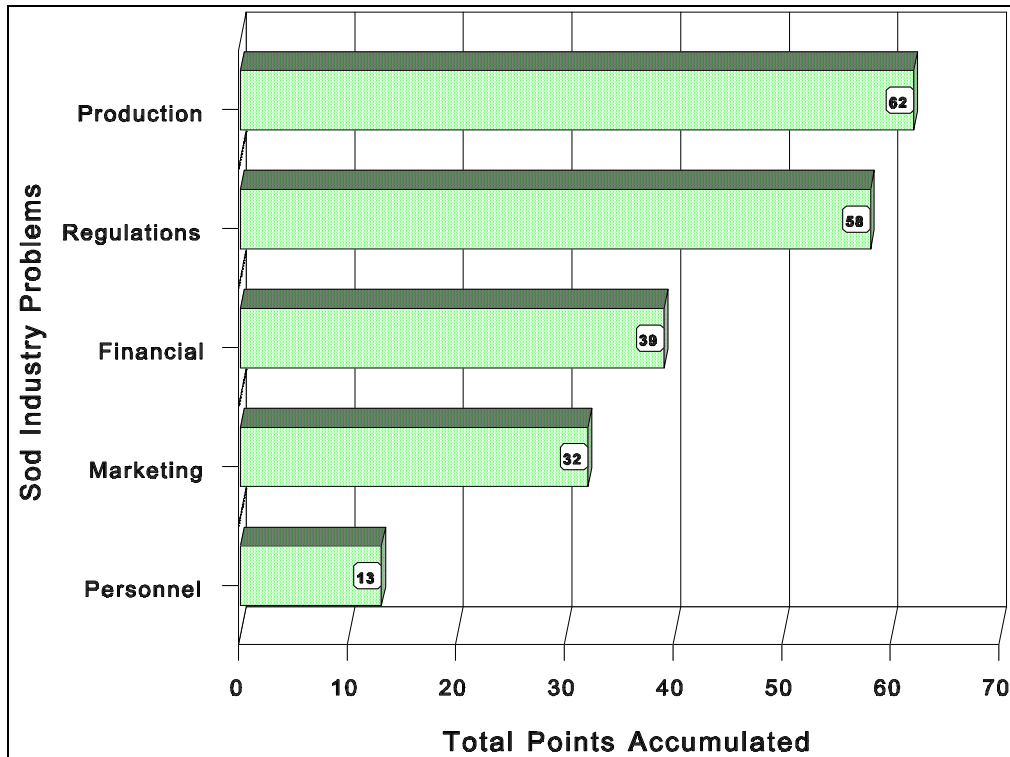
Farm size	Operating expense change from 5 yrs. ago				
	Percent of growers with cost increase	Average amount of cost increase	Percent of growers with no cost change	Percent of growers with cost decrease	Average amount of cost decrease
Small	94%	18%	0%	6%	10%
Medium	78%	21%	11%	11%	5%
Large	100%	39%	0%	0%	n.a.
Very Large	67%	15%	33%	0%	n.a.
Average	90%	21%	4%	6%	8%

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, personnel and marketing (Figure 10). Of these five, clearly the most prominent (a weight of 93) related to financial concerns, such as difficulties managing debt, excessive labor costs, costs associated with acquiring more land, cash flow problems, prohibitive equipment costs, overproduction and its impact on prices and profitability, and the tax burden faced by smaller businesses. Production and regulatory considerations were tied for second (weights of 42 each). Typical production issues were the need for new grass varieties, soil chemistry problems, limited pest and disease control agents, and the decline in available muck land. Regulatory type concerns included the costs associated with more stringent government regulations, increasing water restrictions and growing environmental pressures. With a weight of 38, personnel-related issues were ranked fourth. These involved problems like deficient production skills of employees, the difficulties associated with managing employees, theft and illegitimate workman compensation claims. The last category (fifth-ranked with a weight of 22) addressed marketing and economic problems. Some problems listed were the cutthroat policies of competitors, finding good landscape contractors that pay, influx of new growers and their impact on prices, the threat of economic slowdowns, accurate forecasting and keeping customers satisfied.



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 (Figure 11). Production concerns were weighted the highest for the industry, followed by regulatory, financial, marketing and personnel problems. A few industry-related issues not expressed from the firm perspective included too many new sod growers, non-professional businesses, poor image of the industry, loss of land in the Everglades Agricultural Area and quality control.



SUMMARY

Roughly 100 producers comprised Florida's sod production industry in 1996 producing an estimated 53,000 acres of sod. This figure is consistent with demand for sod that was determined to be in the neighborhood of 54,000 acres. Of the total quantity produced, 62 percent was grown on sand-based soils while 38 percent was produced on muck soils, particularly around Lakes Okeechobee and Apopka. St. Augustinegrass accounted for 72 percent of total production, followed by bahiagrass (10 percent), centipedegrass (9 percent), bermudagrass (8 percent) and an insignificant amount of zoysiagrass. In terms of St. Augustinegrass, Floratam dominated all grass varieties.

Florida sod producers harvested and sold the majority of the grass grown, varying from a low of 48 percent for bahia to a high of 88 percent for bermudagrass. More than three-quarters (76 percent) of St. Augustinegrass was harvested. Sod prices received were consistently strong, ranging from 5 cents per square foot for bahiagrass to 18 cents for zoysiagrass with St. Augustinegrass holding the middle ground at almost 13 cents per square foot. Using these prices in conjunction with harvest figures, the study estimated the farm gate value of sod at nearly \$200 million in 1996, making it a major agricultural commodity in Florida.

Although sod utilizes numerous market outlets, most (66 percent) was sold to the new housing market, 18 percent was targeted for re-establishing existing home lawns, and the remaining 16 percent 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 sod farm employed nearly 16 full-time, four part-time and four seasonal workers. This number represented an

employment increase for 42 percent of the farms compared to five years ago and “no change” for 40 percent of the farms.

Finally, producers identified several problems that affected business performance. The most significant problems were financial-related issues such as difficulties managing debt, cash flow problems and excessive labor costs. Production and regulatory issues were tied for second place and included the need for new grass varieties and the impact of increasingly stringent government regulations.

LITERATURE CITED

- Beard, James B. 1973. *Turfgrass Science and Culture*, Prentice-Hall, Inc., Englewood Cliffs, N.J.
- Bureau of Economic and Business Research. 1997. *1996 Florida Statistical Abstract*, Thirtieth Edition. Susan S. Floyd, Ed. University of Florida.
- Cisar J.L. and J.J. Haydu. 1991. Adjustments in market channels and labor in the Florida sod industry. *Journal of Agribusiness* 9(2): 33-40.
- Haydu and Cisar. 1992. An economic and agronomic profile of Florida's turfgrass sod industry. *Economics Report* ER92-1, Food & Res. Econ. Dept, IFAS, UF.
- Hodges, A.W., J.J. Haydu, P.J. van Blokland, and A.P. Bell. 1994. Contribution of the turfgrass industry to Florida's economy, 1991-92: A value-added approach. *Economics Report* ER 94-1, Food & Res. Econ. Dept. IFAS, UF.
- McCarty and Cisar. 1989. *Basic Guidelines for Sod Production in Florida*. Florida Coop. Ext. Serv., Bulletin 260, IFAS, UF.
- Turgeon, A. J. 1985. *Turfgrass Management*. Reston Publishing Co., Reston VA.
- USDA/ERS. 1997. *Financial Performance of U.S. Commercial Farms, 1991-94*. Agricultural Economic Report Number 751.

C:\Core\WPfiles\jjh\TURF\SURVEY\SodAcres4.wpd