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Economic Analysis and Impact of Sod Production in Texas

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Abstract: This paper presents analysis of the cost structure for a medium-sized sod producing operation in Texas and results of a mail survey providing information on the production economics and marketing of sod in Texas. Results are compared with findings from previous studies conducted in Florida and Alabama.

Key Words: sod, production, costs, marketing

JEL Classification: Q190

Economic Analysis and Impact of Sod Production in Texas

Introduction

Little formal applied research has been done on the structure of the sod producing industry in Texas. The industry has become concerned that increases in input prices and recent proposals at the state level related to changes in tax policy and water regulation will have an adverse impact on the industry. The industry feels the need to collect and analyze data to support sound policy decision and farm management decision making.

Previous Research

Haydu, et al. have carried out a series of studies on the Florida sod industry. These studies include information on production, employment, marketing, and product quality and price since 1992. The 2003 study by Haydu et al. indicated that in 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. The 2003 survey showed that 96 percent of all Florida producers expected to maintain or increase current sod production, indicating optimism about future demand.

Cain, et al. carried out a study to analyze the costs associated with beginning and operating a turfgrass farm in Alabama. This study explored start-up costs, including new equipment, variable and fixed costs, and labor needs and costs. The Cain et al. study also evaluated marketing and production practices based on a producer survey to determine trends in the industry.

Lard et al. published a study that estimated the economic impact of sod production in Texas on that states economy. The industry was broadly defined to include sod production, lawn maintenance, landscape contractors, as well as retailers and wholesalers of turfgrass and ornamental horticulture.

Beddow et al. carried out a survey of turfgrass professionals in Virginia to inquire about past, present and future trends in turfgrass production and management in that state. The Beddow et al. study concluded that the Virginia turfgrass production industry was changing due to increased quality expectations, labor costs and regulatory issues.

Methodology

The mailing list for the survey was constructed from two sources. A list from the Texas Turfgrass Producers Association of all known sod producers in Texas, including both members and non-members was the primary source. In addition, Texas Cooperative Extension agents provided information on firms producing sod in the state. Two mailings were made at a four week interval starting in November 2005 with a reminder sent to non-respondents two weeks after the first mailing (Dillman). The questionnaire was a modified version of the instrument used by Haydu et al. and was divided into sections related to production, marketing, product quality, and firm and industry problems. The data from the returned questionnaires were entered into a Microsoft Access database for validation and compilation, and then exported to Microsoft Excel spreadsheets for analysis.

A three member panel of producers who were willing to provide information on cost of production was identified through the Turfgrass Producers of Texas. Variable and

fixed costs were estimated using data from these representative producers. Capital investment costs are estimated by obtaining asset complements and related prices for the different equipment items and facilities used by turfgrass producers. Enterprise budgets were developed using the Mississippi State University Budget Generator (Laughlin and Spurlock). The Mississippi State Budget Generator is a computer program designed to calculate costs and returns for individual crop and livestock enterprises and whole farm plans on an annual basis.

Results and Discussion

One hundred-forty-seven firms were identified and included in the initial mailing, compared to 139 firms for the Haydu et al. study in Florida and 150 firms in the Cain et al. study in Alabama. Forty-six surveys were returned and two respondents indicated they were no longer in the sod producing business for an adjusted response rate of 31.7%. This compares with 59 responses in the Haydu et al. study and 31 responses to the initial survey in the Cain et al. study.

For comparison purposes, the Haydu et al. methodology was followed and all farms were grouped into four size categories based on acres in production. The Small category ranges from 0–499 acres, with Medium ranging from 500–999 acres, Large ranging from 1,000–1,999 acres and Very Large greater than or equal to 2,000 acres.

Results by size of operation are shown in Table 1. The results of this survey of Texas producers shows some interesting differences with respect to the Haydu et al. study regarding size of operation. The forty-one useable responses indicated that 78.1% of Texas producers fall into the Small category, compared with 52.5% of the Florida

producers surveyed. Twenty-five percent of the Florida producers were classified as medium sized as opposed to 12.2% of Texas producers. The Large and Very Large categories totaled 9.4% of Texas producers that responded compared with 22% of the Florida producers responding. These results indicate that the Texas sod producing industry is comprised of smaller sized operations relative to the Florida sod production industry.

Table 1. Acreage reported and respondents with useable data and by size of farm, 2005.

Size of Farm	Acreage Reported	Number of Respondents	Percent by Size
Small	6,188	32	78.1%
Medium	3,475	5	12.2%
Large	4,142	3	7.3%
Very Large	2,800	1	2.4%
Grand Total	16,605	41	100.0%

To estimate total acreage in sod production in Texas, the average acreage in production by size of farm was calculated, as shown in Table 2. The projected number of Texas sod farms by size was then calculated by applying the respective percentage of respondents by size shown in Table 2 times the total number of farms identified in Texas. Total acreage estimated to be in sod production in Texas based on this 2005 survey is 60,710 acres, compared with 21,515 acres in 1993 (Lard, et al.). These results can be compared with the estimate made by Haydu et al. of total 2003 sod acreage in Florida of 92,990 acres.

Table 2. Projected total acreage in sod production by size of farm in Texas, 2005.

	Average Acreage	Projected # of Farms	Projected Acreage
Small	193	113	21,809
Medium	695	18	12,510
Large	1,381	11	15,191
Very Large	2,800	4	11,200
Grand Total		146	60,710

Survey results for employment in sod production by size of farm are shown in Table 3. These results are based on forty-one useable responses.

Table 3. Employment reported by size of farm in Texas, 2005.

	Full Time	Part Time	Seasonal
Small	125	24	70
Medium	66	16	49
Large	93	20	22
Very Large	64	2	0
Total	348	62	141

Survey results by employment type and by size of farm are shown in Table 4. These results are based on forty-one useable responses. As would be expected, the average number of full time employees increases across size of farm, with very large farms less dependent on part time and seasonal labor.

Table 4. Average reported employment by type of labor and size of farm, Texas 2005.

	Full Time	Part Time	Seasonal
Small	3.9	0.8	2.2
Medium	13.2	3.2	9.8
Large	31.0	6.7	7.3
Very Large	64.0	2.0	0.0

To estimate total employment in sod production in Texas, the average employment in production by size of farm was calculated, as shown in Table 4. The projected number of Texas sod farms by size was then calculated by applying the respective percentage of respondents by size shown in Table 2 times the total number of farms identified in Texas. Total employment estimated to be in sod production in Texas based on this 2005 survey is 1,276 full time workers, 224 part time worker and 504 seasonal workers.

Table 5. Total projected employment by type of labor and size of farm, Texas 2005.

	Full Time	Part Time	Seasonal
Small	441	85	247
Medium	238	58	176
Large	341	73	81
Very Large	256	8	-
Total	1,276	224	504

The results from the enterprise budget development effort for sod production for a mid-size farm in Texas are shown below. Table 6 shows the budgeted expenses by major category for the establishment of bermudagrass sod. Machine hire is comprised of the original dirt work related to drainage and shaping the sod fields, as well as custom application charges. Other expenses are comprised of miscellaneous supplies, pickup related expenses, insurance, taxes, utilities and spot spraying. Repair and maintenance includes not only field equipment but irrigation equipment as well. Initial land cost is projected at \$1,500 per acre, with sales value at the end of a 15 year production life of \$900 per acre. This results in an annual land charge of \$155.43 per acre. Other durable input values with initial values, useful lives, and breakdown of annual and direct costs are shown in Table 7. The costs shown in Table 6 are specified as an annual cost recovery item in the sod production expense budget shown in Table 10.

Table 6. Total projected expenses per acre for the first year of Bermuda sod establishment for mid-size farm, Texas 2005.

ITEM	UNIT	PRICE dollars	QUANTITY	AMOUNT dollars
DIRECT EXPENSES				
Fertilizer	acre	130.90	1.0000	130.90
Herbicides	acre	44.73	1.0000	44.73
Other	acre	208.35	1.0000	208.35
Machine Hire	acre	521.50	1.0000	521.50
Seed Stock	acre	390.00	1.0000	390.00
FOREMAN	hour	16.00	10.0000	160.00
LABOR	hour	7.00	25.1405	175.98
DIESEL FUEL	gal	2.20	86.6961	190.74
GASOLINE	gal	2.50	2.2488	5.62
REPAIR & MAINTENANCE	acre	60.50	1.0000	60.50
INTEREST ON OP. CAP.	acre	110.92	1.0000	110.92

TOTAL DIRECT EXPENSES				1999.24
TOTAL FIXED EXPENSES				649.21

TOTAL SPECIFIED EXPENSES				2648.45

Table 7. Single durable inputs: estimated purchase price, useful life, total direct, fixed and total cost per year projected for the establishment of Bermuda sod for mid-size farm, Texas 2005.

Item Name	Unit of Measure	Purchase Price dollars	Useful Life years	Total Direct \$/yr	Fixed \$/yr	Total Cost \$/yr
1/4 Mile Wheel Move	each	8,000	20	248	869	1,117
Barn	each	75,000	15	750	9,304	10,054
Land	acre	1,500	15	-	155	155
Lay Down Pipe-3"	each	28,800	30	-	2,761	2,761
Linear Canal	each	40,000	30	-	3,893	3,893
Linear Irr System	acre	85,000	20	1,063	9,062	10,125
Main Line Pipe	each	10,000	30	167	973	1,140
Pump+Gearhead	ac-in	15,000	20	11,250	1,643	12,893
Relift Pump	ac-in	15,000	20	750	1,629	2,379
Reservoir - 2.5 acre	each	20,000	30	-	1,947	1,947
Road & Loading Pads	each	15,000	15	150	1,861	2,011
Well	each	85,000	25	850	8,654	9,504

As shown in Table 7, total initial investment in durable inputs other than land for the 500 acre farm is \$396,800. Initial land value is \$750,000. As shown in Table 8, the mid-size farm requires an initial investment of \$205,000 in tractors and self-propelled equipment. The initial investments in implements required for the farm is \$72,500 as shown in Table 9. Total projected investment for the 500 acre farm is \$1,424,300. This estimate is slightly below the estimate of \$1,838,914 for the 550 acre farm in the Cain et

al. study. However, the Cain et al. study included \$457,000 for investment in delivery equipment, while this study's cost estimates were made on an FOB basis. Exclusion of delivery costs from the estimate in the Cain et al. study would put the average per acre investment at \$2,512 per acre for an Alabama farm starting up in 2001, while this study estimated the initial investment at \$2,848.60 per acre for a Texas farm starting up in 2005. This difference would be expected based on a four year difference in the estimates and a 10% differential in acreage.

Table 8. Tractor and Self-propelled machines: estimated purchase price, size, annual use, useful life, and direct and fixed cost per hour for the mid-size Bermuda sod farm, Texas 2005.

Item Name	Size	Purchase Price dollars	Annual Use hours	Useful Life years	Total Direct \$/hour	Fixed \$/hour	Total Cost \$/hour
Large Tractor	150	30,000	350	10	25.65	11.38	37.03
Mid-Size Tractor	80	28,000	800	14	16.30	3.82	20.12
Small Tractor	55	22,000	1000	14	13.19	2.61	15.80
ATV	20	5,000	600	5	12.99	3.00	15.99
Fork Lift	80	37,500	2200	10	237.73	30.12	267.85
Fork Lift-2	80	37,500	2200	10	237.73	30.12	267.85
Sod Harvester		45,000	1800	20	246.70	21.51	268.21

The residual expenses shown in Table 10 include insurance, taxes and utility charges. Total expenses per acre of \$2,402.55 imply that at an annual yield of 4,000 square yards per acre a FOB price of \$0.60 per square yard must be obtained before all expenses are covered.

Table 9. Implements: estimated purchase price, annual use, useful life, and direct and fixed cost per acre for the mid-size Bermuda sod farm, Texas 2005.

Item Name	Purchase Price dollars	Annual Use hours	Useful Life years	Total Direct \$/acre	Fixed Implement \$/acre	P.U. \$/acre	Total Cost \$/acre
Aerator	7,500	200	20	4.38	0.99	0.95	6.33
Disc	5,000	15	20	5.38	6.03	1.89	13.31
Drag	2,500	25	20	10.05	4.17	4.37	18.61
Haul Out Trailer	4,000	400	20	0.25	0.01	0.11	0.38
Mower - Large	17,000	800	7	1.22	0.32	0.21	1.76
Mower - Small	5,500	800	7	2.25	0.22	0.43	2.91
Planter / Plugger	20,000	20	30	46.88	64.89	7.58	119.35
Roller	3,500	800	20	27.16	0.79	6.37	34.33
Shredder	2,500	250	7	5.36	0.77	1.04	7.18
Sprayer - Boom	3,500	200	20	2.38	0.19	0.38	2.95
Utility Trailer	1,500	50	30	28.19	2.92	2.61	33.72

Table 10. Summary of estimated costs per acre for the mid-size Bermuda sod farm, Texas 2005.

ITEM	UNIT	PRICE dollars	QUANTITY	AMOUNT dollars
DIRECT EXPENSES				
Fertilizer	acre	224.90	1.0000	224.90
Herbicides	acre	81.58	1.0000	81.58
Pallets	acre	255.00	1.0000	255.00
Other	acre	137.35	1.0000	137.35
Machine Hire	acre	50.00	1.0000	50.00
Insecticides	acre	13.00	1.0000	13.00
FOREMAN	hour	16.00	10.0000	160.00
MANUAL LABOR	hour	7.00	77.5771	543.03
DIESEL FUEL	gal	2.20	161.3547	354.99
GASOLINE	gal	2.50	1.4992	3.75
REPAIR & MAINTENANCE	acre	45.36	1.0000	45.36
INTEREST ON OP. CAP.	acre	35.81	1.0000	35.81

TOTAL DIRECT EXPENSES				1765.27
TOTAL FIXED EXPENSES				539.28

TOTAL SPECIFIED EXPENSES				2304.55
TOTAL RESIDUAL EXPENSES				98.00
TOTAL EXPENSES				2402.55

Conclusion and Need for Further Research

The results of this study found that the Texas sod industry was composed of smaller farms than found in recent studies in Florida. This study estimated that sod production acreage in Texas for 2005 was 60,710 acres, compared with 21,515 acres in 1993 (Lard, et al.). Total employment estimated to be in sod production in Texas based on this survey is 1,276 full time workers, 224 part time worker and 504 seasonal workers. This study estimated that an initial investment at \$2,848.60 per acre was required for the startup of a medium sized sod farm in Texas. Given projected costs and an annual yield of 4,000 square yards per acre, this study estimates that a FOB price of \$0.60 per square yard must be obtained before all expenses are covered. Further research will include estimates of economic multipliers to estimate the impact of the sod production industry on the Texas economy.

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