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Research Reports

Sales, Value Added and Employment Impacts of the United States Sod Production Industry[1]

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Abstract

A study using government secondary data in conjunction with primary data collected through a national survey was conducted to assess the importance of the sod production industry to the United States economy. Results indicate that the 2,124 sod farms contributed over $1.72B in gross output or sales impacts to the U.S. economy, $1.31B in value added, employed 13,454 people, and paid $28.6M in indirect business taxes. The top five producing states in terms of sales impacts include Florida ($344M), Texas ($183M), Alabama ($118M), Georgia ($116M) and Oklahoma ($84M), accounting for nearly 50% of total sales.

Index words: economic impact, employment, multipliers**,** sod production, value added.

Significance to the Nursery Industry

In recent years, residential and commercial business construction has been strong in the United States, fueled by low interest rates and wealth accumulation from rising home values. As a consequence, the nursery industry has been equally dynamic as it strives to satisfy the demand for landscape plant materials. The sod production sector is little known, but a critical component of the U.S. nursery and greenhouse industry that supplies much of the grass that is used for lawns, especially in the southern states. The United States Department of Agriculture (USDA) has collected limited information on the number of sod farms, number of acres produced, and number of acres harvested, but reports of these numbers are published infrequently and lack the comprehensiveness given to reports of traditional agricultural sectors. In response, some states have conducted their own studies verifying that this industry is not only growing but, in some cases, evolving into a highly significant commodity area. However, there is still nothing available that offers this information on a consistent basis for all 50 states. This research sought to address this problem by conducting a systematic and comprehensive economic impact study of the U.S. sod production industry. The approach relied primarily on existing secondary data, but it was supplemented with primary information so that state and national economic impact analyses could be conducted. For the first time, this project has documented the importance of the sod production industry at the national level in terms of total sales impacts, value added, jobs generated and indirect business taxes paid. The top ten states for total sales impacts, value added and number of jobs are presented.

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Introduction

For many decades the U.S. Department of Agriculture has collected detailed production and financial data on the farm sector. This information has been used by government agencies, universities, and trade associations to track changes in the size and scope of the various agricultural industries over time. Early on, however, not all sectors of agriculture were included in the government's data collection effort. Typically, those sectors for which data were provided were limited to large-scale 'food & fiber' commodities, such as corn, soybeans, cotton, citrus, dairy, and cattle. This decision to focus on the largest, most common sectors of agriculture was largely cost driven — it was simply too expensive for the government to collect detailed information on the many hundreds of relatively minor 'specialty crops' that were produced. In the past 15–20 years, the economic significance of specialty crops has grown appreciably and the USDA now conducts broader studies that include nearly every specialty crop. Additional studies have been conducted that focus on ornamental crops and turfgrass, such as 'Floriculture and Nursery Crops Outlook' (16). While these studies have filled a void in government statistics for 'green industry' crops, due to the large numbers of specialty crops and the number of states producing them, information collected is largely limited to area under production and, in some cases, area harvested and sales.

Increasingly, state associations representing specialty crops require more detailed information that documents the economic significance of their industry. Incentives to acquire this information focus more and more on regulatory and resource allocation issues, government financial support, and legislative actions that limit chemicals and fertilizers used in the production process. Competition for these natural and economic resources is felt in many parts of the country, but it is particularly acute in densely populated areas (3, 4, 9). As industries struggle for access to more water and land, the need for documentation of their economic contributions to society have become more essential and, as a result, a recent abundance of 'green industry' studies funded largely by state trade associations and conducted by University economists and horticulturists have been published. The scope of industry publications and the methodologies employed vary widely, but all have a common theme and purpose of documenting the economic contribution of their respective industries. A list of over 50 of these state-level publications spanning the period 1978 to 2004 were compiled for this study. The titles of these studies can be grouped into three categories: 1) those with general titles such as 'Green Industry Survey', 'Environmental Horticulture' or 'Nursery Industry', most of which also cover the turfgrass industry; 2) studies with titles that identify both nursery and turfgrass explicitly; and 3) studies with turfgrass titles only.

Cultivated turfgrass is a pervasive feature of the urban landscape in the United States and many other developed regions of the world. According to Beard (1), turfgrass provides at least three major benefits to human activities — a) functional, b) recreational, and c) ornamental. *Functional* uses include erosion control from wind and water, thus effectively reducing dust and mud levels for homes and businesses. Turf is also helpful at reducing glare, noise and heat surrounding homes or commercial buildings. *Recreational* use of turf is extensive throughout the world. Common sports activities played on turf include golf, lawn tennis, soccer, rugby, polo, football and baseball. Most professional and recreational

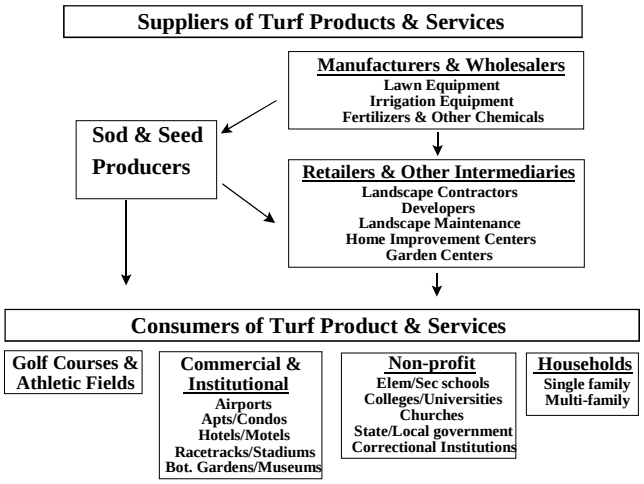

Fig. 1. Economic structure of the United States turfgrass industry.

sports utilize grass because of its ability to minimize injuries (compared to hard surfaces) and provide a durable groundcover capable of cost-effective regeneration from season to season. *Ornamental* or aesthetic attributes of turfgrass are also highly regarded. Metropolitan areas and suburban residences profit from the agreeable surroundings of healthy lawns, especially if complemented with trees, flowers and shrubs. Properly landscaped homes and businesses may also benefit financially from higher resale values when compared to poorly landscaped residences (2, 5, 10, 13).

The structure of the turfgrass industry and the flow of goods and services among the various sectors of the industry are shown in Fig. 1. Central to this economic activity are the sod producers who create the product that is directly or indirectly utilized by the rest of the turfgrass industry. As the figure shows, harvested sod is ultimately sold to four major user groups — golf courses and athletic fields, commercial and institutional markets, non-profit organizations such as schools and churches, and households. Market intermediaries purchase the sod and then provide value added services to customers including transportation, packaging, installation, and product use information. Finally, lawn maintenance service vendors provide complete lawn care services, such as mowing, irrigation, fertilization, and control of pests and diseases. Each of these service activities adds value to turfgrass products for final consumers.

An initial objective of this study was to combine secondary data from the USDA with individual state-sponsored projects to derive a national economic profile of the sod production industry. However, only a small number of states actually conducted studies on the sod production industry, resulting in checkerboard coverage of the industry nationally. In addition, the time frame when these studies were conducted spans a decade or more, making much of the information out-dated. The technical issue was that data derived from disparate sources is often non-compatible due to differing research objectives, methodologies and variables employed in the investigative process. Non-compatibility prevents assimilation of data into a useful and seamless report.

The ultimate objective of this study was to develop an economic impact assessment of the U.S. sod production industry. Eventually this objective expanded to cover the five major sectors that comprise the U.S. turfgrass industry, one of which

is the sod production sector. In this article, results are confined to the sod production sector, as this was the original project objective and it is easily defined and circumscribed. For the study, an input-output (I-O) model was employed to generate multipliers that account for the full range of economic activity between industry sectors within a given state. The I-O model captures what each business or sector must purchase from every other business or sector to produce its products and services. Variables examined in this analysis include output (total sales impacts), employment, value added, labor income, and indirect business taxes.

Materials and Methods

Information sources. Economic information on the sod industry was compiled from national and state data on number of farms and production area from the Census of Agriculture for 2002 (15). Area and value of turfgrass harvested were estimated from a survey conducted by the University of Florida, with harvest value based on regional average prices (14). This was necessary because Census data estimated production area but not quantities of turfgrass harvested and sold. In this survey, a total of 581 sod farms were sent questionnaires of which 159 were returned, for a response rate of 27% (Table 1). Responses were obtained from the following 37 states by region: *Northeast* (Maine, New Hampshire, New York, Rhode Island); *East Central* (Delaware, Kentucky, Maryland, Michigan, New Jersey, Ohio, Pennsylvania, Virginia); *Southeast* (Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee); *North Central* (Illinois, Iowa, Minnesota, Nebraska, Wisconsin); *South Central* (Arkansas, Kansas, Missouri, Texas, Oklahoma); *Western Interior* (Colorado, Idaho, Montana, Nevada, Utah, Wyoming); and *Western Coastal* (California, Oregon, Washington). States were grouped into these regions for two principal reasons: 1) they were used in earlier studies (6, 7, 8), which facilitates comparison of results across studies and 2) some states had relatively few returns so grouping them into areas with geographic similarities provided more accurate estimates of the variables being examined.

To determine sales value, respondents were asked their production area, percent harvested, and average weighted price (farm gate price, i.e., delivery not included). Respondents were also asked to indicate the share of sales that were sold outside their respective states. Shares of sales exported out of state were used to generate multipliers for the input-output analysis.

Economic impact analysis. To evaluate the broad regional economic impacts of the sod production industry in the United States, regional economic models were developed for each state using the *Implan* software system and associated state datasets (11). The information for these models was derived from the U.S. National Income and Product Accounts, together with regional economic data collected by the U.S. Department of Commerce, Bureau of Economic Analysis. Input-output models represent the structure of a regional economy in terms of transactions between industries, employees, households, and government institutions (12).

Economic multipliers derived from the models were used to estimate the total economic activity generated in each state. In addition to direct sales by industry firms, total economic activity includes the effects of intermediate purchases by industry firms from other economic sectors (indirect effects) and the effects of industry employee household consumer spending (induced effects). The regional *Implan* models were constructed as fully closed models, with all household, government, and capital accounts treated as endogenous, to derive Social Accounting Matrix (SAM) type multipliers, which represent transfer payments as well as earned income. Separate multipliers are provided for output, employment, value added, labor income, and business taxes. These multipliers were applied to estimated industry sales to derive estimates of total economic impacts. For the sod production sector, total economic impacts were estimated as:

$$I_{hj} = S_h \times [A_{hj} + E_h \times (B_{hj} + C_{hj})]$$

where:

I_{hj} is total impact for measures (j) of output, employment, value added, labor income, or indirect business taxes, in each state (h).

S_h is industry sales in state h.

A_{hj} is the direct effects multiplier for measure j in state h.

E_h is the proportion of industry sales exported or shipped outside the state, by state h.

B_{hj} is the indirect effects multiplier for measure j in state h.

C_{hj} is the induced effects multiplier for measure j in state h.

The calculation assumes that only the export portion of output is sold to final demand and, therefore, is subject to the indirect and induced effects multipliers, while the remainder of in-state sales is subject to intermediate demand from other business sectors and to direct effects multipliers. Data on exports were estimated from regional averages of the survey

Table 1. Production and marketing characteristics of U.S. sod producers surveyed, by region.

	Northeast	East Central	Southeast	North Central	South Central	Western Interior	Western Coastal	Total
Number firms contacted	21	99	206	78	63	65	49	581
Number firms responding	10	25	72	18	12	12	10	159
Production area (acres)	4,527	12,151	72,056	11,920	10,746	4,725	8,235	124,360
Share of production area harvested	0.537	0.354	0.599	0.479	0.667	0.465	0.970	0.587
Number employees per acre production area (full-time and part-time)	0.031	0.029	0.024	0.025	0.034	0.040	0.097	0.031
Average sod price ($/ft^2)	0.229	0.168	0.147	0.165	0.146	0.220	0.235	0.165
	(7%)[z]	(8%)	(11%)	(26%)	(13%)	(7%)	(8%)	(6%)
Share of non-local sales (outside state)	0.356	0.062	0.053	0.210	0.087	0.120	0.007	0.080
	(22%)	(38%)	(32%)	(53%)	(59%)	(46%)	(95%)	(17%)

[z]Numbers in parentheses indicate relative standard errors of mean values.

Source: UF/IFAS Sod Producer Survey, 2005 (unpublished data).

Table 2. Summary of economic impacts of the sod production industry, by state, 2002.

State	Farms[z]	Production area (acres)[z]	Harvest value ($1000)	Output impacts ($1000)	Employment (jobs)[y]	Employment impacts (jobs)[y]	Value added impacts ($1000)	Labor income impacts ($1000)	Indirect business tax impacts ($1000)
Alabama	96	25,805	109,152	118,473	879	999	112,541	38,031	2,567
Alaska	2	130	550	593	4	5	324	160	7
Arizona	13	3,187	14,173	16,239	126	151	13,402	7,237	270
Arkansas	58	8,998	38,060	41,130	306	349	35,997	15,602	729
California	62	15,909	67,293	76,006	542	629	53,264	29,126	1,085
Colorado	48	7,767	34,540	40,496	307	372	24,688	14,600	568
Connecticut	10	1,251	4,317	5,232	32	41	4,809	2,473	108
Delaware	6	2,305	5,982	6,304	68	71	6,044	2,062	129
Florida	235	92,990	306,800	343,562	3,167	3,604	309,005	140,715	6,571
Georgia	92	24,653	104,279	115,748	840	969	109,263	38,867	2,570
Hawaii	20	113	478	532	4	5	479	306	7
Idaho	38	4,704	20,919	23,564	186	224	22,111	13,261	371
Illinois	40	7,994	27,585	35,604	203	281	21,999	11,694	656
Indiana	38	5,076	17,516	21,526	129	175	12,193	6,541	340
Iowa	33	4,836	16,688	20,026	123	165	9,787	5,071	287
Kansas	49	4,971	21,027	23,085	169	193	10,002	5,935	213
Kentucky	54	4,692	12,177	12,864	137	146	11,490	5,365	209
Louisiana	23	2,747	11,619	12,698	94	108	8,729	4,676	165
Maine	10	1,151	3,972	4,813	29	41	3,619	2,099	80
Maryland	29	4,987	12,943	14,054	146	159	12,434	5,570	245
Massachusetts	6	390	1,347	1,687	10	13	1,035	701	25
Michigan	54	10,262	26,633	28,505	301	321	14,626	228	228
Minnesota	89	14,564	50,256	64,126	369	518	31,543	18,630	1,015
Mississippi	47	4,352	18,408	19,871	148	169	18,913	7,737	388
Missouri	53	6,002	25,388	28,174	204	238	14,938	8,346	320
Montana	16	1,232	5,479	6,064	49	57	3,286	1,957	64
Nebraska	38	3,015	10,404	12,537	76	104	5,891	3,388	168
Nevada	11	720	3,202	3,647	28	33	3,415	2,170	56
New Hampshire	2	130	449	557	3	5	340	219	8
New Jersey	53	12,485	32,402	34,391	366	385	28,426	14,027	515
New Mexico	5	1,186	5,274	5,958	47	57	5,188	2,988	93
New York	14	6,868	23,699	28,564	174	221	20,459	11,645	499
North Carolina	87	10,952	46,326	50,760	373	427	48,039	16,430	1,113
North Dakota	3	27	93	108	1	1	44	25	1
Ohio	62	9,434	24,484	26,018	276	294	15,065	7,831	267
Oklahoma	95	17,846	75,486	83,909	608	721	46,714	25,848	969
Oregon	14	2,608	11,032	12,293	89	105	7,665	5,211	128
Pennsylvania	24	2,100	5,450	5,884	62	66	4,358	2,482	75
Rhode Island	15	2,453	8,465	10,034	62	81	6,216	3,731	138
South Carolina	27	14,027	59,333	64,450	478	544	61,244	16,341	1,312
South Dakota	3	195	674	796	5	7	409	212	11
Tennessee	56	8,419	35,611	39,625	287	337	21,145	11,561	449
Texas	205	38,341	162,178	183,305	1,306	1,530	108,294	59,123	2,425
Utah	46	4,036	17,948	21,022	160	200	17,318	9,976	339
Vermont	3	3	10	12	0	0	9	5	0
Virginia	25	7,315	18,985	20,404	214	231	13,936	7,390	252
Washington	41	3,756	15,887	17,501	128	146	14,432	8,955	229
West Virginia	2	130	338	357	4	4	90	62	2
Wisconsin	63	4,399	15,180	18,648	111	153	10,423	6,465	265
Wyoming	9	610	2,713	3,000	24	28	1,706	1,026	34
Total U.S.	2,124	412,123	1,533,203	1,724,755	13,454	15,681	1,307,348	604,105	28,564

[z]Source: USDA/NASS, Census of Agriculture, 2002.

[y]Employment includes full-time and part-time workers.

data. Total impacts of the sod industry at the national level were estimated by simply summing the impacts for all 50 states.

Results and Discussion

National impacts. According to the 2002 Census of Agriculture, a total of 2,124 sod production firms were in operation in 2002 (15) (Table 2). These firms had 412,123 acres of sod in production in open fields and harvested 244,354 acres, 59% of production area. The sales of sod directly within the respective states (direct impacts) represented almost 90% of sales. Indirect impacts, which are the purchase of goods and services from other sectors used in the production process, accounted for $28.6M. Induced impacts (effects of money spent from wages and salaries by industry employees) resulted in an additional $163M. The combined output of direct, indirect and induced impacts was $1.72B for all sod producers. The indirect and induced impacts above and beyond direct sales were just over 11% for sod production. This

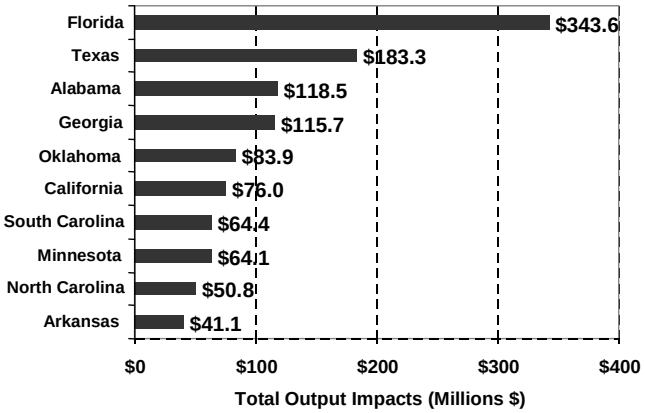

Fig. 2. Top ten states for output impacts in the sod production sector, 2002.

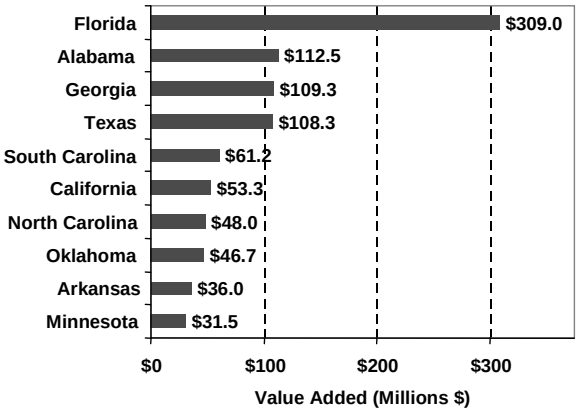

Fig. 4. Top ten states for value added impacts in the sod production sector, 2002.

differs from the nearly 30 and 40% for lawn care services and lawn care retailing, respectively. The difference is due primarily to the 'product' orientation of sod production rather than the 'service' orientation of the lawn care services and retailing sectors, which demand larger labor forces and account for much of the value added.

In addition to total output impacts, an even more important estimate of economic contribution is value added. Value added is an important measure of an industry's contribution to a regional economy that represents the difference between sales revenues and the cost of purchased inputs. It includes the value of employee wages, salaries and benefits, business owner income (profits, dividends), property income such as interest and rents, business taxes paid to state and local governments, and capital consumption (depreciation). Nationally, the sod production industry generated $1.31B in value added.

Because of their strong economic and political ramifications, employment figures are perhaps the most visible aspects of a business entity or industry. Jobs and unemployment rates are watched closely as indicators of the economic health of a region. Wages spent on goods and services by employees ripple through and stimulate all sectors of the economy. Nationally the sod production industry generated 15,681 jobs and paid out $604M in labor income. Indirect business taxes paid to local, state and federal governments totaled $28.6M.

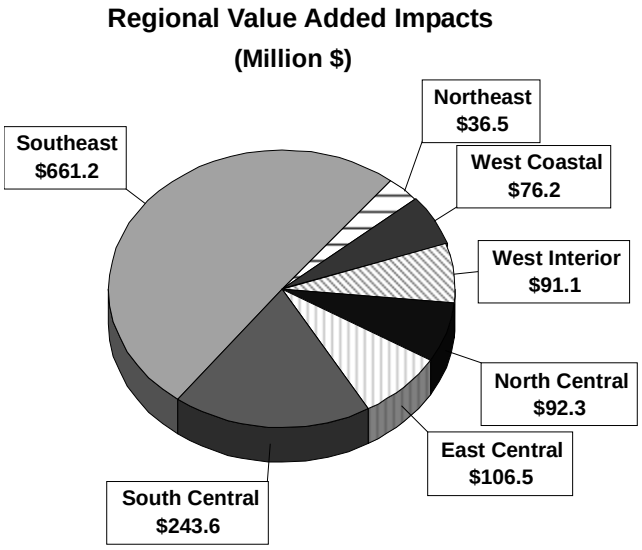

Fig. 3. Regional value added impacts of the U.S. sod production sector, 2002.

State and regional impacts. When ranking the top ten states in terms of total economic impact for sod production, four tiers are readily apparent. Florida clearly held the top tier in output impacts with nearly $344M, 20%, of the U.S. total (Fig. 2). Texas comprised the second tier with $183M in output impacts. Together these two states accounted for nearly one-third (30%) of total U.S. output impacts. Alabama at $118M and Georgia with $116M in output impacts were third and fourth, and represent the third tier. The fourth tier consisted of Oklahoma ($84M), California ($76M), South Carolina and Minnesota ($64M each), North Carolina ($51M), and Arkansas ($41M) with Colorado and Tennessee just out of the top ten with $40M each. Altogether, the top ten states accounted for $1.14B or 66% of sod production output impacts generated in the United States.

In terms of the top ten states for employment impacts for sod production, four tiers are again discernable, with Florida holding the number one spot at 3,604 jobs. Texas is ranked second with 1,530 jobs. Alabama and Georgia with 999 and 969 jobs, respectively, form a third tier. Rounding out the top ten states are Oklahoma, California, South Carolina, Minnesota, North Carolina and New Jersey — with employment ranging from a high of 721 in the case of Oklahoma to a low of 385 for New Jersey. Altogether, these states accounted for 66% of total employment by the U.S. sod production sector.

As shown in Fig. 3, the Southeast contributed the largest share of value added at $661M, just over 50% of the total value added impact by the sod industry. The top ten states for value added accounted for over two-thirds of the $1.31B in value added for the U.S. sod production industry (Fig. 4). Florida dominated with $309M, followed by three states — Alabama ($113M), Georgia ($109M), and Texas ($108M). A third tier is comprised of South Carolina, California, North Carolina, Oklahoma, Arkansas and Minnesota. Within this group, value added ranged from a high of $61M for South Carolina to a low of $32M for Minnesota.

It is important to recognize that rankings in one category, such as employment or number of firms, do not guarantee a

similar ranking with other indicators, because of the difference in economic structure among states. For example, with value added, Alabama and Georgia rank above Texas, which was second for both sales and jobs, and New Jersey reached the top ten only with jobs, replacing Arkansas, which was in the top ten for both sales impacts and value added, but ranked twelfth in jobs.

The U.S. sod production industry represents a vital sector within the turfgrass industry and is growing in importance in many states, particularly in southern states where sod is more easily grown. In Florida, sod realized $307M in farm cash receipts, making it a top ten agricultural commodity for the state. Similar prominent rankings are found in Alabama, Georgia, South Carolina and Texas, as well as Oklahoma and the northern states of Minnesota and Michigan. New residential construction in the United States grew from 1.57 million units in 2000 to 1.93 million units in 2005, representing a 22.7% increase (17). As urban populations continue to grow, the demand for landscape materials and sod will also grow. As it does, the supply of sod will increase in economic importance relative to many other agricultural commodities.

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