Maryland Sod Production Costs The Key To Business Success

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Editor's Note: Getting a fix on production costs of sod has been a primary goal of the sod industry. But, the industry as a whole is too diverse to make broad generalizations. Economists have thus tended to concentrate on costs of production within a given state. The following article was prepared from questionnaires answered by 90 percent of the Maryland producers who grew and/or sold sod in 1968 and 1969. In future issues WEEDS TREES and TURF will be publishing cost of producing sod in other states.

THE TURFGRASS INDUSTRY is a rapidly expanding segment of Maryland's agricultural economy. In fact, it demonstrates the interdependence between the state's agricultural and non-agricultural sectors.

In recent years, growth in the turfgrass industry has exceeded overall agricultural expansion. Reliabable estimates show a 70 percent increase in cultivated turfgrass acreage over the five-year period of 1963-1968. During this period, acreage increased from 7,000 to 11,590 acres. Of the 11,590 acres in 1968, 3,739 acres were harvested.

The revenue generated from this harvest contributed $3.0 million to Maryland's farm income and $10.9 million to other sectors of the state's economy from transportation and installation of turfgrass. During 1969, cultivation increased to 12,732 acres with an accompanying increase in farm-level income to $3.3 million.

The cost estimates derived from detailed interviews with turfgrass producers were divided into variable and fixed costs. Variable costs are the expenses incurred for employing variable inputs whose quantity increases or decreases with the level of output. Fixed costs refer to the expense incurred by a firm for employing fixed resources.

Table 1. Average Variable Cost of Production for Alternative Sizes of Turf Farms, Maryland, 1968

Item	Producer Size Group: Less than 100 Acres	100-150 Acres	151-300 Acres	Greater than 300 Acres	All Growers
	—Dollars Per Acre, Two-Year Production Period—				
Seed	29.00	22.40	22.10	29.00	26.69
Fertilizer	18.45	16.71	19.11	18.51	17.76
Top-dressing	24.08	25.37	25.90	32.81	26.73
Herbicides	6.36	8.56	6.49	10.69	7.32
Lime	10.64	10.33	9.76	8.42	9.76
Fuel and oil	7.03	7.74	5.09	7.97	6.81
Production labor	34.02	35.62	32.66	31.36	33.47
Interest on variable capital	17.68	17.18	16.56	18.86	17.60
Average variable cost	147.26	143.91	137.67	157.62	146.14

Supply expenditures included the value of all variable inputs whose quantity could be altered within the production period to effect a change in output. For turfgrass production, variable cost is comprised of expenditures for seed, fertilizer, herbicides, insecticides, lime, fuel and oil, production labor (labor expended for field operations) and interest (eight percent) on variable capital. Variable costs for alternative sizes of farms are reported in Table 1.

The largest single component of average variable cost was the expense incurred for production labor. Because labor accounted for such a large proportion of variable cost, 23 percent on average, the data dealing with labor requirements were subjected to statistical analysis in an attempt to discover possible sources of labor economies. Analysis of variance and sequential testing were used to identify which of the cultural practices reported in Table 2 would lead to significant labor reductions as farm size increased.

Labor reductions, significant at

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Table 2. Average Labor Requirements for Turfgrass Production[a]

Cultural Practice	Farm Size: Less than 100 Acres	100-150 Acres	151-300 Acres	Greater than 300 Acres	All Growers
	—Hours Per Acre, Two-Year Production Period—				
Seedbed preparation	3.55	2.37	1.99	2.50	2.64
Stone removal	3.33	3.15	0	0	3.26
Seeding	0.86	0.87	0.51	0.40	0.67
Top dressing	0.79	0.88	1.17	0.43	0.80
Spraying	0.65	0.53	0.50	0.61	0.57
Mowing	8.18	10.03	10.26	6.76	8.96
Total	16.09	17.14	13.69	10.61	14.62

[a]Simple summation by cultural practices will not yield the reported total labor requirement for each size of farm. Each estimate of the labor requirement by cultural practice was computed from only those growers in each farm category who actually performed that practice. Total labor for each size of farm is therefore a weighted summation of the labor requirement by cultural practice.

Table 3. Average Fixed Cost of Production for Alternative Sizes of Turf Farms, Maryland, 1968

Item	Producer Size Group				
	Less than 100 Acres	100-150 Acres	151-300 Acres	Greater than 300 Acres	All Growers
	—Dollars Per Acre, Two-Year Production Period—				
Machinery and equipment					
Depreciation	36.16	24.48	20.10	13.58	25.24
Repairs	20.88	14.16	11.62	7.86	14.60
Insurance	3.76	3.54	2.10	1.42	2.62
Permanent structures					
Depreciation	8.12	7.56	7.36	5.66	7.08
Repairs	2.66	2.48	2.42	1.86	2.32
Insurance	2.40	2.24	2.18	1.68	2.10
Supervisory services	3.42	7.31	9.09	28.56	10.04
Real estate tax	8.31	7.95	8.98	8.70	8.17
Interest on fixed capital	27.36	21.58	19.48	17.10	21.78
Land rental rate	34.00	34.00	34.00	34.00	34.00
Average fixed cost	147.07	125.30	117.33	120.42	127.95

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the 95 percent level, were observed for seedbed preparation, seeding and stone removal. In general, it was found that the largest farms were somewhat more efficient in their use of labor than the smallest farms and that some opportunities did exists for decreasing production labor requirements by increasing cultivated acreage from less than 150 to more than 150 acres.[2] However, the decrease in production labor did not lead to a reduction in production labor expense.

Wage rates, which averaged 40 percent more on the largest farms (as opposed to the smallest farms), resulted in almost constant production labor expense for all sizes of farms.

The cost of variable supply inputs (seed, fertilizer, top-dressing, herbicides, lime and interest on variable capital) declined gradually from $106.21 per acre on farms with less than 100 acres to $99.92 on farms with 151 to 300 acres, and increased to $118.29 on farms with more than 300 acres.

Farms with more than 300 acres typically employed more variable capital inputs in their production process in an attempt to produce a better quality grass than was produced on the less intensive operations of competing growers.

The majority of growers with more than 300 acres harvested a portion of their acreage and realized that the better quality grass was easier to harvest, easier to market and could command a premium price.

Expenses for fixed cost of production included expenditures for land, buildings or permanent structures, large equipment or machinery and supervisory services

Fixed costs reported in Table 3 were computed on an assumed machinery and equipment life of eight years with 20 percent salvage value. Fixed costs for permanent structures assumed a 20-year life with zero salvage value. The resulting annual cost for depreciation, repairs and insurance was 14.55 percent value of machinery and equipment complements and 4.95 percent of the new value of permanent structures.[3] Interest on fixed capital was charged at an annual rate of seven percent on the average value of fixed investment. The land rental rate of $34.00 per acre ($17.00 per annum) was chosen as the most accurate measurement of the opportunity cost of land used for turfgrass production.

The cost of supervisory services, labor other than required for field operations, increased steadily from the smallest to the largest farms. This was due to the prevalence of hired foremen on large turf farms, separation of turf fields, and the more sophisticated, time-consuming sales techniques which were necessary to assure a market for a much greater volume of turfgrass.

The absolute cost of machinery, equipment, buildings and interest on fixed capital declined as farm size increased (Table 4). However, the general decline in average fixed cost of production was offset bv increases in the cost of supervisory services when farm size exceeded 300 acres (Table 4). As a percent of average total cost, the cost of supervisory services increased steadily from 1.17 percent on the smallest farms to 10.27 percent on the largest farms.

Another factor which contributed to the cost structures in Table 4 can be seen by examining variable costs. The inputs of variable capital in the form of seed, fertilizer, herbicides and top-dressing differed with each size of farm (Table 4).

As a group, producers with the largest farms employed the greatest amount of variable capital inputs in their production process. They

Table 4. Average Per Acre Production Costs, Maryland Turf Farms, 1968

Item	Producer Size Group				
	Less than 100 Acres	100-150 Acres	151-300 Acres	Greater than 300 Acres	All Growers
	—Dollars Per Acre, Two-Year Production Period—				
Fixed Cost					
Machinery and equipment					
Depreciation	36.16	24.48	20.10	13.58	25.24
Repairs	20.88	14.16	11.62	7.86	14.60
Insurance	3.76	3.54	2.10	1.42	2.62
Permanent structures					
Depreciation	8.12	7.56	7.36	5.66	7.08
Repairs	2.66	2.48	2.42	1.86	2.32
Insurance	2.40	2.24	2.18	1.68	2.10
Supervisory services	3.42	7.31	9.09	28.56	10.04
Real estate tax	8.31	7.95	8.98	8.70	8.17
Interest on fixed capital	27.36	21.58	19.48	17.10	21.78
Land rental rate	34.00	34.00	34.00	34.00	34.00
Average fixed cost	147.07	125.30	117.33	120.42	127.95
Variable cost					
Seed	29.00	22.40	22.10	29.00	26.69
Fertilizer	18.45	16.71	19.11	18.51	17.76
Top-dressing	24.08	25.37	25.90	32.81	26.73
Herbicides	6.36	8.56	6.49	10.69	7.32
Lime	10.64	10.33	9.76	8.42	9.76
Fuel and oil	7.03	7.74	5.09	7.97	6.81
Production labor	34.02	35.62	32.66	31.36	33.47
Interest on variable capital	17.68	17.18	16.56	18.86	17.60
Average variable cost	147.26	143.91	137.67	157.62	146.14
Average total cost	294.33	269.21	255.00	278.04	274.09

spent 23 percent more for top-dressing fertilizers and 46 percent more for herbicide applications than the average for all growers in Maryland. The cost of employing these inputs was not a function of the size of farm, rather it was a function of management decisions. These more intensive applications of variable capital were an attempt to produce a higher quality, more uniform product which could be marketed with greater ease than turfgrass produced by the less intensive operations of competing producers.

In any examination dealing exclusively with costs, there is an inherent danger of excluding the critical economic variable which ultimately determines the success or failure of a business enterprise, profit or return to management. From the productive process, each of the four factors of production earns a return. Land earns rent, labor receives wages, capital earns its return as interest and management receives profit.

Returns to land, labor and capital have been incorporated into the cost of producing turfgrass by the inclusion of rent, wages and interest charges into the statement of average total cost. Any residual which remains between total cost and total revenue, whether positive or negative, must therefore revert to management.

Receipts for one acre of unharvested Common Ky. Bluegrass or a mixture of Bluegrasses and Red Fescue averaged $316.77 in 1968 (Table 5). Growers with the largest farms, typically producers of the best quality sod, received the highest price, averaging $340.25 per acre.

Often, turfgrass producers who incurred higher costs while attempting to improve the quality and appearance of their product earned a greater net return than growers who produced at a lower cost.

For example, farms with more than 300 acres received the highest price for unharvested turfgrass in 1968, while farms with between 151 and 300 acres averaged only $311.60 for grass of the same variety. The end result was a return to management of $62.21 per acre (two-year production period) on the largest farms and $56.63 on farms with 151-300 acres, the latter being farms which had the lowest average total cost of production (Table 5). Again, this can be explained by the different levels of costs and returns associated with the respective size of farm.

Net return to management for other sizes of farm are also shown in Table 5.

Table 5. Return to Management from Sale of Turfgrass by the Acre, Maryland, 1968

Item	Farm Size				
	Less than 100 Acres	100-150 Acres	151-300 Acres	Greater than 300 Acres	All Growers
	$ Per Acre	$ Per Acre	$ Per Acre	$ Per Acre	$ Per Acre
Gross receipts per acre	304.16	333.33	311.60	340.25	316.77
Less variable cost per acre including hired or operator labor equals	147.26	143.91	137.67	157.62	146.14
Return to land, fixed capital and management	156.90	189.42	173.93	182.63	170.63
Less fixed costs including seven percent on fixed capital and $34.00 land rental rate equals	147.07	125.30	117.30	120.42	127.95
Return to management	9.83	64.12	56.63	62.21	42.68

Larger farms, through their ability to spread fixed costs over more acres, were able to produce turfgrass at a lower cost than farms with less than 100 acres. However, a portion of the cost savings on larger farms was offset by increasing supervisory expenses. The net result was a higher average total cost on farms with more than 300 acres than on farms with either 100-150 or 151-300 acres.

Four factors can be credited with explaining the observable changes in cost which accompanied increases in size from the smallest farm to the largest producing unit:

1. Declining average fixed costs of machinery, equipment and buildings throughout.
2. Increasing supervisory expense throughout.
3. Higher wage rates on larger farms which offset physical labor economies.

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4. Variable supply expenditures which declined through the three smallest size groups and increased on the largest farms.

Under industry conditions which prevailed during 1968, farms with between 100 and 150 acres earned the maximum return to management from sale by the acre, $64.12 over a two-year period. Farms with less than 100 acres incurred the highest production costs and received the lowest price per acre which combined to yield the lowest per acre return to management, $9.83, for a two-year period. □

References

[2]For a more complete analysis of labor requirements, see Fred T. Arnold and Billy V. Lessley, **The Commercial Turfgrass Industry in Maryland: Structure, Costs and Returns,** Maryland Agricultural Experiment Station Bulletin No. 488, University of Maryland, College Park, Maryland, 1972.

[3]George A. Stevens, **Farm Data Manual,** Department of Agricultural and Resource Economics Information Series No. 6, University of Maryland, College Park, Maryland, August 1970, p. 154.

Toro's Irrigation Division Releases 12-Minute Film

Brushstrokes, a 12-minute film that tells how automatic underground irrigation is enhancing man's environment, has just been released by the Irrigation Division of the Toro Company.

Filmed in California, the film is a dialogue between Courtland Paul, a landscape architect and Edwin J. Hunter, vice president and general manager of Toro's Irrigation Division.

Paul points out in the narrative that it has long been a tendency of man to waste or abuse nature's resources but that tendency now is opposed by growing forces demanding conservation and preservation.

Irrigation, he says, not only aids conservation but actually is capable of generating new resources by nurturing and sustaining plant life on once-barren land and in "jungles of asphalt, concrete and structure."

Advantages gained by advances in irrigation components and systems technology are described in the film. Extensive use of plastics, it is pointed out, eliminated unsightly and hazardous above-ground piping and led to such development as pop-up, pop-down valve-in-head sprinklers which facilitate mowing and discourage vandalism.

Paul points out that recent developments in automatic control devices have improved the effectiveness and efficiency of modern irrigation systems. Ideally, he suggests, an irrigation system should simulate a "soft rainfall" under controlled conditions in order to apply water to match soil conditions and prevent wasteful runoff.

Prints of the 16mm sound/color film are available on free loan from Toro to teaching institutions and professional organizations associated with the irrigation industry. For information concerning availability of prints, write: Irrigation Division, The Toro Company, P.O. Box 489, Riverside, Calif. 92502.

Int. Erosion Control Assn. Names George Harrison Pres.

George Harrison, Erosion Control Superintendent of Washington Tree Service, Seattle was recently named president of the International Erosion Control Association. The association objectives are to encourage research into new and more efficient methods of stabilizing soils and preventing erosion loss.