FIXED SOD COST DECREASES AS MARYLAND FARM SIZE RISES

By J. Thomas Gilbert, Jr. and Billy V. Lessley[1]

This article discusses fixed and variable costs and returns by size of farm for producing unharvested turfgrass in Maryland in 1976.[3] A previous article detailed the importance of the commercial sod industry in Maryland. In 1976, the industry was composed of 63 growers who produced 8,712 acres of turfgrass. Of this acreage, an estimated 2,497 acres were sold for $5.4 million at the farm level.

Total cost estimates derived from conducting interviews with Maryland turfgrass producers were divided into categories of variable and fixed costs. Variable costs refer to all expenses that are a function of output and are incurred only if production is carried on. Fixed costs refer to those expenses incurred for employing fixed resources.

Variable expenditures for the production of turfgrass included seed, fertilizer, top-dress fertilizer, herbicides, lime, fuel and oil, production labor (labor used in field operations) and interest on variable capital (calculated at 8.25 percent) These variable costs of production for the various sizes of turfgrass farms are presented in Table 1.

The largest expenditure for any item of average variable cost for all growers was for top-dress fertilizer. This was followed closely by the expenditure for seed (Table 1). Producers were willing to spend these amounts for seed and fertilizer to promote a good stand of quality turfgrass. Individual costs for seed and top-dressing requirements were 22 and 24 percent, respectively, of total variable cost for the all growers category.

The next most important expense item of average variable cost was for production labor. Expenditures for production labor were based on labor requirements and hourly wages used in performing various typical cultural practices.

Table 2 shows that total labor requirements decreased as farm size increased to 300 acres then increased for farms with more than 300 acres. However, production labor cost economies were offset by an increasing average hourly wage paid as farm size increased. Wage rates ranged from $2.88 per hour on the smallest farms to $3.67 per hour on the largest farms, or a 27 percent increase. This increasing average wage rate caused average production labor expenditures to vary little for all farm sizes except farms with 151-300 acres. Producers in this category reported an average production labor cost of $45.44 per acre while other categories averaged around $60.00 per acre. The large decrease in production labor to 14.22 hours accounted for the lower labor cost for this size group (Table 2). Too, these 14.22 hours required for production labor were 35 percent less than the highest reported figure found on farms with less than 100 acres and 27 percent less than the state average.

Variable input cost requirements (seed, fertilizer, top-dressing fertilizer, herbicides, lime and

Table 1. Average Variable Costs of Production for Various Sizes of Turfgrass Farms, Maryland, 1976

Item	Farm Size: Less Than 100 Acres	100-150 Acres	151-300 Acres	Greater Than 300 Acres	All Growers
	Dollars Per Acre, Two-Year Production Period				
Seed	78.40	60.80	69.00	84.32	76.13
Fertilizer	32.96	33.40	29.12	37.06	33.54
Top-dressing	84.12	79.26	72.52	77.64	80.80
Herbicides	11.07	11.91	15.25	20.85	14.31
Lime	17.59	13.25	19.25	14.83	16.59
Fuel and Oil	32.27	30.36	26.77	31.55	31.11
Production Labor	63.65	60.39	45.44	59.58	59.61
Interest on Variable Capital	28.11	25.47	24.40	28.65	27.43
Average Variable Cost	348.17	314.84	301.75	354.48	339.52

Table 2. Average Labor Requirements for Turfgrass Production for Various Farm Sizes, Maryland, 1976[a]

Cultural Practices	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	4.13	3.59	3.20	3.10	3.69
Stone Removal	4.03	2.90	2.11	2.11	2.99
Seeding	1.05	.83	.48	.64	.85
Top-dressing	1.09	.74	.60	.94	.95
Spraying	.49	.28	.54	.55	.49
Mowing	13.72	13.69	7.94	10.11	12.11
Total Labor	22.07	20.33	14.22	16.24	19.43

[a] Simple summation by cultural practices will not give 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 size category who actually performed that practice. Total labor for each size of farm is therefore a weighted summation of the labor requirement by cultural practive.

[1] Scientific Article Number A2491, Contribution Number 5522 of the Maryland Agricultural Experiment Station, Department of Agricultural and Resource Economics. For more detailed information, an Experiment Station publication will be available in late fall or early winter.

[2] Research Assistant and Professor, Department of Agricultural and Resource Economics, University of Maryland.

[3] All costs are based on a two-year production period. This period was reported by the majority of growers as the production-marketing period that one could expect under normal conditions.

[4] George A. Stevens, *Farm Data Manual*, Department of Agricultural and Resource Economics, AREIS No. 18, Cooperative Extension Service, University of Maryland, College Park, Maryland, August, 1977. Repair estimates were based on a percentage of investment for buildings and equipment and were placed in the fixed cost category.

interest on variable capital) ranged from a high of $354.48 per acre on farms with more than 300 acres to a low of $301.75 per acre on farms with 151-300 acres (Table 1). The largest farms were charac-

Table 3. Average Fixed Costs of Production for Various Sizes of Turfgrass Farms, Maryland, 1976

Item	Farm Size: Less Than 100 Acres	100-150 Acres	151-300 Acres	Greater Than 300 Acres	All Growers
	— Dollars Per Acre, Two-Year Production Period —				
Fixed Costs					
Machinery and Equipment					
Depreciation	68.12	48.10	37.64	35.55	41.29
Repairs	34.06	24.05	18.82	17.78	20.65
Insurance	4.08	2.89	2.26	2.13	2.48
Permanent Structures					
Depreciation	19.26	14.56	10.78	10.18	14.70
Repairs	3.86	2.92	2.16	2.04	2.94
Insurance	3.86	2.92	2.16	2.04	2.94
Supervisory Services	7.21	6.70	15.14	26.05	13.65
Real Estate Tax	9.00	9.28	9.24	9.38	9.28
Interest on Fixed Capital	52.50	38.26	30.44	29.78	35.52
Land Rental Rate	70.00	70.00	70.00	70.00	70.00
Average Fixed Cost	271.95	219.68	198.64	204.93	213.45

Table 4. Average Total Costs of Production for Various Sizes of Turfgrass Farms, Maryland, 1976

Item	Farm Size: Less Than 100 Acres	100-150 Acres	151-300 Acres	Greater Than 300 Acres	All Growers
	—Dollars Per Acre, Two-Year Production Period—				
Fixed Costs					
Machinery and Equipment					
Depreciation	68.12	48.10	37.64	35.55	41.29
Repairs	34.06	24.05	18.82	17.78	20.65
Insurance	4.08	2.89	2.26	2.13	2.48
Permanent Structures					
Depreciation	19.26	14.56	10.78	10.18	14.70
Repairs	3.86	2.92	2.16	2.04	2.94
Insurance	3.86	2.92	2.16	2.04	2.94
Supervisory Services	7.21	6.70	15.14	26.05	13.65
Real Estate Tax	9.00	9.28	9.24	9.38	9.28
Interest on Fixed Capital	52.50	38.26	30.44	29.78	35.52
Land Rental Rate	70.00	70.00	70.00	70.00	70.00
Average Fixed Cost	271.95	219.68	198.64	204.93	213.45
Variable Costs					
Seed	78.40	60.80	69.00	84.32	76.13
Fertilizer	32.96	33.40	29.12	37.06	33.54
Top-dressing	84.12	79.26	72.52	77.64	80.80
Herbicides	11.07	11.91	15.25	20.85	14.31
Lime	17.59	13.25	19.25	14.83	16.59
Fuel and Oil	32.27	30.36	26.77	31.55	31.11
Production Labor	63.65	60.39	45.44	59.58	59.61
Interest on Variable Capital	28.11	25.47	24.40	28.65	27.43
Average Variable Cost	348.17	314.84	301.75	354.48	339.52
Average Total Cost	620.12	534.52	500.39	559.41	552.97

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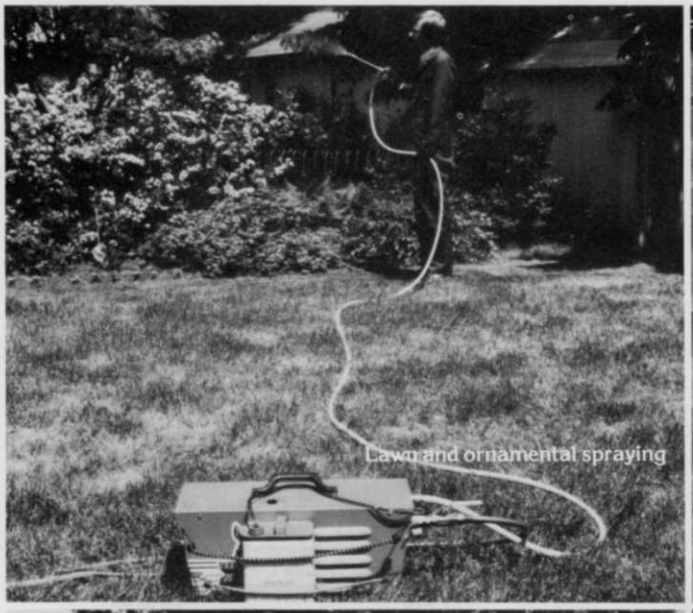
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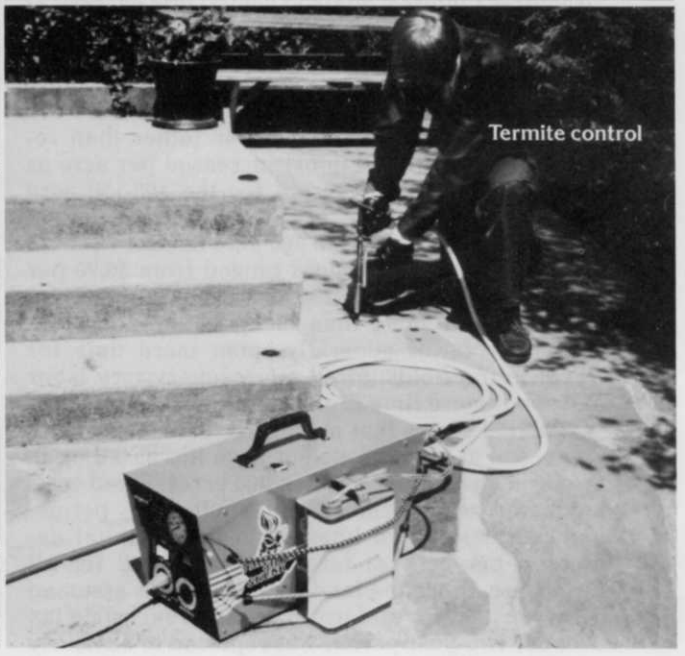
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terized as spending above or near average per acre costs for seed, fertilizer, top-dressing fertilizer and production labor. The use of these inputs at or above average cost was not a function of farm size, rather a function of production management decisions. The more intensive applications of production inputs were an effort to insure adequate growth, appearance and quality of the grass which would ultimately help in the marketing and sale of the product.

Fixed costs incurred in the production of sod over a two-year production period are reported in Table 3. The calculated annual fixed cost for all machinery and equipment was based on an assumed life of the asset of eight years with 20 percent salvage value. The average fixed cost per acre for buildings and permanent structures assumed a 20 year life and zero salvage value. The resulting annual cost for depreciation, repairs and insurance was calculated at 15.6 percent of the value of the machinery and equipment complements and seven percent of the new value for permanent structures.[4] Interest on fixed capital was charged at an annual rate of 8.5 percent of the average value for fixed investments. A land rental rate of $70 per acre ($35.00 per year) was used as the opportunity cost of land for sod production.

The cost of supervisory labor (other than required for field operations) increased per acre as farm size increased, except for the 100-150 acre farm size category which was nearly equal to that reported for the less than 100 acre category (Table 3). Costs for these services ranged from $6.70 per acre for farms with 100-150 acres to $26.05 per acre for farms with more than 300 acres. Producers on the larger farms generally spent more time for travel to the fields, hired more supervisory labor and spent more time finding and negotiating sales.

Table 3 shows that average fixed cost per acre decreased as average size of farm increased up to the farm size of greater than 300 acres. Fixed costs attributed to machinery and equipment, permanent structures and interest on fixed capital decreased per acre as farm size increased for all farm sizes. Since the land rental rate was assumed to be constant for all farm sizes, and real estate tax over the two-year period was reported to be nearly equal for all farm sizes, the increase in the total fixed cost per acre on farms of greater than 300 acres can be traced to increasing supervisory labor costs as farm size increased. Again, the higher supervisory cost is explained by time being spent in supervising a large number of employees and managing the intensive cultural practices, while also spending time in transacting sales for the extra volume of output on the largest turfgrass farms.

To summarize, an examination of the average total cost items shown in Table 4 reveals there are four areas which affected the total cost structure for the various farm sizes:

1. Average fixed cost per acre for machinery, equipment and permanent structures decreased as farm size increased for all farm sizes.

2. Costs of supervisory services increased per acre as farm size increased except for the 100-150 acre farm size category where the cost was nearly equal to that reported for the less than 100 acre size category.

3. Average variable cost decreased through the three smallest farm size groups but increased to its highest level on the largest farms.

4. Hourly wages paid, according to farm size, increased as farm size increased, virtually offsetting any dollar savings from lower per acre labor requirements on the larger farms.

Gross receipts per acre for mixtures of Kentucky bluegrasses and Red Fescue or Kentucky-31 Tall Fescue and Kentucky bluegrass sold on an unharvested basis for an average of $657.09 per acre in 1976 (Table 5). The receipts ranged from a low of $611.36 per acre on farms with less than 100 acres to a high of $734.50 per acre on farms with 100-150 acres.

Table 5. Return to Management from Sale of Turfgrass by the Acre, Maryland, 1976

Item	Farm Size (Net Acres of Turf)				
	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	611.36	734.50	685.00	700.00	657.09
Less Variable Cost Per Acre Including Hired or Operator Labor Equals	348.17	314.84	301.75	354.48	339.52
Return to Land, Fixed Capital, and Management	263.19	419.66	383.25	345.52	317.57
Less Fixed Cost Per Acre Including 8.5% on Fixed Capital and $70.0 Land Rental Rate Equals	271.95	219.68	198.64	204.93	213.45
Return to Management	—8.76	199.98	184.61	140.59	104.12

Return to management (gross receipts minus expenses) from the sale of turfgrass sold on a unharvested basis for various farm sizes is also reported in Table 5. Under industry conditions prevailing in 1976, farms with 100-150 acres, selling turfgrass on an unharvested basis, realized the highest return to management of $199.98 per acre over the two-year production period. Farms with less than 100 acres, which incurred the lowest average price per acre and the highest total production costs per acre, realized a negative return to management of -$8.76 per acre for the two-year production period.

The third article in this series concerning the Maryland sod industry will present costs and returns for various vertically integrated production, harvest and transportation options observed for the industry in 1976. **WTT**

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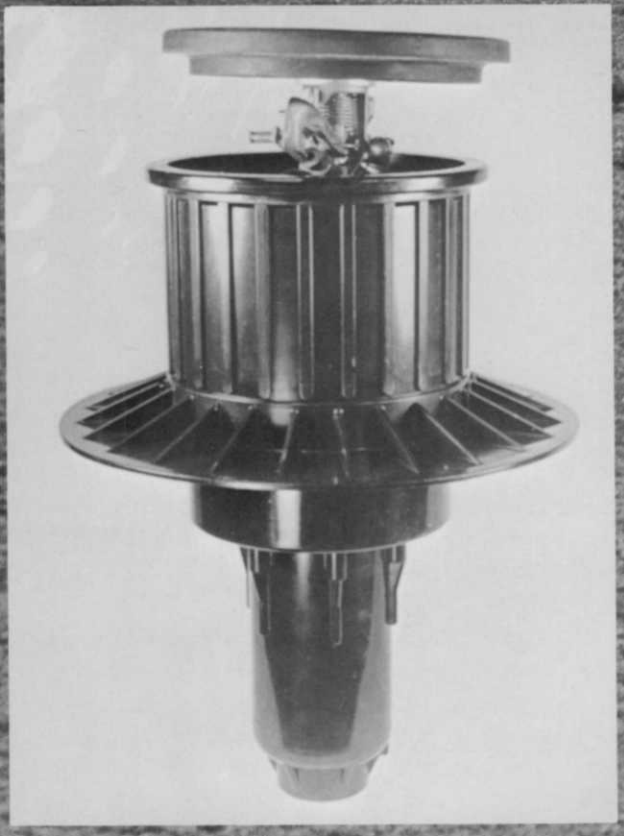

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VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *I have a turf area in an industrial lawn that has a cation exchange capacity of 7.5. What would you recommend as a top dressing to build up the soil, and how often should this material be applied?*

A: As you probably are aware, many people consider the cation exchange capacity (CEC) of a soil the best single index of potential soil fertility. A "good" CEC would be in the range of 14 to 20 milliequivalents per 100 grams of soil. The CEC of your soil (7.5) indicates a fine sandy loam that would have problems retaining both nutrients and water.

Organic matter improves the CEC of sandy soil more rapidly than mineral soil (clay or silt) additives, although a good top soil would be satisfactory. However, the use of a top dressing that is distinctly different from the underlying soil may result in the development of an interface, a layering affect that impedes penetration of air and water. Top dressing in conjunction with a coring process will minimize the layering by providing some integration of the soil and top dressing. The top dressing process may be repeated over a period of several years until the desired CEC has been achieved.

Q: *What is the best application for getting rid of broadleaf weeds when one doesn't want to affect or damage (kill) newly planted trees. We've lost trees with spray applications.*

A: We have had good success with paraquat or Roundup although you may get some injury on young, green-barked trees.

Q: *I have a maple tree with roots that are on the surface and are injured when I mow. Can I cut off these roots safely?*

A: Unless there are a number of large roots, you should be able to prune them without causing injury to the tree. However, the roots are differentiated near the surface because that is where conditions are favorable for root growth and development. Maples are notorious for surface rooting, but compacted soils, waterlogging and other factors which inhibit air penetration contribute to surface root development. Unless these conditions are corrected, new roots may reappear on the soil surface.

Q: *I always used a wetting agent when I applied paraquat, but someone told me not to use one with Roundup. I have been using it anyhow. Who is right?*

A: Whoever told you not to use a spreader sticker with Roundup is right. Always follow the recommended application procedures on the chemical label. The Roundup label states, "DO NOT ADD ADDITIONAL SURFACTANT."

Q: *What is the latest status on tree wound dressings? Should we still be using them?*

A: Although there has been some fairly recent research indicating that tree wound dressings do not prevent the entry of decay organisms, other evidence has shown that certain beetles are attracted to fresh wounds on trees if they are not painted. One Minnesota tree company was sued for not painting cuts on oaks which subsequently died from oak wilt, a disease carried by sap feeding beetles. Of course, the best policy would be to avoid pruning whenever possible during periods of beetle flight.

New research is being performed and projected by the Davey Company and by others in the field of arboriculture. Until more conclusive evidence is available which suggests that pruning cuts should not be treated, our recommendation will remain to paint all pruning cuts over one inch in diameter. **WTT**

PROSCAPE

By Michael Hurdzan, Ph.D., golf course designer and consultant

Q: *We have had little success removing Poa annua from our bent greens. Is there any new chemical I can use this fall to eliminate or at least slow down the annual bluegrass?*

A: Although researchers at many universities and chemical companies are working on this problem, there have been no recent major advances in selectively controlling *Poa annua* in bentgrass. The physiology of the annual bluegrass is so close to that of desired turfgrasses it is difficult to develop a selective control mechanism.

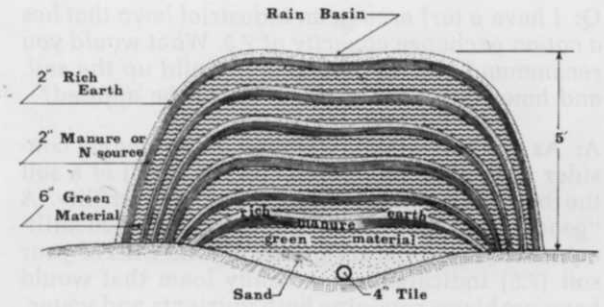
Annual bluegrass germinates during cool, moist times of the year (spring and predominately fall). It produces seedheads in late spring and early summer. Preemergence materials must be applied in both spring and fall during active germination. Post-emergence materials are applied after germination when the plant is most susceptible to the specific chemical. Although some superintendents have had remarkable success with post-emergence materials on bentgrasses, pre-emergence materials appear safer to use on bentgrass.

Bensulide (Betasan®) is a preemergent herbicide manufactured by Stauffer Chemical Co., which kills germinating *Poa annua* seeds. To be effective, the chemical must be in the root zone during germination. Disruptions of the root zone after application reduce the effectiveness of bensulide. Maintenance procedures such as thatching, vertical mowing, aerification or heavy topdressing should be done two to three weeks prior to application. In addition, overseeded or sodded turf should not be treated for a period of at least three mowings after installation or seeding.

The residual period of bensulide is about 4-6 months on sand-base greens and 8-12 months on soil depending upon soil type, soil texture, pH, and rainfall or irrigation frequency. This means that no reseeding should be done within four months of application. However, bensulide can be deactivated by applying seven pounds of activated charcoal per 1000 sq. ft. and washed into the soil by irrigation. Then reseeding can be done after only seven days.

Although our arsenal against *Poa annua* in bentgrass is limited, bensulide has a good safety factor, can be quickly deactivated with charcoal, and is readily available. It must be integrated into the overall maintenance and renovation program, but when properly done over a three year period, it has given good results.

Right now is the time to apply the fall application of any pre-emergence material. If you are uncertain of its performance, at least establish a test area for yourself on half of a green, tee, or well maintained nursery area. This field observation is valuable not only to yourself and other superintendents but to the chemical companies as well.



Q: *Can you recommend a good method of compost pile construction?*

A; The standard compost pile is made by first laying down a 5-6" layer of green material, a 2" layer of manure, (blood or bone meal, sewage sludge, or other high protein material), a 2" layer of rich earth, ground limestone and rock phosphate. This process of layering is continued until the pile is about five feet high and five feet wide. The length of the pile is optional. This gives the best aeration to the compost pile.

After this material has been piled up and the surface lightly tamped to prevent blowing, form a shallow basin on top of the pile to catch rain water. Lastly cover the pile with a thin layer of topsoil. All that remains is to thoroughly wet the pile and let it decay, turning the pile every 4-5 weeks.

From this basic method many variations have been developed such as pits, using fencing to hold the compost pile, or bricks, and using different materials. As long as the pile is turned every 3-4 weeks as the temperature inside the pile reaches 150° F.

Compost piles provide a perfect way to get rid of leaves and grass clippings and return a profit from the sale of the compost. To make a leaf compost requires a good size pile of leaves that have been shredded by either being put thru a shredder or mulched with a rotary mower with a mulching attachment. Since leaves are low in N they must be supplemented with a fertilizer for optimum composting. A good formula is a 1:1:1:.2

100# of leaves
100# of grass clippings or old hay
100# of manure (2-3# N)
20# of ground rock minerals (P,K, Ca)

Mix all these shredded materials together and wet the pile thoroughly. By the second day the pile should start to heat any by the third day it should be turned. Then turn the pile for the next 12-15 days on a three day cycle until the pile starts to cool. Place the material thru a shredder and it is ready to use.

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