inventory to offset down time is also worthy of consideration.

Labour Costs (50% of the cost per acre)

This is the highest portion of the cost per acre to cut grass. The cost may vary from minimum wage to over $16 per hour and depends on the geographic region. Labour costs include the time to load and unload or otherwise transport the mower and the fuelling and daily service of the mower which reduce the time for mowing although the operator is paid for an eight hour day. It is generally considered that only 6.5 hours are spent mowing out of an eight hour day.

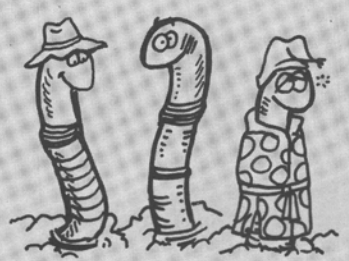
In addition to the base wage of the operator are the fringe benefits such as medical plans, pension schemes, workmen's compensation, federal and provincial taxes, educational and training allowances, and even safety shoes and hearing protection.

Investment Costs (6% of the cost per acre)

This is an allowance for the value of the money which could be invested and the mowing done by contract. Generally a mower will last for 8 to 10 years during which it will operate about 6,000 hours.

GRASS CLIPPINGS

Although 7,000 species of earthworms have been identified in the world, only three, the garden worm, the red worm and the night crawler are the most common types. Earthworms do not feed on living plants but are effective in reducing the accumulation of organic residues on the soil surface. Thus pesticides which reduce earthworm populations result in increased thatch accumulation.



GTI RESEARCH HILITES

The efficacy of many insecticides depends on the placement of the material relative to the zone of activity of the insect. An example is the control of the European Chafer whose larvae or grub feeds on the crown and surface roots of turf species. Insecticides left on the surface are not effective, therefore a system for moving the material into the active feeding zone is required.

The most common system is to water the insecticide in, but often insufficient water is applied to move the material to an adequate depth or an irrigation system is not available. The presence of a thatch layer increases the difficulty of moving the insecticide downward.

Prof. Mark Sears of the Dept. of Environmental Biology examined subsurface injection systems for the placement of insecticides below the turfgrass thatch layer for the control of the European Chafer at two locations in 1992. Prof. Sears applied emulsifiable concentrates or flowable formulations of Diazinon and Chlorpyrifos (Dursban) to plots at recommended and half rates. He used a conventional sprayer system applying 4.5 L water/100 m^2, a Toro Hydraject Liquid Pulse Injector at a rate of 57 L water/ m^2, and a Pattison Bros. Liquid Spoke Injector at the same rate. At a location on the OVC lawn he also applied a insect parasitic nematode with the sprayer system and with the Spoke Injector.

Three weeks after application the plots were examined for live grubs within a 0.33 m^2 area. The results of his findings are recorded in Table 1.

Both the commercially available insecticides were effective in controlling the grubs when applied with a sprayer at Cambridge where there was a high grub numbers. Less consistent data was found on the OVC lawn where Dursban 480EC was the better material.

The use of the two types of injectors did not consistently improve the efficacy of the insecticides. The potential for the Toro Hydraject system to relieve compaction in addition to providing a system for applying an insecticide is an additional benefit where a combined problem of grubs and compaction exists.

Significant control of the Chafer was obtained with the insect parasitic nematode. The nematodes applied with a conventional sprayer appear to be more effective than those injected with the spoke system. This non chemical approach to control is worthy of further investigation.

Table 1. The percentage reduction in grub numbers due to insecticide applications by three systems in 1992.

Application System	Insecticide	Rate	Cambridge*	OVC Lawn*
		(kg a.i./ha)	(% of check)	
Toro	Dursban 480EC	1.8	79.4	33.3
Toro	Dursban 480EC	0.9	80.4	45.8
Toro	Diazinon 500EC	4.5	93.8	91.7
Toro	Diazinon 500EC	2.25	60.8	50.0
Spoke	Dursban 480EC	1.8	95.9	16.7
Spoke	Dursban 480EC	0.9	90.7	50.0
Spoke	Dursban 50 WSP	2.25	80.4	58.3
Spoke	Dursban 50 WSP	1.13	68.4	37.5
Spoke	Diazinon 500EC	4.5	93.8	70.8
Spoke	Diazinon 500EC	2.25	66.0	37.5
Spoke	Nematode	Full	-	54.2
Sprayer	Dursban 480EC	1.8	80.8	95.8
Sprayer	Dursban 50 WSP	2.25	92.8	45.8
Sprayer	Diazinon 500EC	4.5	94.8	0.0
Sprayer	Nematode	Full	-	83.3
Sprayer	Nematode	Half	-	54.2

*Grub Number in Control: Cambridge = 24; OVC Lawn = 12.