Effect of topsoiling, fertilisers, and soil conditioners on pasture production from areas where topsoil is removed during land forming

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Pritchard and Mason (1) posed the question whether soils in the Goulburn Valley in northern Victoria were suited to landforming. The same question could be asked about most soils in any district. It is an inevitable consequence of landforming that the soil structure is damaged as large volumes of soil are moved using heavy machinery. Laser grading requires many passes over the one area to get the necessary accuracy. Where the soil is removed, the 'cut' areas, damage to the subsoil structure is especially severe. These cut areas are also low in plant nutrients. Pritchard and Mason showed that normal soil produced about 50% more crop than where topsoil was removed. In the Macalister Irrigation District in east Victoria most landformed areas are sown to pasture and replacement of topsoil on cut areas is now a common practice.

Method

In 1983 an experiment was begun on the Macalister Research Farm near Maffra to assess the effect of replacing topsoil on cut areas together with other methods of improving soils. A landformed area where 0.5m soil had been removed was divided into three sections. In one section a further 50mm of soil was removed and replaced with topsoil, in another the same was done to 100mm depth and the third area was left untreated. Across all three sections soil conditioners (2 replicates) were applied before sowing in autumn. A mixture of perennial ryegrass, apanui cocksfoot and white clover, was drill sown with 250kg/ha superphosphate. Other fertilizer treatments were applied in July 1983.

Results and Discussion

Table 1. Soil analysis of topsoil areas and subsoil (0-100mm sample

	pH	Olsen P ppm	Skene K ppm	Total N %	Org. C %
Subsoil	6.5	3.3	133	0.08	0.4
Topsoil (50mm)	6.1	7.1	168	0.14	1.2
Topsoil (100mm)	5.7	19.7	406	0.23	2.7

Exchangeable cations (me/100g): Subsoil Ca^{++} 3.3, Mg^{++} 2.9, Na^{+} 0.2, K^{+} 0.4.
Topsoil Ca^{++} 3.8, Mg^{++} 1.6, Na^{+} 0.2, K^{+} 1.0.

Table 2. Pasture dry matter yield 1983/84

	Subsoil kg/ha	50mm Topsoil kg/ha	100mm Topsoil kg/ha
Control [1]	3046	3682	5585
500kg/ha Super Potash 3:1 (PK)	3326	3880	5947
PK + molybdenum (50 gm/ha)	3712	3712	6103
PK + nitrogen (50kg N/ha)	3190	4871	5930
PKN + gypsum (10t/ha)	4016	4879	5773
PKN + lime (5t/ha)	4235	4637	6235
Gypsum (10t/ha)	2454	3326	5576
Lime (5t/ha)	3348	4326	5918

Note: 250kg/ha super applied all treatments at sowing.

In the first year after sowing the area with 100mm topsoil outyielded other two areas in all treatments by about 70%. There was a small response to super potash which will probably increase as pasture production increases. Nitrogen gave an initial boost to pasture but had a depressing effect on clover growth which more than offset the benefit. If nitrogen is used much smaller dressings may be better

(<25kgN/ha). Gypsum had little effect as expected from exchangeable cation levels. Lime gave a small response as did molybdenum.

1. Pritchard K.E. and Mason W.K. 1982 Proc. 2nd Aust. Agron.Conf., Wagga, p. 306.