Landforming in northern Victoria - are our soils suited to this technology?

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Landforming, or laser-levelling, has become very popular with irrigation farmers because of advantages offered, including:

- better water control through larger bay size and uniform slope,
- because of (a), irrigation is easier and automation possible,
- lower costs, with increased water use efficiency and reduced labour,
- increased production by removal of poorly watered areas.

Better salinity control and an increase in the range of cropping possibilities, as surface drainage is improved, are also suggested as advantages. However, problems can be caused by landforming: red-brown earths are the dominant soil type in this area and have shallow surface loams (typically 150 mm deep) overlying a heavy clay B horizon which can be exposed.

Methods

In 1979 an area of Lemnos loam was divided into plots, half of which were stripped of topsoil and topdressed with gypsum at 12.5 t/ha. Chemical analyses were done on samples from untreated A and B horizons. The plots were sown to maize (XL77) and soybeans (Bethel) in 1979/80 and to maize and sorghum (Honeydrip) in 1980/81. All plots were fertilized with 23 and 28 kg P/ha and 51 and 200kg N/ha in 1979/80 and 1980/81 respectively. An additional 19 kg P/ha and 68 kg N/ha was applied to the stripped plots in 1979/80 to counter their lower nutrient status. Before the second sowings all plots were ripped to 0.6 m. Furrow irrigation was an additional treatment on the stripped plots.

Results and Discussion

Table 1. Some differences between A and B horizons for Lemnos loam

	PH	Available P (p.p.m.)	Available K (p.p.m.)	Total N (%)	Organic C (%)
A Horizon	5.8	17.2	194	0.283	3.1
B Horizon	7.5	1.9	198	0.079	0.6

Removal of the topsoil removed soil nutrients and organic matter (Table 1), and caused other problems:

- Exposed clay tended to slake and disperse when wet: stable structure is inhibited by low organic matter even when gypsum is applied.
- Poor infiltration and limited root penetration reduced the availability of water to plants.
- Seedling establishment was poor.

Table 2. Total dry matter yields.

	Topsoil removed		Normal soil
	Furrow (kg/ha)	Flood (kg/ha)	Flood (kg/ha)
Maize (1979/80)	10,100	8,290	26,200
Soybeans (1979/80)	4,430	4,920	11,600
Maize (1980/81)	11,000	9,510	23,700
Sorghum (1980/81)	15,000	16,000	30,600

Despite gypsum and ripping (1980/81) treatments, stripping topsoil reduced yield by about 50% (Table 2).Germination rates were lower with flood irrigation but accounted for little of the yield differences

between treatments. Research is needed to establish whether yield reduction can be overcome with management of fertilizers, irrigation water and soil amelioration. We may then need to consider topsoil replacement for landforming policy. Whatever the result, these problems must be considered when assessing the need for landforming.