Drainage for crops and forages

A. Ellington, G.W. Ganning and A.C. Bakkert

Rutherglen Research Institute and tAg. Eng. Centre, Werribee, Department of Agriculture, Victoria

Almost half of the farmed land in Victoria suffers periodic subsurface waterlogging, while in South Australia and Western Australia most of the land receiving more than 500 mm rainfall annually suffers similarly (1). Evidence on crop loss from waterlogging was gained at Rutherglen in 1983, from a demonstration of drainage with soil management practices on large plots.

Methods

An underground drain pipe was installed in an acid, compacted soil which regularly becomes waterlogged. Main treatments across the drain were lime (?3 t ha^{-1}) and deep ripping with a Paraplow to 35 cm depth. Sub-treatments across the drain were wheat, barley, oilseed rape, Hamburg lupins, clover/ ryegrass, and lucerne.

Results and Discussion

Yields of wheat, barley, oilseed rape, lupins, lucerne and clover/ryegrass pasture were increased by deep ripping and by underground drainage, with further increases from all the species except lupins being obtained with the addition of lime (Table 1).

Table 1 Grain yields (t ha^{-1}) and dry matter yields (t ha^{-1}) after subsurface drainage, liming and ripping

	Wheat	Barley	Rape†	Hamburg Lupin	Lucerne (1 cut)	Clover/Ryegrass
No drain No Rip No Lime	1.8	0.8	0.18	0.13	0.04	2.4
Lime 3 t ha^{-1}	2.6	0.8	0.21	0.14	0.12	4.8
Drained No Rip No Lime	2.3	1.0	0.35	0.59	0.03	2.6
Lime 3 t ha^{-1}	3.5	1.7	0.55	0.33	0.69	3.4
Drained Rip 35 cm No Lime	3.9	2.1	0.50	2.38	0.10	5.2
Lime 3 t ha^{-1}	4.2	2.5	0.98	1.07	0.76	6.9
s.e.	0.2	0.3	0.08	0.15	-	0.3

† Hail caused 50% loss of rapeseed

Hydraulic conductivity increased from 0.1 m day^{-1} (unripped) to between 0.6 and 1.5 m day^{-1} (ripped). The watertable was lowered from 2-10 cm depth (unripped) to 35-40 cm depth (ripped) during August and September. The drain lowered the watertable for only 5 metres from the drain in unripped soil and for more than 30 metres in ripped soil.

During that time, five rain events resulted in water runoff in the region, giving floods of muddy water which caused crop loss, flood damage and reduced water quality in down-stream areas. The loosened and drained soil acted as a buffer against the floods, storing the water and releasing some of it gradually as a steady stream of clear water. Of 197 mm of rain which fell in the period, 77 mm was released in this way. The remainder presumably percolated deeper into the subsoil, as there was no noticeable runoff and little evaporation from the treated area, and probably contributed to the increased yields which were obtained on the treated land.

The results confirm the importance of subsoil loosening where a hardpan exists, to increase the effectiveness of subsoil drainage works (2).

1. Northcote, K.H. (1978). Australia - Soil Resources. Division of National Mapping, Canberra.

2. Trafford, B.D. (1975). In: Soil physical conditions and crop production. Tech. Bull. 29, MAFF, HMSO, London. p. 417-436.