

## Reduced cultivation for irrigated maize on a red-brown earth

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Despite the worldwide movement towards reduced or zero cultivation for crop production in recent years, there has been little research or adoption by irrigated agriculture. The red-brown earths which dominate Australia's irrigated areas have been thought to be unsuited to direct drilling because of their dense and hard setting surface soils (1.5 g/cc). However, these soils have a fragile structure which is degraded by cultivation and irrigation. Reduced tillage is desirable to maintain soil structure formed during a pasture phase, as well as for reducing time and energy inputs.

### Methods

Irrigated maize was grown for two seasons on Lemnos loam using varying degrees of cultivation including complete seedbed preparation with furrow irrigation (CC), single pass soil disturbance treatments using a 'PARAPLOW' (PP) or 'ROTAVATOR', and direct drilled (DD) into undisturbed pasture. The 'PARAPLOW' was used at three depths (150, 200, 350 mm) and differing irrigation strategies were tried with DD treatments to help the young crop cope with rapidly hard setting surface soil. In all treatments except CC, narrow rotary hoes (50 mm) were used to prepare a seeding slot in front of the planter. Annual pasture (10 years old) was sprayed out with glyphosate (3 L/ha) and atrazine (5 L/ha) was applied for summer weed control; 36 kg P/ha and 240 kg N/ha was applied. There were six treatments each year (3 replicates in year 1, 5 in year 2) but some treatments were changed in the second year. Establishment was excellent for all treatments.

### Results and discussion

Total dry matter yields for three treatments common to both years are given in Table 1

**Table 1. Yields (t DM/ha) of maize (cv. P.3183)**

	1986/87	1987/88	Mean
Cultivation (furrow irrigated)	23.5	23.6	23.6
'PARAPLOW' (200 mm deep)	22.6	24.1	23.4
Direct drill	20.5	22.7	21.6

There was no significant yield difference in either year. In year 2, grain yields were measured. These were CC 11.9, PP 12.3, DD 11.9 t/ha at 12%.

Seedling growth of DD crops was slightly retarded. At 28 days from emergence mean plant heights were 500 mm for CC and PP but 460 mm for DD. Root development at this stage (measured by interception of a 50 mm soil core) showed more roots at 100 mm with cultivation (CC 12.7 v 1) 8.2 roots/plant) but at 250 mm, despite much greater penetrometer resistance. DD plants had equivalent root development (CC 5.0 v DD 5.9).

Soil water intake and extraction as measured by a neutron probe showed that cultivated treatments always held and extracted more water above 0.6 m, but DD crops used more subsoil moisture (0.6 - 1.0 m) during grain fill.

Rhizoctonia root rot was identified in DD plots in year 1. Its patchy incidence caused variable yield reduction.

These results indicate good prospects for the development of systems of reduced cultivation for irrigated crops on soils previously thought to be physically unsuited to such techniques.