Management Options for intensive cropping of red duplex soils

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Poor soil structure is a major constraint to efficient dryland cropping on most of the red-brown earth soils of north-central Victoria. A long-term (10 year) rotation-tillage experiment was established in 1986 to assess some of the management options available to farmers wishing to intensively crop these soils. This paper outlines this experiment, then reports the yield results from the first two years.

Methods

Major factors chosen for investigation were:

• The effects of fallowing, reduced tillage and stubble retention on available soil water and nitrogen, soil structure and crop yields.

• The value of field peas in maintaining available soil nitrogen.

Experimental treatments are:

• Rotation: Three cycles of all phases of two rotations, PeWB and PeFW (Pe=Field Peas, W=Wheat, B=Barley, F=Winter Fallow)

• Tillage: Minimal (chisel plough - narrow points, plus herbicides) and conventional (chisel plough - wide points)

• Stubble management: Burnt (Autumn) and stubble retained.

Results and discussion

The grain yield data (see Table 1) shows that treatment effects varied in these two years. For example, wheat showed substantial yield responses to fallowing in 1988 but not in 1987. Differences in stored soil water were probably involved, as cultivated bare fallow stored from 27 (1987) to 48 (1988) mm/150 cm more water than uncultivated chemical fallow with a surface mulch. In 1988, the yield response to conventional fallowing (0.95 t/ha) approximated the potential water use efficiency of 20 kg/ha/mm proposed by French (1).

Yields of the "conservation tillage" treatments were generally similar to, or less than, the corresponding "traditional" treatments. Barley yields in 1988 were good, despite severe damage during early growth by Rhizoctonia solani.

Table 1: Effect of rotation, tillage and stubble management in 1987 and 1988 on grain yields on a red duplex soil

Grain yields (t/ha)		1987				1988			
	Crop	Conv. till		Min. till		Conv. till		Min. till	
Rotation	phase	Burn	Retain	Burn	Retain	Burn	Retain	Burn	Retain
PeFW	W	2.21	2.19	1.73	1.93	3.74	3.66	3.00	2.93
	Pe	1.31	1.19	1.02	1.48	2.14	2.15	2.11	2.20
PeWB	W	2.47	2.46	2.48	2.23	2.79	2.34	2.35	2.34
	B	1.22	1.14	0.78	0.83	2.32	2.39	1.88	1.81
	Pe	1.46	1.38	1.12	1.46	2.13	2.07	1.87	2.01
LSD ($P<0.05$)		Differences between means = 0.30(1987) 0.28 (1988)							

1. French, R. J. (1987). Proc. 4th Aust. Agronomy Conf., pp. 140-149.