

The effect of deep tillage and fallow on yield of wheat on a hard setting soil

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Direct drilling of wheat into hard setting soils can produce low yielding crops. Poor seedling vigour of direct drilled crops can be responsible for these low yields (1). An investigation was commenced in 1983 at Cowra to look at the relative importance of deep tillage, cultivation and moisture conservation on seedling vigour and grain yield of wheat.

Methods

Half the plots in a degenerated lucerne-subterranean clover pasture on a hard setting red-brown earth soil (Northcote Classification Dr 2.63) were deep tilled to 20cm with an Agrowplow in March 1983. Superimposed on these two treatments were conventional (three scarifyings), chemical (knockdown herbicide) and nil fallow treatments. All treatments were sown with Banks wheat 84 days after the fallow treatments were imposed and 7 days after the nil fallow treatment had received a knockdown herbicide.

Results and Discussion

Both primary and secondary tillage operations increased the dry matter production from wheat harvested 97 days after sowing (Table 1). The lower dry matter production from the non-tilled plots was associated with reduced seedling vigour rather than poor plant establishment. The better soil moisture conservation in the chemical fallow plots offset the high soil strength of the non deep tilled plots and resulted in a dry matter production between that of the nil and conventional fallow plots.

The lower grain yield observed under the nil fallow treatment was probably caused by a lower profile moisture storage and a more acute expression of the hard setting nature of the surface soil. The chemically and conventionally fallowed plots had similar yield levels. When all fallow treatments had received an initial primary tillage, grain yield was increased on the nil and chemical fallow plots but was not significantly increased on the conventional fallow plots.

Table 1. The effect of deep tillage and fallow on the vegetative yield (g/m²), grain yield (t/ha) of wheat and the bulk density (g/cc) of a hard setting soil.

Factor	Conventional		Fallow		Nil		L.S.D. (P<5%)
	Deep tillage		Chemical		Deep tillage		
	Plus	Minus	Plus	Minus	Plus	Minus	
Dry matter	147	122	130	91	140	69	32
Grain yield	6.0	5.7	6.7	5.6	6.8	4.1	0.8
Bulk density	1.58	1.40	1.51	1.59	1.64	1.56	n.s.

Although deep tillage had an obvious effect on yield, the effect on bulk density (0-5cm depth) was less apparent 14 months later (Table 1). The bulk densities in the conventional fallow treatment in the minus deep till plots tended to be lower than those of the other fallow treatments and lower than those of the conventional plus deep till plots.

The effect of deep tillage on bulk density largely disappeared after one season suggesting that the benefits from this practice may be short term. The use of a chemical fallow system can reduce the adverse effects of high soil strength and, when combined with maintenance of soil macropores by direct drilling, may have longer term implications for the maintenance of high yields even though soil bulk densities may remain high.

1. Hamblin, A.P., Tennant, D. and Cochrane, H. (1982). Aust. J. Soil Res. 33, 887-97.

