

The effect of stubble retention and cultivation on wheat yield in the Victorian Wimmera and Mallee

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Correctly identifying the effects of cultivation on soil water, mineral nitrogen content and subsequent yield is not possible in many experiments because of the confounding influence of retained stubbles in reduced or zero tillage treatments. An experiment was therefore commenced in 1987 at the Cereal Experimental Centre (CEC), Doon and the Mallee Research Station (MRS), Walpeup to assess the effects of stubble retention and cultivation individually in two environments on two different soil types.

Methods

Four fallow systems on which wheat was sown were commenced in August at the CEC (grey clay, Ug 5.2) and in September at the MRS (sandy loam, Gc 1.2). Two fallows with 6 t/ha stubble and no stubble, and with and without cultivation were arranged as a 2*2 factorial in a randomised block design. Weed control was maintained with herbicides in uncultivated treatments and with repeated cultivations, up to 12 times, in the cultivated treatments. A continuously cropped pea-wheat rotation was used as a control treatment.

Results and discussion

Overall, stubble increased yield at the CEC by 27% (1.09 t/ha) to 5.07 t/ha in 1988, whereas increases of only 9% were observed in the Mallee (Table 1). In the Wimmera, cultivation with or without stubble did not affect yield but in the Mallee, the most productive fallow was uncultivated and retained stubble. A reduction in daytime temperatures, evaporative losses and runoff due to stubble are the most probable mechanisms for causing soil water and yield increases. Nitrogen tie-up and evaporative losses may be a problem with both stubble retention and cultivation in the Mallee. Stubble retention increased soil water accumulation by 85 mm to 2 m and subsequent yield in the Wimmera compared to the Mallee where there was only a small increase in soil water and little effect on yield.

Table 1 Wheat yield (t/ha) from four fallow systems compared to a continuous cropped system in the Wimmera and Mallee.

Fallow system	CEC - Wimmera cv. Matong	MRS - Mallee cv. Meering
Cultivated, stubble retained	5.12	2.44
Uncultivated, stubble retained	5.03	2.66
Uncultivated, no stubble	4.07	2.28
Cultivated, no stubble	3.89	2.39
Wheat after peas (non fallow)	3.09	2.23
LSD (P<0.05) all comparisons	0.66	0.27 (P<0.10)

The relatively low water holding capacity and high permeability of Mallee soils limit the perceived advantages of stubble retention to the control of wind erosion. The practice of fallowing, in general, also is likely to be of diminishing value in the Mallee. In the Wimmera, on the other hand, clear yield advantages exist for stubble retention on both chemical or cultivated fallows and their combination.