

## **The effect of stubble retention and nitrogen fertilisation on wheat yield in the Victorian Wimmera**

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Dryland wheat crops in the Victorian Wimmera are usually preceded by fallows which are cultivated over a 10 month period. Alternative techniques of fallowing using specialised equipment and/or herbicides allows the option of retaining stubble throughout the duration of the fallow. Soil water accumulation and yield are commonly increased.

### **Methods**

An experiment was established in 1980 at the Cereal Experimental Centre, Doon to examine the effects of stubble retention on soil water and nitrate accumulation and crop productivity. Two methods of stubble retention, chemical fallow (no cultivation) and blade plough fallow, were compared to the district practice of removing stubble by burning and repeated cultivation to control weeds. In 1984, 1985 and 1986, two nitrogen regimes were included where ammonium nitrate was applied at sowing with an additional application at tillering in 1986.

### **Results and discussion**

Stubble retention generally increased soil water by around 20 mm (0-2 m) at sowing, but there were large differences between years. In 1982, a significant reduction in nitrate nitrogen was observed as a consequence of stubble retention, however, in 1986 only the chemical fallow had lower nitrate levels. Fallow method in the other years did not affect nitrogen mineralisation but levels varied greatly from year to year.

Yield was affected by stubble retention in 1985 and 1986 only. In 1985 chemical fallow increased yield by 26% ( $0.8 \text{ t ha}^{-1}$ ) above the conventional as a consequence of higher soil water levels whereas in 1986 it produced the lowest yield ( $P=0.013$ ). Lower levels of nitrate at sowing and biomass at anthesis were evident in this treatment. There were also fewer plants at anthesis suggesting establishment difficulties. It appears that stubble retention systems probably will need some cultivation to maintain a sufficient rate of nitrogen mineralisation.

The application of nitrogen fertiliser increased ( $R=0.074$ ) yield by 6% ( $0.25 \text{ t ha}^{-1}$ ) in 1986, however, no yield responses were observed in 1984 or 1985. Nitrogen fertilisation may therefore overcome deficiencies brought about by stubble retention but it is unlikely to be necessary where long fallows are practiced in the Wimmera.

No single biological factor has emerged which gives stubble retention a consistent advantage over conventional cultivation in the Wimmera. The effects of stubble retention on the storage of water and accumulation of nitrate nitrogen has generally been small and resultant yields primarily determined by seasonal conditions. The type of seasonal rainfall patterns which favour stubble retention may however, be determined by simulation modelling studies and may provide a way to maximise productivity on a year to year basis for individual crops.