

## The effect of stubble level on runoff and soil loss under simulated rainfall

R.J. Loch<sup>1</sup> and T.E. Donnollan<sup>2</sup>

<sup>1</sup>Queensland Wheat Research Institute, Holberton Street, Toowoomba. Qld 435C

<sup>2</sup>Department Primary Industries, Toowoomba. Qld 4350.

The level of stubble mulch needed to reduce runoff and soil loss is a major consideration in the development of mulch-tillage systems. Rainulator studies in the U.S. (Mannering and Meyer 1963; Meyer et al. 1970) showed that relatively low stubble levels greatly reduced soil loss, but this effect has not been shown for Queensland soils and tillage methods.

Rainulator plots 32.5 x 4 m were established on a shallow black earth of 6% slope, with standing wheat stubble treatments of 3, 3 and 1 t/ha, and a burnt stubble treatment of 0.2 t/ha. These plots were ploughed on the contour using a blade plough fitted with 900 mm sweeps. To minimize differences in antecedent soil moisture all plots were pre-wet to the point of surface runoff and allowed to drain overnight before 79 mm of artificial rain was applied at 95 mm/hr. Results of runoff and soil loss measurements are shown in Table I.

**TABLE I. Runoff and soil loss under four stubble levels.**

| Stubble treatment<br>(t/ha) | Runoff<br>(mm) | Soil loss<br>(t/ha) |
|-----------------------------|----------------|---------------------|
| 3                           | 6.2            | 0.15                |
| 2                           | 9.4            | 0.85                |
| 1                           | 15.2           | 0.67                |
| 0.2                         | 21.0           | 2.61                |

The results show large differences in surface runoff even after the pre-wetting treatment. These differences are attributed to heavy lateral water movement downslope through the ploughed layer, rather than to differences in deep infiltration.

Soil losses from the 0.3 t/ha and 3 t/ha treatments differed greatly, with spatial variability in stubble distribution affecting the intermediate treatment results. Rills did not develop on any of the plots, and soil loss was by inter-rill erosion only. Soil losses shown in Table 1 are quite low, suggesting that even under intense rainfall, inter-rill erosion is unlikely to cause appreciable soil loss.

Other studies have shown that rill erosion can transport much greater quantities of soil than inter-rill erosion (Mosley 1974; Loch unpubl. data). Further studies of stubble effects obviously need to consider the effect of stubble on rill development. The results also show that lateral sub-surface water movement could be an important phenomenon in some cultivated soils.

Mannering, J.K. and Meyer, L.D. (1963). Soil Sci. Soc. Amer. Proc. 37 : 84.

Meyer, L.D., Wischmeier, W.H. and Foster, G.R. (1970). Soil Sci. Soc. Amer. Proc. 34: 938.

Mosley, M.P. (1974). Trans.A.S.A.E. 17: 909.