

RUNOFF AND SOIL LOSS FROM DRYLAND COTTON ROTATIONS

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INTRODUCTION

Runoff and soil erosion from dryland cotton fields is a major concern in several respects. Runoff is a direct loss of soil water that could produce yield. Cotton, planted on wide row spacings, produces minimal cover and soil protection from raindrop impact. Skip row configurations further exacerbate these problems. Cultivation for weed control destroys stubble from previous crops and leaves the soil in a highly erodable condition. In Central Queensland, high rates of erosion have been observed from dryland cotton on sloping soils.

Crop rotations, including wheat and sorghum, can provide stubble cover to protect the soil while cotton is establishing. Controlled traffic layouts have the potential to evenly distribute runoff over the field and prevents concentrations in rill lines. Associated with controlled traffic, minimum tillage and soil compaction control can increase infiltration and reduce runoff. An experiment was established in 1993 to study the impacts of controlled traffic, using a bed and furrow system, on runoff and soil loss.

MATERIALS AND METHODS

The experimental site is located on Elsdon Farms, Tyson Road, Emerald. The soil is a shallow Open Downs cracking clay. Mean annual rainfall and evaporation are 639 mm and 2265 mm, respectively. Plots are 8 m wide and 550 m long, oriented

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down a 1.5% slope. Cropping options (cotton, sorghum, wheat) provide a range of surface conditions and cropping histories at all times (Table 1). Drought conditions have prevented a wheat planting and restricted other planting opportunities.

Table 1. Crop Rotations

Treatment	Bed Size	1993		1994	1995	1996
		Planted September	Planted November	Planted February	Planted February	Planted January
T1	1m	Sorg (spray)			Sorg (spray)	Cotton
T2	1m		Cotton		Sorg (grain)	Cotton
T3	2m	Sorg (spray)			Sorg (spray)	Cotton
T4	2m		Cotton		Sorg (grain)	Cotton
T5	2m			Sorg (grain)		Cotton
T6	2m			Sorg (grain)		Sorg (grain)
T7	2m		Cotton			Sorg (spray)
T8	2m	Sorg (spray)			Sorg (spray)	Cotton
T9	2m	Dolichos			Sorg (spray)	Cotton

Automated runoff and soil loss measuring equipment was installed in 1994.

RESULTS AND DISCUSSION

Rainfall has been 605 mm in 1993/4, 340 mm in 1994/5, and 456 mm in 1995/6.

The treatments produced a wide range of runoff from three events: on 4/2/95 0-26 mm runoff from 39 mm rain, on 7/2/95 10-31 mm runoff from 54 mm rain, and on 9/1/96 21-62 mm runoff from 125 mm rain. For all events, runoff was less from treatments with more cover and drier soils.

Rainfall and runoff on 9/1/96 for selected treatments with different cover levels

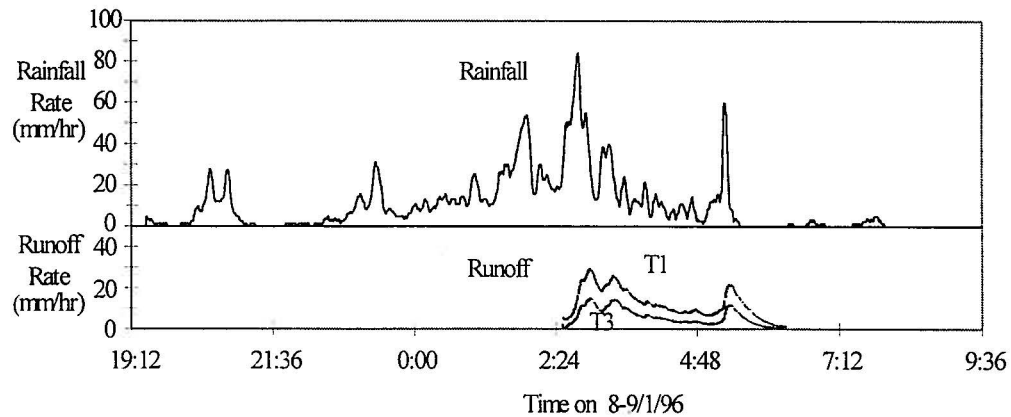
(T1 12%, T3 21%) and soil water (T1 277 mm, T3 254 mm) are presented in

Figure 1. 62 mm of rain fell in 7 hours before any runoff occurred. T3, with drier soils and more cover, infiltrated more rain before runoff commenced, and had higher infiltration rates during runoff (lower runoff peaks).

Total soil loss was 0.8-7.6 t/ha in February 1995 and 2.0-6.1 t/ha in January 1996.

Soil loss is approximately 100 kg/mm of runoff. These rates are too high, but are less than measured in other research in Central Queensland..

Figure 1. Rainfall and Runoff 8-9/1/96



Consistently, erosion is most affected by runoff amount, and suspended soil loss is 2 to 4 times greater than bed load. These results imply that cover is not reducing sediment concentration (cover levels have been low - less than 30%). High suspended loads pose a major environmental threat because turbidity, nutrients and agrichemicals are concentrated in this soil fraction. These have the potential to move long distances with the water.

CONCLUSIONS

Soil erosion is a major issue for dryland cotton but these results show that residue retention increases infiltration and reduces soil loss. Controlled traffic layouts can provide runoff and erosion control on sloping lands.

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