SOIL EROSION RESEARCH IN CANE FIELDS ON THE WET TROPICAL COAST OF NORTH EAST QUEENSLAND

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INTRODUCTION

A research program was initiated in 1982 to develop appropriate minimium tillage and harvest residue retention practices to reduce soil erosion in sloping canelands. Previous estimates of **soil** *erosion* **in the area were as** high as 380t/ha after a mammoth January rainfall of 2742mm (Matthews and Hakepeace , 1981) but methods to combat the problem in north Queensl and have not been widely adopted,

The area has very high rainfall (>3000mm/annum), and steep and broken topography and the use of conventional soil conservation structures is not often acceptable to the farmer because of the difficulty in achieving workable layouts. In the absence of protection, thunderstorms and a prolonged wet season cause large erosion losses in the intensively cultivated soils,

Trials were established on commercial farms in each of the mi 11 areas where 5ignifigant areas of sugar cane were grown on sloping 1 and. This was to ensure a high level of interest from local farmers and to facilitate the extension of the work in that area,.

This paper summarises the soil erosion measurements for different tillage and residue retention practices and reports some preliminary findings of nutrient concentrations in runoff water leaving the farm paddock. The results Of the soil erosion research are currently being written for submission as a final project report to the National Soil Conservation Program and for submission to relevent scientific journals.

METHODS

Soil erosion was measured using a profile meter (Sallaway and Prove, 1983) which enables changes in the soil surface to be monitored prior to and subsequent to erosive rainfall events, Runoff was measured with a system of height recorders and data loggers as. it passed through a 75mm Parshall flume, Nutrient samples were collected from large set tling tanks at the bottom of the paddock and from the creek draining the farm, and analysed at the AIMS laboratory (Ryle et al ., 1981).

RESULTS AND DISCUSSION

Soil Erosion

Soil erosion rates between 50 and 500 t/ha/yr were measured under conventional cultivation practices depending on the severity of the wet season, the land slope, and time since cultivation before erosive rainfall occurred, In general terms, soil loss in the order of 150 t/ha can be expected in any year, At the site which recorded 500t/ha/yr, 400 t/ha was lost in two thunderstorms in October and November 1985. A further 100 t/ha was lost during the wet season. The reason for the heavy thunderstorm losses was that intensive cultivation was carried out prior to both storms.,

Under zero tillage and residue retention systems,' soil erosion rates have been reduced to 50 t/ha/yr or less, These much reduced soil erosion rates resulted primarily from the absence of tillage, thereby taking advantage of

the soil compaction associated with harvesting. operations. In addi t ion:, protection was gained from increased levels of ground cover;.

Runoff

Total runoff volumes were largely unaffected during wet season rainfall even t's,'; As t h e soil is at,or above field capacity during most of the wet 'season, high intensity rainfall causes overland flow (or runoff) to o c c u r irrespective of the management practice. Management practices, however will influence the shape of the runoff hydrograph (Figure, 1). Response times for both the rising and falling stages of 'the hydrograph have been increased with residue retention and zero tillage, however peak rates have been decreased, thereby reducing the erosive potential of the runoff water'.

Nutrient' Levels

Preliminary results indicate that total inorganic nitrogen concentrations in runoff water from farm plots range from 84 to 1000mg/1. Total inorganic phosphorus concentratioris were from 1 .6 to 34mg/1. Concentrations of total inorganic nitrogen and phosphorus in the creek draining the farm ranged between 140 to 1540 and 3.1 and 15.5mg/1, respectively. No apparent differences between management practices were detected. Interpretation of this information must be carried out very cautiously as only single samples were obtained. No analysis of nutrients in bed load sediments has been carried out.

Adopt i on Rates

Extension activities have concentrated on increased awareness of s o i l erosion rates occurring annual 1 y from cultivated canefields and 'on management practices capapable of reducing these rates substantially. After five years of research and extension and associated industry organisation efforts, an adoption rate of 60% in all sloping caneland of the wet tropics region, using conservation farming techniques, is expected for the 1987-88 *cane season.

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CONCLUSIONS

The large soil erosion rates (up to 500t/ha/yr) in intensively cultivated sugar caneland may be substantially reduced (<50t/ha/yr) by adopting' zero tillage and residue retention practices. Little informat ion is available o n nutrient levels in runoff waters leaving the farm, however it appears that no, apparent change in nutrient concentrations will occur with the adopt i on of these conservation farming practices. During the 1987-88 se ason, conservation farming practices are expected to be adopted on 60% of the sloping caneland on the wet tropical coast.

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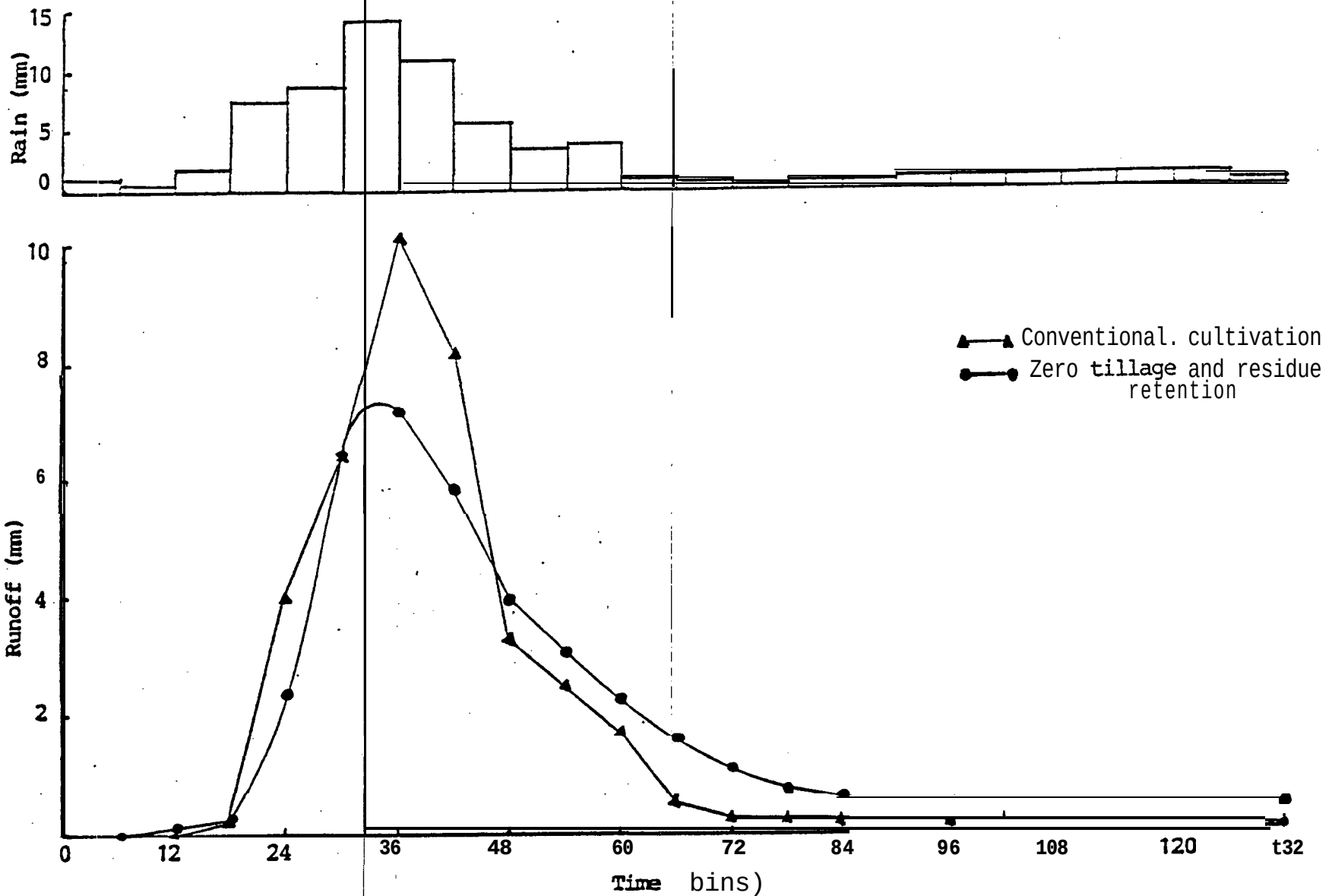

Figure 1

Rainfall Hyetograph and Runoff.Hydrcgraphs for a 0.08 ha Catchment in Innisfail (21/1/86)