STUDIES ON THE USE OF INTERCEPTOR DRAIN TECHNIQUE FOR IMPROVED DRAINAGE IN MAHAWELI SYSTEM C

By

ANPALAKI JEYABALASINKHAM

Thesis

Submitted in partial fulfilment of the requirements

for the degree of

MASTER OF PHILOSOPHY

in the

POSTGRADUATE INSTITUTE OF AGRICULTURE

of the

UNIVERSITY OF PERADENIYA

SRI LANKA

Approved :

Supervisor (Dr. E.R.N. Gunawardena)

Examiner (Dr. A.A. Jayasekera)

Examiner (Dr. C.D. Gangodawila)

July 1989.

ABSTRACT

In Mahaweli system C, high water tables interfere with the production of upland crops. Upland crops would otherwise be most suitable if grown on RBE soils. A catchment hydrology study was conducted in a small catchment at the Girandurukotte Regional Research farm, to assess the factors contributing to water logging, with regular monitoring of ground water and soil moisture fluctuations. This study was continued with an interceptor drain cut through the water logged area of the same catchment to validate the findings of the previous study and to test the possibility of using artificial drains to control water logging.

Monitoring of ground water and soil moisture fluctuations were continued for another year starting from September 1987. Soil texture was analysed at certain stations to determine the clay contents in the A_1, A_2 and B_1 horizons. Soil hydraulic conductivity, infiltration and soil moisture characteristics were measured. Weekly and daily water balances were computed to estimate the source and amount of excess water. The climatological data needed were obtained from the meterological station near the study area. A 90° V notch weir was installed for the measurement of small stream flows from the catchment, which were found to be common during the previous study. An interceptor drain 1 m deep was cut through the water logged area and the drain flow was recorded daily using a 51 mm flow meter.

The mean clay content of the A_1, A_2 and B_1 horizons were found to be 13.0, 20.4 and 24.6% respectively. Basic infiltration rates were up to 9 mm h^{-1}. The average unsaturated hydraulic conductivities of the A_1, A_2, B_1 and B_2 horizons varied from 0.40 to 1.30 m d^{-1}. According to the soil moisture characteristic, field capacity was between 20 - 22% and the permanent wilting point varied from 13 - 15%. Rainfall was found positively correlated with stream flow (r^2=0.84) and contributed 41% to same. Two distinctive peaks per single rainfall event were observed in the stream flow pattern. Soil moisture storage reached a maximum of 200 - 215 mm. At the driest, moisture approached values below permanent wilting point in the top 100 cm soil. The maximum moisture storage capacity was estimated to be 100-105 mm. Drain flow

was found positively correlated with stream flow (r^2=0.84) and contributed 19% to same. Double peaks per single rainfall event were observed in the drain flow as well.

The horizontal movement of water becomes prominent during wet periods due to the large variations in saturated hydraulic conductivities of different layers. However, this difference in hydraulic conductivity declines during dry periods, resulting in substantial vertical movement of water.

The water balance study indicated a substantial flow of seepage water in and out of the catchment. Seepage could thus contribute to waterlogging more than rainfall in RBE soils.

It was also observed that piezometer readings are less reliable for monitoring water-logging problems, when compared with soil moisture readings. A combination of these two methods could therefore give a better understanding of the water logging problem.

As indicated by the water table measurements, water-logging was much reduced when compared with that of the previous year. Water levels dropped rapidly in the piezometers closer to the drain. A considerable drawdown was observed as a result of the interceptor drain. Artificial interceptor drains might therefore be both practical and economic for protecting upland crops on the RBE soils from water-logging. However, the reduction was less prominent in the upper part of the catchment due to the complex topography and the interference of the unlined irrigation channel near the upper boundary of the catchment. Lining the irrigation channels, land grading and smoothing will reduce the water logging problem to a great extent in Mahaweli system C.