

TECHNICAL EVALUATION OF FURROW IRRIGATION

IN BURA IRRIGATION SETTLEMENT PROJECT

THIS THESIS HAS BEEN ACCEPTED FOR
THE DEGREE OF M.Sc. 1990
AND A COPY MAY BE PLACED IN THE
UNIVERSITY LIBRARY.

BY

S. M. MUTURI

A thesis submitted in partial fulfillment for the degree of
Master of Science in Agricultural Engineering in the Faculty
of Engineering, University of Nairobi.

UNIVERSITY OF NAIROBI
LIBRARY

ABSTRACT

Bura is one of the largest furrow-irrigated projects in Kenya plagued with irrigation problems. A technical evaluation of the furrow irrigation system was conducted to obtain the system's state and operational variables and to identify alternatives for improving its hydraulic performance.

The objectives were met by conducting a field survey and a series of field trials. Cylinder infiltrometer was used to determine Kostiakov infiltration parameters (a, k) for major project soils (Typic Camborthids and Natrargids). The volume balance method was used to determine parameters of advance equation (p, r) and of Kostiakov-Lewis equation (a, k, f_0) under conditions of varying furrow discharge, slope and under maize crop.

Findings of the survey revealed that the present system had the following furrow characteristics: Length(285m), Slope(0.05-0.3%), Spacing(0.9m) and cross-section(parabolic). Nearly 64% of farmers use furrow discharge ranging from 1.5-2.0 l/s. Project soils exhibit moderate rates of infiltration. Parameter p increased with furrow slope and discharge with parameter r remaining constant. The infiltrated volume increased directly with discharge and inversely with slope.

The system hydraulic performance was better under cotton than maize. For cotton, application efficiencies(E_a) and distribution uniformities(D_u) ranged from 51-68% and from 70-81% respectively. As for maize, E_a and D_u ranged from 23-52% and from 23-45% respectively.

Suggested improvements of the hydraulic performance of the furrows include: the use of improved furrows-in-basin, cutback, alternate furrow irrigation, reducing furrow spacing to 0.7m and planting on the ridge shoulder.