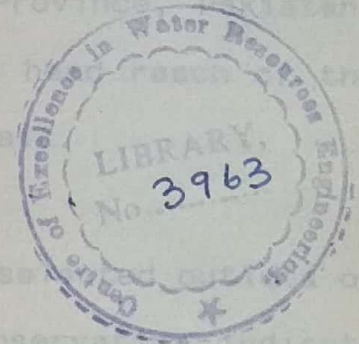


ABSTRACT

EFFECT OF VARYING DISCHARGES ON THE EQUITY OF WATER
DISTRIBUTION IN THE IRRIGATION SYSTEM

BY

MUHAMMAD NAWAZ BHUTTA



A dissertation submitted in fulfillment of the
requirements for the degree

of
DOCTOR OF PHILOSOPHY

IN

WATER RESOURCES MANAGEMENT

(Dr. Muhammad Latif)
Internal Examiner

(Dr. J. W. Kijne)
Internal Examiner

(Dr. Gilbert Levine)
External Examiner

(Dr. W. F. Vlotman)
External Examiner

(Dr. Shaheen Akhtar)
Director

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
University of Engineering and Technology, Lahore

May, 1990

ABSTRACT

This study was conducted at three distributaries of Upper Gugera Branch of Lower Chenab Canal, Punjab Province, Pakistan. Mananwala and Lagar Distributaries are in the head reach of the channel and Pir Mahal Distributary is at the tail. I suggest that under current physical conditions the combination of rotation between Discharge of these distributaries and of selected outlets of these distributaries were measured. Field observation indicate that water deliveries at the head of distributaries are rarely in accordance with the original design criteria. The discharge at the head of the distributaries (perennial) is lower than 75 percent of the design for a period varying from 111 days to 198 days in a year. A combination of rotation between the distributaries and along the distributaries can increase the discharge. Field measurement indicate that the distribution of surface water between the outlets of a distributary is substantially inequitable when the original design parameters of distributaries no longer prevail. The average discharge delivered to the outlets varies from 250 (head reach) to 0 (tail reach) percent of design values. The data suggest that two design assumptions for outlets are no longer valid; constant water level in the distributary and modular flow conditions of outlets.

The data also suggest that the intake structure of a secondary channel should be a gated one to attain reliable water supplies.

Moreover, active management, e.g. altering position of stop logs from horizontal to vertical at the head of a distributary can reduce variation of water deliveries to the distributaries.

A computer model "MISTRAL" was adopted for the evaluation of management options. Tests performed by the model suggest that under current physical conditions the combination of rotation between the distributaries and along the distributaries can improve the equity conditions of the irrigation system. For example in the case of Lagar Distributary the discharge of tail outlets can be increased by 3 times of their existing discharge by introducing rotation between the tail of the distributary and Jhinda Minor. There will be a small decrease in the discharge of Jhinda Minor by adopting this option. A combination of rotation between the distributaries and along the distributaries can increase the discharge of tail outlets up to 7 times of their existing discharges. The results of the model suggest that if the original design parameter of a distributary are restored, re-adjustment of non-modular and tempered outlets is necessary before equity of water distribution can be achieved.