Water Delivery Performance in the lower Nile Delta in Irrigation Networks Affected by Backflow from Drainage

KHATER A. EL-HAMED[1], YOSHINOBU KITAMURA[2], KATSUYUKI SHIMIZU[2]
[1] *The United Graduate School of Agricultural Sciences, Tottori University, Tottori, Japan;abdo_khatter@yahoo.com*
[2] *Faculty of Agriculture, Tottori University*

1 Introduction

Water is life and also a limited resource that mankind should cherish. Water management aims to develop and protect the available water and land resources in the developing countries. In water scarce countries depending on external water supplies, like Egypt, water distribution to the different water users is of paramount importance. Egypt is an arid country with hardly any rainfall. For its water resources, Egypt is depending mainly on the supply of fresh water transported from Nile basin countries through the Nile River.

Main problem facing the Nile delta is water supply shortage at the end of irrigation network especially at the tail of main canals branched from Nile River; nowadays the government depends on feeding some canals which have water supply shortage from the drains, In this study, a pipe was constructed at the end of the branch canal to feed it whenever there is water shortage. But backflow conveyed from the drain to the canal depends on water level differences between drain and canal tail. That is because the water structure (pipe) connecting the end of the canal with the drain does not have control gates or valves. It is only to convey water from the drain into the canal whenever the drain water is higher or opposite.

Main objectives of this study are to check water distribution performance for the study area which face water shortage and depend mainly on water backflow from the main drain (Bhr Nashart). The performance of the study area will be checked with and without backflow from the drain.

The study area shown in Fig.1 is located in Kafr El-Sheikh government which is considered as one of the governments of Egypt. It lies in the north of the country along the western branch of the Nile Delta. Study area located at the tail of main canal (Meet Yazeed) which considered as the main canal feeding the study area, and this drainage canal connecting to the main drain (Bhr Nashart). This main drain is feeding some branch canals that are facing water shortage. There are three branch canal branched from main canal called Sefsaf, Eliwa and Masharga. Also there is two sub branch canal branched from Sefsaf and Masharka. These canals drain its access water in Bhr Nashrt drain.

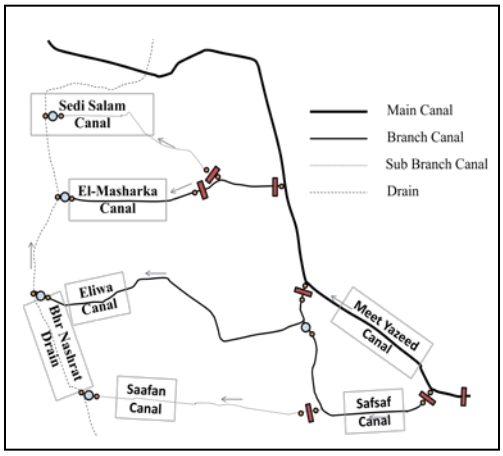

Fig.1 Study area in Egypt

2 Material and Methods

Adequacy, Efficiency Dependability and Equity indicators will be calculated for the study area within two cases, Case (1) Water supply for the study area will be considered as supply from head regulators only. Case (2) Back flow from the drain will be considered as additionally water supply. Based on this evaluation, some data were required from the field to calculate the indicator. These data are water levels, gate openings, discharges, pipe data connecting channels with (Bhr Nashart) drain and crop pattern. These measurements were measured from the period May 2008 until May 2009. By The Water Management Research Institute (WMRI) of the National Water Research Center (WMRI, 2008). Calculations of daily water supply in the head of branch canal depend on calibration of head regulator, which the following data are required for calculation, water levels at upstream, downstream and gate opening of head regulator. Calculation of daily backflow from the drain depends on calibration of pipe connecting canal with drain (DCM, 2001, HEC-RAS, 2008) which requires the following data, tail water levels, drain levels and pipe dimensions. Calculation of water demand is based on CROPWAT model (FAO, No. 56.).

3 Results and Discussion

Both water supply passing the head regulators and backflow from the drain were calculated as daily discharges values for all canals in the study area by conducting a calibration among water levels and gate opening measurements as shown in fig.2 and fig.3 Cropping pattern data were collected from different agriculture directorates as shown below. Crop water requirements were calculated using CROPWAT model.

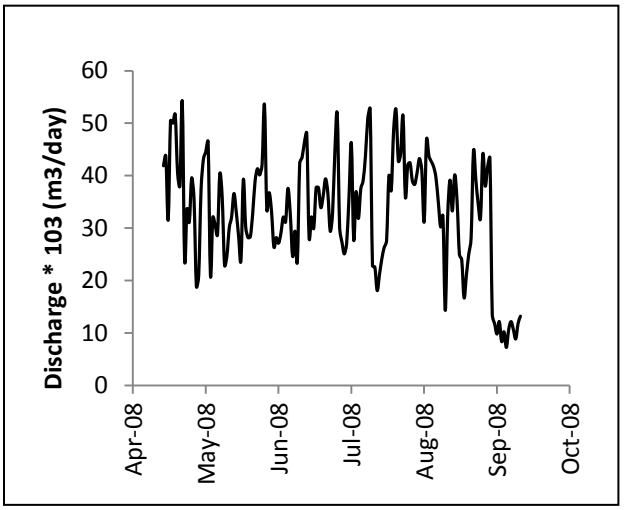

Fig.2 Average daily variations of discharge at head of Safsaf canal during summer 2008

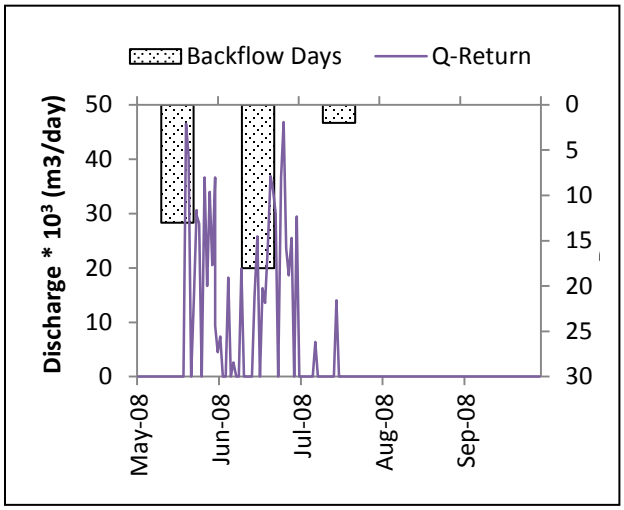

Fig.3 Average daily backflow discharges at Safan canal tail and no. of backflow days at summer 2008

4 Conclusion

It was observed that at summer season the water supply from head regulators was sufficient during all months for all branch canals except at June, July and August. So Backflow is required only at these months while in winter season the water supply from head regulators was sufficient during all months for all branch canals except at March. So there is no need for backflow at winter season. Backflow occurred for all canals at May and September while there was water supply sufficiency from head regulator because of less water requirements at these months. Backflow occurred at the months which have water shortage but it was higher than water shortage quantity which may affect the quality negatively. It also occurred at winter season while there was water sufficiency. Main crops cultivated at summer season were rice, maize and cotton, and alfalfa, wheat and sugar beet at winter season, crop pattern among the three branch canal was almost the same.

5 Recommendation

Backflow flowing from the drain to the canal should be controlled and distributed among the canals according to shortage in discharges which occurred only at June, July and August to maximize the performance indicators, The pipe connecting the drain to the canal tail should be controlled by valves, any hydraulic structure or replaced with pumps to allow water to flow under control. Amounts of backflow which covered and exceeded water shortage in fresh water supply can be used (if quality is appropriate) to safe more fresh water flowing from canal head regulator or increase are cultivated. Also head regulators should be rehabilitated to allow more organized water distribution.

Farmer's behavior while distributing water to their farms should be improved as usually farmers at head canals take water more than enough which lead to shortage at canals tail. They also should decrease the area cultivated with rice as it is considered as maximum water consumption crop cultivated in the study area.

References

DCM (Drainage Criteria Manual) 2001. Urban Drainage and Flood Control District. Volume 7 (V.2).

FAO. (Crop Evapotranspiration), Irrigation and Drainage Paper, No. 56. Rome.

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