REUSE OF AGRICULTURE DRAINAGE WATER IN IRRIGATION (CASE STUDY IN WESTERN DELTA)

By

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A Thesis Submitted in Partial Fulfillment of the Requirement for the Doctor of Philosophy Degree In Environmental Science

Department of Agricultural Science, Institute of Environmental Studies and Research, Ain Shams University

2009

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إعادة إستخدام مياه الصرف الزراعى فى الرى
(دراسة حالة بغرب الدلتا)

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معهد الدراسات والبحوث البيئية
جامعة عين شمس

2009

صفحة الموافقة على الرسالة

إعادة إستخدام مياه الصرف الزراعى فى الرى (دراسة حالة بغرب الدلتا)

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تاريخ الموافقة: / / 2009

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أجيزت الرسالة بتاريخ / / 2009

موافقة مجلس المعهد / / 2009

موافقة الجامعة / / **2009**

2009

ABSTRACT

The objectives of this research are to study the suitability of the drainage water of El Umum drain for irrigation, either directly or after mixing with fresh water to compensate the shortage of fresh water using two scenarios and study the impact of them on:

- The water salinity of Nubaria canal after mixing
- The water salinity and water quantity of El Umum drain that pours into Mariut Lake.
- The discharge of El Max Pump Station (P.S.).

To achieve the objectives, the Umum main drain in the western part of the Delta is selected to be monitored by collecting samples during the year (2004-2005) on monthly base.

The field measurements carried out at each sampling loccasion included discharge measurents and water quality in-situ measurements.

The water samples collected were analyzed for the following parameters: according to standard method (AWWA) 1998.

- EC & pH.
- Soluble cations such as Na, K, Ca and Mg.
- Soluble anions such as Cl, HCO_3, CO_3 and SO_4.
- Adj. SAR.
- Some Heavy metals such as Fe, Mn, Cd, Cu, Pb and Zinc.
- Boron.
- Total suspended solids and total volatile solids.

- Dissolved Oxygen.
- Biological Oxidations Demand (BOD).
- Chemical Oxidation Demand (COD).
- Nutrients such as NO_3, NH_4 and PO_4.

QUAL2EU model was used to predict the impact of using the drainage water on the quality of water drained to Mariut Lake, under the proposed scenarios

The results indicated the following:

- The water quality of the drainage water of Abu Hommous P.S. is better than Shereshra P.S and that of Shereshra is better than that of Truga P.S depending on the criteria of EC and TDS.
- Due to the values of the EC and TDS of the studied locations, the drainage water can be used for irrigating the salt – tolerant and semi - tolerant crops with mixing that water with fresh one.
- It is recommended to mix the drainage water of the three studied locations with the fresh water of Nubaria canal depending on different scenarios as will be discussed later.
- The total quantity of the drainage water that pours into Mariut Lake will be decreased by 1417.95 million m^3/year, which will be used in irrigation after mixing with the fresh water of Nubaria canal.
- According to scenario (1) the percentage of EL Max P.S drainage water will be decrease about 63% of the total water discharge of El Max P.S.

- The water quantity of Nubaria canal will be increased by 1417.95 million m^3 /year and the EC of the water will increase from 0.40 dS/m to 0.97 dS/m.
- Due to applying of scenario (2) the total amount of drainage water used will be $775.83*10^6$ m^3 /year. As mentioned before of El Umum drain discharge will be decreased, subsequently the discharge of El Max P.S will be decreased by that amount of water used in mixing with Nubaria canal water.
- The water quantity of Nubaria canal will be increased by $775.83*10^6$ m^3 /year while the EC of the water will increase from 0.40 dS/m to 0.67 dS/m.

Key words: irrigation water quality, water salinity (EC), biological and chemical oxygen demands, nutrients, heavy metals and boron.

AKNOWLEDGMENT

Sincere thanks and deep appreciation are due to ***Prof. Dr. Mahmoud Mohamed Hegazi***, Agric. Engineering Department, ***Prof. Dr. Mohamed Nabil El Awady,*** Agric. Engineering Department and ***Dr. Ahmed Abou El-Yazied***, Associate Prof., Dep. of Horticulture, Faculty of Agriculture, Ain Shams University, for their suggesting the problem, supervising the research, their invaluable supervising and help in the preparation of this study.

The author wishes to express his deep thank**s** to **Prof. *Dr. Gamal Abdel – Nasser Kamel***, Prof. of Soils Science-Drainage Research Institute (DRI), for his encouragement, helpful supervision and providing facilities for all the phases of the research.

Thanks due to all the staff members of Drainage Research Institute (DRI)-National Water Research Center (NWRC), for their friendship and encouragement through out this work.

ABBREVIATIONS

Adj. SAR	Adjusted sodium adsorption ratio
BCM	Billion m^3
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DRI	Drainage Research Institute
EC	Electrical Conductivity
Km, N.E.	Kilometre North East
MWRI	Ministry of Water Resources and Irrigation
NWRC	National Water Research Center
NWRP	National Water Resources Plan
ppm	Part per million
PS	Pump Station
Q	Rate of discharge m3/area.
RNPD	River Nile Protection and Development
RSC	Residual Sodium Carbonate
SAR	Sodium Adsorption Ratio
SSP	Soluble Sodium Percentage
TDS	Total Dissolved Salts
WASP	Water Quality Analysis Program

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