

**EVALUATION THE IMPACT OF LAND RACLAMATION
OPERATIONS AND IRRIGATION SYSTEMS ON
IMPROVEMENT SOIL PROPERTIES – CASE STUDY IN
EL NOKRA VALLEY- ASWAN**

By Submitted

Zoher Omar Abd EL kader Mohamed

B. Sc. of Agricultural Sciences (Technology & Administration Projects)

Faculty of Agriculture, Ain Shams University, 2006

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Science

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

2013

APPROVAL SHEET

**EVALUATION THE IMPACT OF LAND RACLAMATION
OPERATIONS AND IRRIGATION SYSTEMS ON
IMPROVEMENT SOIL PROPERTIES – CASE STUDY IN
EL NOKRA VALLEY- ASWAN**

By Submitted

Zoher Omar Abd EL kader Mohamed

B. Sc. of Agricultural Sciences (Technology & Administration Projects)
Faculty of Agriculture. Ain Shams University, 2006

This thesis Towards a Master Degree in Environmental Science
Has been Approved by

Name

Signature

1- Prof. Dr. Mahmoud Mohamed Ibrahim Abo Zaid
Emeritus Prof, Of Soil Science. Department of Soil & Water
Faculty of Agriculture, Tanta University

2- Prof .Dr. Mohamed Bakr Abdel Ghany Gohenim
Emeritus Prof .of Soil Science Agricultural and Agricultural Drainage,
Drainage Research Institute, National Water Research Center,
Ministry of Water Resources & Irrigation

3- Prof. Dr. Ezzat Mohamed Soliman
Emeritus Prof. of soil & Water Science in Department of Environmental
Agricultural Science, Institute of Environmental Studies & Research,
Ain Shams University.

4- Prof. Dr. Gamal Abdel Nasser Kamel Saber
Prof. of Soil & Water Science, Research Institute for Ground Water,
National Water Research Center,
Ministry of Water Resources and Irrigation

2013

**EVALUATION THE IMPACT OF LAND RACLAMATION
OPERATIONS AND IRRIGATION SYSTEMS ON
IMPROVEMENT SOIL PROPERTIES – CASE STUDY IN
EL NOKRA VALLEY- ASWAN**

By Submitted

Zoher Omar Abd EL kader Mohamed

B. Sc. of Agricultural Sciences (Technology & Administration Projects)

Faculty of Agriculture. Ain Shams University, 2006

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Science
Science Agricultural Department of Environmental

Under The Supervision of :

Signature

Name

1- Prof. Dr. Ezzat Mohamed Soliman

.....

Emeritus Prof. of soil & Water, in Department of Environmental
Research & Studies Environmental Agricultural Science, Institute of
. Shams University Ain

2- Prof. Dr. Gamal Abdel Nasser Kamel Saber

.....

Prof. of Soil - Water Research Institute for Ground
Water - National Water Research Center –
Ministry of Water Resources and Irrigation

2013

ABSTRACT

EVALUATION OF THE IMPACT OF LAND RECLAMATION OPERATIONS AND IRRIGATION SYSTEMS ON IMPROVEMENT OF SOIL PROPERTIES IN EL – NOKRA VALLEY, ASWAN GOVERNORATE

The aim of this study was to evaluate the impact of the methods of land reclamation as well as different irrigation systems on some soil chemical and physical properties and crop yield.

The study area is about (64788) feddan divided into (7) main villages and include farms with large areas as well as small scale farms.

The studied sub areas are owned by two categories of beneficiaries:-

- * The investors own areas of about (48659) feddan.
- * The high graduates own of about (16129) feddan.

A field survey was carried out for all the villages in the study area to identify the reclamation systems and the different irrigation method used in the current study.

Soil samples were collected form all villages under study, considering that all collected samples are representative to all reclamation methods and irrigation systems used.

Also water samples were collected from the main branches and sub main canals as well as from the main and sub main drainage water. Soil and water samples were analyzed chemically and physically.

The study concluded the following recommendations:

- * The effect of salt leaching process is effective at the beginning of the sandy soil reclamation.

- * The irrigation systems used in the study areas had no significant effect on salt leaching.
- * The addition of organic fertilizers were not effective in the salt leaching of the studied area due to the coarse texture of the soil and the existence of gravel.
- * The effect of gypsum addition during the reclamation process was not significant.

Key words: land Reclamation, Irrigation Systems, Soil Properties

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my supervision
Prof. Dr. Ezzat Mohamed Soliman Professor of soil science -
Department of Environmental Agricultural Science, Institute of
Environmental studies and Research, Ain Shams University.

Who giving me the chance to make this study under his guidance, the
topic of this work, and the continues support of my master study.

Prof. Dr. Gamal Abdul Nasser Kamel Professor of soil science, Under
Groundwater water Research Institute, National Water Research Center,
Ministry of Water Resources and Irrigation, for his continuous support of
my masters study patience, motivation, enthusiasm, and immense
knowledge.

I could not have imagined having better advisors and mentors for my
masters of study.

Last but not the least; I would like to thank my wife

Karima Abd EL Kadir Mubarak, who has always been a motivation
for me to move forward, and was the best assistant to me in my life, she
always stood by my side and if there is preferred to any person after God
and after my super viziers committee it must be for my wife. Since she
was stands by my side to completing this research and I extend to her all
since gratitude and appreciation.

I would like to thank to **Dr. Walied Mohamed fares** Researcher lab
Central Bureau of Statistics - Institute of crops - Agricultural Research
Center to resurrection of helped me in the statistical analysis and giving
me important tips

CONTENTS

Subject	Page
1- INTRODUCTION	1
2- LITERATURE REVIEW	2
2.1. Land Reclamation	2
2.1.1. Distribution of reclaimed soils in Egypt	2
2.1.2. Sandy Soils	7
2.1.3. Compost Productions	10
2.2: Types of irrigation systems	11
2.2.1: Surface irrigation by using furrows	12
2.2.2: Surface drip irrigation	13
2.2.3: Sub-surface drip irrigation	14
2.2.4: Mini-sprinkler irrigation	16
2.3.: Localized irrigation definitions and classifications	17
2.3.1: Impact of localized irrigation systems on soil characteristics	18
2.3.2: Water use efficiency under localized irrigation systems	22
2.3.3.: Fertilizer's application efficiency under localized irrigation systems	23
2.3.4: Water saving and water application efficiency under localized Irrigation systems	25
2.4.: Low-head-gravity-flow bubbler irrigation	26

Subject	Page
2.5.: Gated pipes irrigation	26
2.6.: Economic considerations of localized irrigation systems	28
3- MATERIALS AND METHODS	31
3.1. Location of the study	31
3.2: The Owners	32
3.3. The irrigation systems	32
3.4. Reclamation process	32
3.5. Cultivated crops	32
3.6. Sites selection	32
3.7. Soil sampling	33
3.8. Water analysis	34
3.9. Plant analysis	34
3.10. Statistical analysis	34
4- Results & Discussion	40
4.1. The cultivated crops in the studied area	40
4.2. Water analysis and its suitability for the irrigation	44
4.3. Soil physical properties	49
4.3.1. Soil Texture	50
4.4. Soil Chemical properties of sandy soil	52
4.4.1. Calcium carbonate	53
4.4.2. Electrical conductivity (EC)	54
4.4.3. Soil pH	56

Subject	Page
4.4.4. Soil salinity	72
4.5. Impact of the irrigation system on soil properties improvement	84
4.5.1 The irrigation system	84
4.5.2 The impact of irrigation system on soil chemical properties	84
4.6. The impact of reclamation process on soil chemical properties	92
4.6.1. Impact of the irrigation system on the salt leaching efficiency	92
4.6.2. The impact of soil reclamation processes on soil Salinity leaching	100
4.7. Leaching of accumulation soil salinity drip irrigation	109
4.7.1. Relative leaching efficiency	109
4.8. Crops productivity	110
4.9. Companion between the crops productivity in the studied area with that of Nile valley	116
The statistical	123
Conclusion	125
Recommendations	126
5-SUMMARY	127
6. REFERENCES	130

LIST OF TABLES

Table	Page
Table (1): Coordinates of the study areas	31
Table (2.a): Areas of different cultivated (Feddan) for the year (2011). crops in the studied areas	41
Table (2.b) Areas of different cultivated crops in the studied areas (Feddan) for the year (2012).	42
Table (2.c) Comparison between the cultivated areas (Feddan) for the year 2011 and 2012.	43
Table (3.a) Chemical analyses of irrigation water	46
Table (3.b) Chemical Analyses of Drainage Water	47
Table (4) Guidelines for Interpretations of Water Quality For Irrigation.(modified from FAO 1985.	48
Table (5.a) Field Investigation of soil samples – El Amal village (Main branch 1 & branch 11)	65
Table (5.b) Field investigation of soil samples El Manar village.	66
Table (5.c) Field investigation of soil samples – Farms on El Nokra main branch.	67
Table (5.d) Field investigation of soil samples – El Hekma village	68
Table (5.e) Field investigation of soil samples - El Karama village.	69
Table (5.f) Field investigation of soil samples – El Baraaem village.	70
Table (5.g) Field investigation of soil samples – Farms on (Main Branch 3 & branch 3/1).	71

Table	Page
Table (6.a) Chemical Analysis of Soil – El Amal village (Main branch 1 & branch 11).	77
Table (6.b) Chemical Analysis of Soil - El Manar village (Main branch 2).	78
Table (6.c) Chemical analysis of soil - Farms on El Nokra main branch.	79
Table (6.d) Chemical analysis of soil – El Hekma village (Branch 5).	80
Table (6.e) Chemical analysis of soil – El Karama village (Branch 7 & branch 9)	81
Table (6.f) Chemical analysis of soil – El Baraaem village (Branch 6).	82
Table (6.g) Chemical analysis of soil – farms served by (Branch 3 & branch 3/1).	83
Table (7.a) Some Chemical Properties of Soil Under Furrow Irrigation System.	87
Table (7.b) Soil Properties Under Border Irrigation System.	88
Table (7.c) Some Chemical Properties of Soil Under Sprinkler Irrigation System.	89
Table (7.d) Some Chemical Properties of Soil Under Drip Irrigation System.	90
Table (8) Water Equivalents for the studied crops.	91
Table (9.a) Soil salinity changes under different method's of reclamation and method's of irrigation system.	94
Table (9.b) Soil salinity changes under different method's of reclamation and method's of irrigation system.	96

Table	Page
Table (9.c) Soil salinity changes under different method's of reclamation and method's of irrigation system.	97
Table (9.d) Soil salinity changes under different method's of reclamation and method's of irrigation system.	98
Table (9.e) Soil salinity changes under different method's of reclamation and method's of irrigation system.	99
Table (10.a) Soil leaching efficiency L.E under soil different process of soil reclamation.	105
Table (10.b) Soil leaching efficiency L.E under soil different process of soil reclamation.	106
Table (10.c) Soil leaching efficiency L.E under soil different process of soil reclamation.	106
Table (10.d) Soil leaching efficiency L.E under soil different process of soil reclamation.	107
Table (10.e) Soil leaching efficiency L.E under soil different process of soil reclamation.	107
Table (10.f) Soil leaching efficiency under L.E soil different process of soil reclamation.	108
Table (11.a) Clover crop productivities under different irrigation system and soil reclamation processes.	112
Table (11.b) Wheat crop productivities under different irrigation system and soil reclamation processes.	114
Table (12.a) Comparison between the crop productivities of cultivated in studied area and those in the Nile valley and firings.	120
Table (12.b) Comparison Between the Crop Productivities of Cultivated in Studied Area and Those in the Nile Valley and Firings.	121

Table	Page
Table (13.a) Clover crop productivities under different irrigation system and soil reclamation processes.	122
Table (13.b) Wheat crop productivities under different irrigation system and soil reclamation processes.	122
Table (14) Statistical analysis (ANOVA) for the Clover crop.	123

LIST OF FIGERS

Figer	Page
Fig. (1): Map of area under study (El nokra valley)	35
Fig. (2): Map of El Nokra villages, El nokra canal, main branch, branch, drain and station – Aswan Governorate	36
Fig. (3): Map of Water sampling sites.	37
Fig. (4): Map of Soil sampling sites.	38
Fig. (5): Section shows soil layers.	39
Fig. (6) Grain size distribution% diagram of the different Profile layers at El Amal village (Main branch 1& branch 11).	58
Fig. (7) Grain size distribution% diagram of the different profile layers at El Manar village (Main branch 2).	59
Fig. (8) Grain size distribution% diagram of the different Profile layers at (Farms on El Nokra main branch).	60
Fig. (9) Grain size distribution% diagram of the different Profile layers at El Hekma village (Branch 5).	61
Fig. (10) Grain size distribution% diagram of the different Profile layers at El Karama village (Branch 7 & branch 9).	62
Fig. (11) Grain size distribution% diagram of the different Profile layers at El Baraaem village (Branch 6).	63