AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
IRRIGATION AND HYDRAULICS DEPARTMENT

EFFICIENT PROCEDURES IN EVALUATING THE PERFORMANCE OF IRRIGATION IMPROVEMENT PROJECT IN THE DELTA OLD LANDS

BY
AHMED ABD ELHAEZ AHMED SHALABY
B.Sc. Civil Engineering, Zagazig University, 2003

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Statement

This thesis is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering.

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No part of this thesis has been submitted for a degree or qualification at any other University or Institution.

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Abstract

The River Nile is the longest river in the world. The length of the Nile from its remote resources to its mouth in the Mediterranean Sea is 6695 km long. The river basin has an area of about 3.11 million km^2. The main sources of the Nile Basin are The Equatorial Lakes (Albert, Edward, George, Kyoga and Victoria), the Ethiopian plateau (Sobat, Blue Nile, Atbara Rivers) and Bahr El Ghazal.

Ethiopian plateau supplies about 85% of the average yearly flow of Nile River estimated at Aswan and the remaining comes from the Equatorial lakes.

The aim of this study is to establish a flood mapping system for the Blue Nile to be available to the decision makers with regard to flood management. Flood forecasting is vital since it can help in reducing the harmful consequences of flood damage especially at the downstream areas. Blue Nile has been selected as a study area due to its importance to the Nile River flow.

The advances in numerical methods and computer technologies have resulted in the development of many mathematical models which can be used for hydraulic simulation of flood. These simulations usually include the prediction of the extent of flood and its depth along a river system. Also Deduction and use of hydraulic parameters (e.g. water levels, flooding-areas) from satellite-images may improve real-time flood forecasting models by comparing them with calculated parameters (data-assimilation).

In order to study the flood in these areas, HEC-GEORAS through Arc GIS has been applied on the DTM, then applying HEC-RAS on selected reaches on the Blue Nile inside Ethiopia and also for the reach between El Deim- Rosieres inside Sudan.

Study results shows that there are no flooding areas inside Ethiopian frontiers along the Blue Nile since the terrain is mountainous but the part near the Sudanese border has some flooded area due it’s mild slope, but for the reach between El Diem & Roseires Dam, there are some flooded areas near El Roseires due to the backwater curve of Dam Egypt is one of the developing countries that face great challenges to encounter expected water crisis. Limited water resources represented in fixed share of the Nile River water and the increase in water demand as a result of the rapid increase of population are the main reasons for water shortage. The expansion in agricultural area

and the industrial growth require developing new sources of water or at least providing efficient management of available water resources.

Irrigation Improvement Project IIP was introduced to improve the social and economic conditions of Egyptian farmers through the development and use of improved irrigation water management to increase crop production. Also to promote efficient water use in irrigation and a more equitable distribution of water by establishing continuous flow and on-demand access to water.

This study aims to introduce an efficient procedure in evaluating the performance of branch canals and Mesqas in W10 command area in Kafr El-SheikhGovernorate (one of the areas that faces water shortages in Egypt) after the implementation of the agreed advanced design criteria for the irrigation improvement strategy. The results were compared to the results obtained by WMRI evaluation study in the same area.

The study showed thatquestion of whether or not continuous flow actually reduces or increases gross water demands at branch canal level is complex and controversial. There appears to be a widely held belief, or at least fear, among Irrigation Sector operating staff that continuous flow requires more water, and this is one reason why continuous flow has still not been properly introduced in improved areas.

Adequacy of water supply was assessed for El-Mofty regulator on Meet-Yazid irrigation canal-Middle Delta Region, Shalma intake, and at the head regulator of the three branch canals of W10 area, these assessments was based on the relative irrigation supplyRIS value (ratio between theoretical water requirements and actual water supply). According to the findings of the study area of the annual and monthly water supply and RIS; the values indicate that there was sufficient water given to W10 area but the wrong way of supply schedule led to severe water shortage in some periods.

Evaluating the water flow condition at the end of W10 canals indicated that there is no effective flow between canals and drains in the majority of the canals.

Table of Content

Statement i

Acknowledgements ii

Abstract iii

I. Table of Content v

List of Figures viii

List of Tables xi

List of Abbreviations xii

Chapter (1): Introduction 1

1.1 Background 1

1.2 Study objectives 4

1.3 Methodology 5

1.4 Research area 5

1.5 Thesis outline 5

Chapter (2) Literature review 7

2.1 Introduction 7

2.2 Irrigation improvement projects in old lands 7

I. At the level of the main system: 9

II. At the level of tertiary system: 14

2.3 Monitoring and evaluation of the irrigation system 18

2.4 Developing W10 performance indicators 24

Chapter (3): Approach and methodology 26

3. 1 Introduction 26

3. 2 Performance indicators 27

3.2.1. Canal performance aspects: 27

3.2.1.1. Adequacy of water supply: 27

3.2.1.2. Application of continuous flow 27

3.2.1.3. Equity of Water Distribution 28

3.2.1.4. Water Shortage at canal end 28

3.2.2. Mesqa performance aspects: 28

3.2.2.1. Water saving 28

3.2.2.2. Equity of water distribution 29

3.2.2.3. Irrigation cost 29
3.2.2.4. Irrigation time 29
3. 3 Data collection and analysis: 31
3.3.1. Canals data collection and analysis: 33
3.3.1.1. Water levels 33
3.3.1.2. Discharges 34
3.3.1.3. Regulator gate openings 37
3.3.1.4. Cropping patterns 37
3.3.1.5. Crop theoretical water requirement: 38
3.3.1.6. Actual water supply at canal head regulator: 39
3.3.2. Mesqas data collection and analysis 50
3.3.2.1. Pumps (Mesqas) discharges: 51
3.3.2.2. Crop theoretical water requirements 51
3.3.2.3. Actual applied water 51
3.3.2.4. Irrigation cost 52
3.3.2.5. Irrigation time 52
Chapter (4): Description of the study area 53
4. 1 Introduction 53
4. 2 Description of W10 canals 53
4-2-1 Meet Yazid canal 54
4-2-2 Branch canal in W10 54
4-2-3 Sub-branch canal in W10 55
4-2-4 Cropping Pattern 58
4. 3 Description of W10 selected Mesqas 60
Chapter (5) Results and Discussions 64
5-1 Introduction 64
5-2 Canal performance measurements 64
5.2.1. Adequacy of water supply: 64
5.2.2. Application of continuous flow: 67
5.2.3. Equity of water distribution 75
5.2.4. Water Shortage at canal end 77
5-3 Mesqa performance indicators 85

5.3.1. Water Saving: 85
5.3.2. Equity of water supply: 87
5.3.3. Irrigation Cost: 88
5.4.1.1. Operating cost of the unit of area 88
5.4.1.2. Total cost 93
5.3.4. Irrigation Time: 97
5-4 Comparing applied indicators to WMRI indicators 104
5.4.1. Canal performance aspects: 104
5.4.1.1. Adequacy of water supply: 104
5.4.1.2. Application of continuous flow: 104
5.4.1.1. Equity of water supply: 104
5.4.1.2. Water Shortage at canal end 105
5.4.2. Mesqa performance aspects: 105
5.4.2.1. Water saving: 105
5.4.2.2. Equity of water supply: 105
Chapter (6): Conclusion and Recommendations 106
6.1 Summary 106
6.2 Conclusions 106
6.2.1. For canal performance indicators 106
6.2.2. For mesqa performance indicators 107
6.3 Recommendations for future studies 108
References 109
ملخص الرسالة 112

List of Figures

Figure 1 Total improvement cost per feddan for IIP1 (WMRI 2005) 3
Figure 2 Location map of IIP command areas. 8
Figure 3 Main concepts of irrigation improvement project. 9
Figure 4: Sketch of improved irrigation management. 11
Figure 5: Downstream control gate and distributor. 12
Figure 6: High level mesqa with single point lifting 16
Figure 7: Lined mesqa J-section (after El-Kashef, 1995) 16
Figure 8: Example of FAO water report results for 16 projects in different countries (after Burt and Styles, 1999) 19
Figure 9: Installing water level recorder 33
Figure 10: Downloading data from recorder to computer 34
Figure 11: Discharge flow measurement at branch canals 36
Figure 12: Current metering of canal section 36
Figure 13: Flow conditions under lifting gates 41
Figure 14: Calibration of Shalma head regulator during summer season 2008 42
Figure 15: Calibration of Shalma head regulator during winter season 2008/09 43
Figure 16: Calibration of El-Mofty head regulator during summer season 2008 43
Figure 17: Calibration of El-Mofty head regulator during winter season 2008/09 44
Figure 18: Calibration of Sefsaf head regulator during summer season 2008 44
Figure 19: Calibration of Sefsaf head regulator during winter season 2008/09 45
Figure 20: Calibration of Eliwa head regulator during summer season 2008 45
Figure 21: Calibration of Eliwa head regulator during winter season 2008/09 46
Figure 22: Calibration of Masharqa head regulator during summer season 2008 46
Figure 23: Calibration of Masharqa head regulator during winter season 2008/09 47
Figure 24: Calibration of Safan head regulator during summer season 2008 47
Figure 25: Calibration of Safan head regulator during winter season 2008/09 48
Figure 26: Calibration of Sidi Salem head regulator during summer season 2008 48
Figure 27: Calibration of Sidi Salem head regulator during winter season 2008/09 49
Figure 28: Fixed flow meter on different pump during summer season 2008 51
Figure 29: Installing irrigation time meters 52
Figure 30:W10 area within Wasat IIP sub-project (Kafr El-Sheikh) 57
Figure 31: Schematic layout of W10 sub-project command area 58
Figure 32: Percentage cropping pattern for selected canals and branch canals during summer 2008 59
Figure 33: Percentage cropping pattern for selected canals and branch canals during winter season 2008/09 59
Figure 34: location of selected mesqas along W10 canals 61
Figure 35: Annual relative irrigation supply at Shalma canal (IIP) and D/S El-Mofty Regulator (W10) 65

Figure 36: Annual relative irrigation supply at Sefsaf, Eliwa, and Masharqa Canals 65
Figure 37: Annual relative irrigation supply at Saafan and Sidi Salem canals Canal 66
Figure 38: Average daily variations of water levels at head of Sefsafa canal (summer 2008)...... 68
Figure 39: Average daily variations of water levels at head of Sefsafa canal (winter 2008/09)... 68
Figure 40: Relative water discharge at Sefsafa canal (summer 2008) 69
Figure 41: Relative water discharge at Sefsafa canal (winter 2008/09)..................................... 69
Figure 42: Average daily variations of water levels at head of Eliwa canal (summer 2008)....... 70
Figure 43: Average daily variations of water levels at head of Eliwa canal (winter 2008/09) 71
Figure 44: Relative water discharge at Eliwa canal (summer 2008)... 71
Figure 45: Relative water discharge at Eliwa canal (winter 2008/09).. 72
Figure 46: Average daily variations of water levels at head of Masharqa canal (summer 2008) 73
Figure 47: Average daily variations of water levels at head of Masharqa canal (winter 2008/09)
.... 73
Figure 48: Relative water discharge at Masharqa canal (summer 2008)................................... 74
Figure 49: Relative water discharge at Masharqa canal (winter 2008/09) 74
Figure 50: Average RIS value for main and branch canals 75
Figure 51: Monthly RIS values for Shalma and D/S El-Mofty regulator 76
Figure 52: Monthly RIS values for branch canals (Sefsafa, Eliwa, and Masharqa)........................ 77
Figure 53: Comparing water level between Sefsafa canal end and Rewina canal........................ 78
Figure 54: Flow condition between Sefsafa canal end and Rewina canal.................................... 78
Figure 55: Comparing water level between Eliwa canal end and Bahr Nashart drain.................. 79
Figure 56: Flow condition between Eliwa canal end and Bahr Nashart drain 80
Figure 57: Comparing water level between Masharqa canal end and Bahr Nashart drain 81
Figure 58: Flow condition between Masharqa canal end and Bahr Nashart drain....................... 81
Figure 59: Comparing water level between Safan canal end and Bahr Nashart drain 82
Figure 60: Flow condition between Saafan canal end and Bahr Nashart drain 83
Figure 61: Comparing water level between Safan canal end and Bahr Nashart drain 84
Figure 62: Flow condition between Sidi Salem canal and Bahr Nashart drain............................. 84
Figure 63: Average annual RIS values for selected areas. 86
Figure 64: Annual RIS values at canal head, middle, and tailfor selected areas 87
Figure 65: Local annual RIS values at each canal head, middle, and tail 88
Figure 66: Average operating cost for selected areas (summer 2008). 89
Figure 67: Comparing average operating costat canal head, middle, and tailfor selected areas (summer 2008). 89
Figure 68: Comparing crop operating cost for selected areas (summer 2008). 90
Figure 69: Average operating cost for selected areas (winter 2008/09). 91
Figure 70: Average operating costat canal head, middle, and tailfor selected areas (winter 2008/09). 91
Figure 71: Comparing crop operating cost for selected areas (winter 2008/09)......................... 92
Figure 72: Average total cost for selected areas(summer 2008). 93
Figure 73: Comparing total costat canal head, middle, and tailfor selected areas (summer 2008).
.... 94

Figure 74: Comparing crop total cost for selected areas (summer 2008). 95
Figure 75: Average Total cost for selected areas (winter 2008/09). 96
Figure 76: Comparing total costat mesqa canal, middle, and tail for selected areas (winter 2008/09). 96
Figure 77: Comparing crop total cost for selected areas (winter 2008/09). 97
Figure 78: Average irrigation time for Cotton& Rice crops for selected areas (summer 2008).... 99
Figure 79: Comparing average irrigation time for Rice crop at canal head, middle, and tail for selected areas (summer 2008). 100
Figure 80: Comparing average irrigation time for Cotton crop at canal head, middle, and tailfor selected areas (summer 2008). 100
Figure 81: Average irrigation time for Berseem & Wheat crops for selected areas (winter 2008/09) 101
Figure 82: Comparing average irrigation time for Berseem crop at canal head, middle, and tail for selected areas (winter 2008/09). 102
Figure 83: Comparing average irrigation time for Wheat crop at canal head, middle, and tail for selected areas (winter 2008/09). 102

List of Tables

Table 1: measured performance aspects, measured indicators, and required data for measuring each indicator. 30
Table 2: Monitoring location and schedule of field measurements 32
Table 3: Total theoretical water requirements (m3) throughout growing seasons........ 39
Table 4: Summary of gate calibration for all canals 50
Table 5: List of the monitored canals and drains 53
Table 6: Data of branch canals within Wasat IIP sub-project........ 54
Table 7:Basic desgin data of branch canal in W10 aera 56
Table 8: presents the cultivated area for each crop along all the study canals during summer and winter seasons. 60
Table 9: Selected mesqa in W10 area and their assigned codes 61
Table 10: Crop pattern for selected mesqas in W10 area during summer season 2008 and winter seasons 2008/09........ 62
Table 11: Total irrigation hours for selected mesqas in W10 area during summer season 2008 and winter seasons 2008/09 98

List of Abbreviations

BCWUA	Branch Canal Water User Association
DSCG	Down Stream Control Gate
EA	Environmental Assessment
FAO	Food and Agriculture Organization
Fed	Feddan (unit of measuring areas commonly used in Egypt =4200m2)
IAS	Irrigation Advisory Service
IIP	Irrigation Improvement Project
IIS	Irrigation Improvement Sector
IIIMP	Integrating Irrigation Improvement and Management Project
IS	Irrigation Sector
KFW	Kreditanstalt Für Wiederaufbau (German Development Bank)
M&E	Monitoring and Evaluation
Mesqa	Local name for tertiary level farmer private Canal
MWRI	Ministry of Water Resources and Irrigation
NWRC	National Water Research Center
RAP	Rapid Appraisal Process
RIS	Relative Irrigation Supply
USAID	United State Agency for International Development
WMRI	Water Management Research Institute
WUA	Water User Association
WUI	Water Use Index

Chapter (1): Introduction

1.1 Background

Egypt is facing a great challenges regarding expected water crisis. Rapid increase in population combined with fixed share of the Nile River water (55.5 billion cubic meters per year) are the main reasons for water shortage problem.

The agricultural sector is the largest user and consumer of water in Egypt, with its current allocation (in 2010) exceeds 68% of the total fresh water supplies or 82% of the total used water (after recycling).

The total area of irrigated land in the year 2010 (according to the Agricultural Strategy 2030) is approximately 8.80 million feddan, with a cropped area of approximately 15.50 million feddan. The consumed amount of water by Evapo-Transpiration is about 40.5 billion cubic meters. This means an annual overall average consumption rate (ET) of about 4600 cubic meter per feddan.

Attia (2009), reported that rainfall in Egypt is very scarce except in a narrow band along the northern coastal areas, where an insignificant rain-fed agriculture is practiced. Rainfall occurs in winter in the form of scattered showers along the Mediterranean shoreline. The total amount of rainfall does not exceed 1.5 billion cubic meters (BCM) per year.

Flash floods occurring due to short-period heavy storms are considered a source of environmental damage especially in the Red Sea area and Southern Sinai. It is estimated that around 1.3 billion cubic meters can be harvested every year.

Shallow groundwater in the Nile aquifer is not an additional source of water as it gets its water from percolation of the irrigated lands and seepage from irrigation canals. Therefore, its yield is considered as a reservoir in the Nile River system with about 6.2 BCM per year of rechargeable live storage, which is about 7.60% of the total water supplies.

Desalination is mainly used to supply remote areas with municipal water, especially in the touristic sector. The cost of desalination is still high, and the annual contribution of this source (in 2010) in the water budget is estimated as 0.35% of the renewable water supplies (according to the 2050 Water Strategy).

The agricultural drainage network carries annual discharge of relatively good water quality, from which a large amount (about 16 billion cubic meters) is reused (officially