AGRICULTURAL VS. HYDROPOWER TRADEOFFS IN THE
OPERATION OF THE HIGH ASWAN DAM

by

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ABSTRACT

The construction of the High Aswan Dam in Egypt has provided the
potential for year-round irrigation of the Nile Delta and Nile Valley
regions, greatly reduced the threat of annual floods by the Nile
River, and is presently satisfying a substantial portion of the yearly
energy requirements of Egypt with the hydroenergy generated at the
Dam's power station. Since the beginning of its operation, the
releases from the High Dam have been made primarily to satisfy down-
stream irrigation demands and provide flood control. Hydropower has
essentially remained a residual benefit.

In any system with multiple purposes there are bound to be con-
flicts in the allocation of water. For instance, in the operation of
the High Dam increases in outputs to a purpose such as agricultural
water supply would tend to come at the expense of the other major
purposes. A quantification of the impacts on the various purposes due
to a change in allocation of one purpose is often referred to as a
tradeoff analysis. The purpose of this thesis is to arrive at a trade-
off relationship between hydropower and agriculture for the monthly
operations of the High Dam under current water availability conditions.
A modified version of a stochastic dynamic programming model for the
High Dam operation is employed in which physical constraints are incor-
porated and institutional constraints are altered to gain a better
understanding of their impact on the multiple objectives of this
reservoir system.

The results show that once operating rules are optimized for
current agricultural demands, an 11-20 percent increase in firm
monthly power production can be gained when summer irrigation alloca-
tions are reduced by 25 percent. A simple benefit/cost analysis
concludes that potential benefits obtained by gains in firm monthly
hydropower are nearly equal to potential losses in the agricultural
sector when summer allocations are reduced by 5 to 10 percent. As the value of hydropower will increase in the future, a reevaluation of the summer cropping patterns may become an essential task to insure the efficient use of the water released from the High Aswan Dam. Recommendations are made for the operating guidelines of the High Dam releases in light of these results.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1 Overview</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1.2 Outline of the Thesis</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>THE NILE AND THE HIGH ASWAN DAM</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2.1 Introduction</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2.2 The High Dam Reservoir</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2.3 The Yearly Water Balance in Egypt</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2.4 Concerns of Bank Erosion</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2.5 Hydropower Generation at the High Dam</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2.6 Summary</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>OBTAINING THE TRADEOFF BETWEEN HYDROENERGY AND AGRICULTURE WITH STOCHASTIC DYNAMIC PROGRAMMING</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3.1 Introduction</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>3.2 Overview of Previous Work</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>3.3 Proposed Procedure for Obtaining the Tradeoff Curve</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>3.4 The Modified Stochastic Dynamic Programming Model</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>3.4.1 Mathematical Formulation</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>3.4.2 The Objective Function</td>
<td>30</td>
</tr>
</tbody>
</table>
3.5 The Comparison of the Original and Modified Models

3.6 Summary

CHAPTER 4: APPLICATION OF THE MODEL

4.1 Introduction

4.2 Data and Parameters of the System
- Yearly Water Requirements
- Inflows to Lake Nasser
- Storage States Used in the Model
- Hydropower Generation Function
- The Toshka Spillway

4.3 Application of the Dynamic Programming Model

4.4 Results of the Dynamic Programming Runs

4.5 Application of the Simulation Model
- Simulation Results with Toshka
- Simulation Results Without Toshka
- Spills to Toshka and Evaporation from Lake Nasser

4.6 Summary

CHAPTER 5: ANALYSIS OF THE AGRICULTURAL - HYDROPOWER TRADEOFFS

5.1 Introduction

5.2 Yearly Power Generation vs. Summer Irrigation Reductions

5.3 Firm Monthly Power Production vs. Summer Irrigation Reduction

5.4 Evaluation of the Tradeoff

5.5 Summary

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions and Recommendations