

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

PA



by

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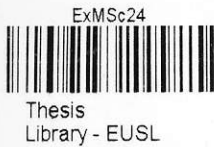
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ABSTRACT

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 downstream irrigation demands and provide flood control. Hydropower has essentially remained a residual benefit.

In any system with multiple purposes there are bound to be conflicts 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 incorporated 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 allocations 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.

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