DEVELOPMENT OF DYKES FOR MAXIMIZING UTILIZATION OF RAINWATER IN SOME WADIES IN THE NORTH WESTERN COAST, EGYPT

Submitted By

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B.Sc. Engineering (Civil Engineering), Faculty of Engineering, Zagazig University, 1992

Master in Civil Engineering, Faculty of Engineering, Helwan University, 2005

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences
Department of Environmental Engineering Sciences

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APPROVAL SHEET

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Abstract

Wadi-bed cultivation is one of the main macro catchment water harvesting system in the Northwestern Coast Zone (NWCZ) which depends on construction of cement dykes across the main stream of the wadi. The main problems resulting from these dykes are unequal distribution of surface runoff, where less runoff reaches the downstream and losing part of the surface runoff at high rainfall storms. This study aimed to evaluate and develop the existing dykes in two wadis represented to the NWCZ wadies, they were wadi Hashim and wadi Shebity located at about 50 and 70 km east and west of Marsa Matrouh city respectively. To achieve the study objectives, many activities were carried out in field, laboratory and office to estimate the runoff volume using Soil Conservation Services Curve Number (SCS-CN) method and the Geographical Information System (GIS), calculate the storage capacity of dykes and fig water requirements for each cultivated area. The evaluation aspects included the percentage of stored runoff, runoff distribution, stored runoff relative to fig water requirements and area of existing cultivated land relative to the potential. The development of dykes depended on studying the effect of spillway height of 20, 30, 40, and 50 cm on the efficiency of the dykes. The results showed that the existing dykes were not suitable for agricultural development under the conditions of NWCZ for both wadies. To Maximize rainwater utilizing in wadi Hashim, the spillways must be constructed at different heights of 20 or 30 cm according to the dyke position along the wadi main stream in addition to constructing water harvesting techniques with total storage capacity of 64364 m^3. However, in wadi Shebity, the spillways must be constructed at different heights of 20 or 30 or 40 or 50 cm in addition to constructing water harvesting techniques with total storage capacity of 12360 m^3. It is concluded that the methodology described in this study

for evaluation and development of the dykes could be applied in other wadies, but with different results according to the watershed area and its physical characteristics, rainfall, the cultivated land area and crop type. The present study reached out for some recommendations to maximize rainwater utilizing in terms of constructing new additional dykes and other water harvesting techniques such as cisterns or tanks and decreasing the distances between fig trees, particularly for the cultivated area in upstream

Keywords:

Macro-catchment water harvesting, Northwestern Coast Zone, surface runoff, dykes, SCS-CN, GIS, spillway

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