

## ABSTRACT

The focus of this study was to devise a way in order to optimise the use of surface water resources of Marab Hassan catchment area in the Northeast Badia of Jordan.

In order to achieve this aim different approaches have been used in the evaluation of the Marab's available surface water resources. The first approach was to develop a rainfall-runoff model for the catchment. Difficulties in obtaining actual reliable stream flow values led to the development of synthetic unit hydrograph of the catchment area (Snyder, SCS and GIUH) using the catchment characteristics, taken from a Digital Elevation Model (DEM). As rainfall is the major source of runoff and due to its importance in the study area, a review of the rainfall records of the catchment area (both monthly and annually) was made. This has indicated a significant decreasing trend in rainfall, number of rainy days and length of wet season from Northwest to Southeast of the Badia area.

The second approach was to develop a correlation between the global climatic indices (ENSO, NAO and Indian Ocean) and the Jordanian rainfall. The correlation between the Annual Regional Rainfall Index (ARRI) and the seasonal climatic indices is significant and was used to develop a rainfall probability model for the region. The developed models were verified against available records of the results of the PRA in relation to the floods and gave quite high reliability. This approach has led to the decision tree for cultivation in the Marab area, especially when a dry year is predicted to occur, and this gives the farmers a lead-time to prepare themselves in advance.

Review and analysis of Marab Hassan was a pilot study in developing criteria for the identification of other Marabs that could possibly be developed. It also gave an indication about the sustainability and the planning of water harvesting technique that could be used to maximise the effective utilisation of the Marab and its present water resources.