THESIS

APPLICATION OF A DECISION SUPPORT SYSTEM FOR EFFICIENT IRRIGATION PLANNING AND MANAGEMENT IN A SELECTED IRRIGATED AREA OF PUNJAB

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ABSTRACT

Efficient irrigation management predominantly relies on improved monitoring of the irrigation system, seamless communication of information and efficient decision making process. The monitoring of the system is quite inefficient and depends upon the century old practices of data collection, which are inadequate to collect the required quantity as well quality of the data. Currently, the Punjab Irrigation Department (PID) does not have any Decision Support System (DSS) in order to take efficient decisions for irrigation system operation and management. The decision making process is based on traditional wisdom rather than on scientific knowledge and techniques. Such decisions for system management often lead to inappropriate and inefficient water management in the province.

The aim of this study is to apply or adopt Water Evaluation and Planning (WEAP) System in 4R distributary canal command offtaking from Hakra canal at head Ghulab Ali and develop scenarios and suggest appropriate solutions in order to overcome the irrigation water shortages on the basis of the water required by the crops. Firstly, in WEAP 4R distributary model was developed as reference scenario and calibrated on the basis of available data by optimizing the maximum crop productions. This is done by maximum potential yield assuming an optimal supply of water which can be obtained when actual evapotranspiration (ETa) and potential evapotranspiration (ETc) are approximately equal (ETa=ETc) for reference Scenario. Two scenarios (Scenario-I: changed climatic conditions, Scenario-II: changed cropping pattern) were developed for the estimation of ETa and ETc for each cropping season and unmet demands for each scenarios were estimated.

The results of two scenarios indicate that there is no significant impact of these scenarios on the water requirement of the crops, because in these scenarios the available water does not fulfill the water required by the crops. However, keeping in view of the canal command area, climatic conditions and soil properties the cotton-wheat cropping pattern was replaced by sorghum-wheat and yet the model results were not satisfying the water requirement of these crops. Therefore, the existing cropping pattern should be continued and furthermore the extra water required to meet the crop water requirement must be pumped during the days of water shortages and canal closure. The extra amount required to be pumped is 67 millimeters from 6^{th} of July for Scenario-I and 88.9 millimeter from 17^{th} of June in case of Scenario-II in order to meet the water requirement of the crops.

Furthermore, the model can be run to simulate by testing both ground and surface water on the existing cropping pattern and as well as considering the canal hydraulic conditions.

Key Words: Decision Support System (DSS), Total Available Water (TAW), Readily Available Water (RAW), Unmet Demand, Irrigation Trigger, Crop Yield.