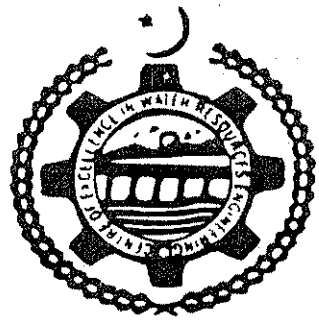
PARAMETRIC EVALUATION OF DIFFERENT IRRIGATION METHODS IN BARI DOAB OF PAKISTAN



Year: 2016

Advisor

DR. GHULAM NABI

Submitted By:

WASIM HAIDER

(2012-MS-WRE-10)

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING

UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE

ABSTRACT

Water is the most critical and precious input for crop production under irrigated agriculture. The per capita water availability in Pakistan at the time of independence was 5,600 cubic meters, which has been drastically reduced to only 1,000 cubic meters, placing Pakistan towards one of the water-scarce countries. The water crisis has intensified with the gradual depletion of water resources and sedimentation in existing reservoirs. The country is facing the worst water shortage of history due to over use of ground water resulting from the drought conditions from the year 2000 till June 2010.

Growing physical scarcity of freshwater resources, shortage of economically accessible water and growing population is threatening food security of the future generations. The situation has become more serious due to low crop water productivity because of ineffective and inefficient utilization of water resources.

The possible solution, of these current water shortages and rapidly competing future demands, is making optimum use of each drop of water by the adoption of best irrigation practices. Land evaluation is the assessment of land performance for the purpose of crop production or comparison of irrigation methods. The present study was conducted in an area of 12,000 hectares (120 km^2) extending from Burewala to Gaggoo Mandi which is on the southern side of River Sutlej and in Chishtian Sub-Division Punjab, Pakistan. The conventional irrigation method of flooding is being used here which however causes significant water losses of 20-25%.

The main objective of this research was the comparison of surface, sprinkler and drip irrigation methods on the basis of a parametric evaluation system in this area.

Parametric evaluation of different irrigation methods is a type of land evaluation technique in which suitability of a particular land is evaluated for surface, sprinkler and drip irrigation methods. This evaluation is based on physical (soil texture, soil depth, soil drainage), chemical ($CaCO_3$ content, salinity) properties of soil and topographic characteristic of land (slope).

The land suitability classis for surface, sprinkler and drip irrigation were worked out by considering the data regarding soil texture, soil depth, lime ($CaCO_3$ content), salinity, drainage and slope. A total of twenty nine (29) soil samples covering the whole study area of Burewala were collected and analyzed for soil texture, $CaCO_3$ content and electrical conductivity (EC) value in laboratory (Annexure II) whereas values of soil depth, soil drainage and slope were taken from semi detailed soil survey report of district Vehari. Similar procedure was repeated for Chishtian sub-division site and required data was obtained from semi-detailed soil survey report of Chishtian sub-division. After analyzing and evaluating the soil properties, suitability maps were produced for surface, sprinkler and drip irrigation methods using Geographic Information System (GIS) 9.3 software.

In case of Burewala site, the obtained maps showed that there was no area found as highly suitable for surface irrigation method because of soil texture limitations (Capability Index $<$ 80) but 7435 ha (62 %) of study area showed moderately suitable land for surface irrigation method. The highly suitable land in case of sprinkler irrigation system was 7435 ha (62 %) of the study area without any limitations. Suitability map for drip irrigation method showed more improved results as highly suitable land in this case was 8455 ha (71 %). The results revealed that by applying drip irrigation method instead of surface and sprinkler irrigation methods, the arability of 8591 ha (72 %) in the study area will improve whereas the application of sprinkler irrigation system in place of

surface and drip irrigation system will improve the land suitability of 1506 ha (13 %) of the area under consideration.

In case of Chishtian sub-division site, 31533 hectares (41%) area showed highly suitable results for surface irrigation, 63807 hectares (83%) for sprinkler and 70374 (92 %) for drip irrigation systems.