

ASSESSMENT OF WATER AND LAND RESOURCE POTENTIAL FOR WATER CONSERVATION IN PUNJAB



By

Rana Waqas Nazir

2018-MS-WRE-29

Research Supervisor:

Dr Ghulam Nabi

2022

Centre of Excellence in Water Resources Engineering
University of Engineering and Technology, Lahore

**ASSESSMENT OF WATER AND LAND RESOURCE POTENTIAL FOR
WATER CONSERVATION IN PUNJAB**

by
RANA WAQAS NAZIR
(2018-MS-WRE-29)

A THESIS
presented to the university of engineering and technology, Lahore
in partial fulfilment of the requirements for the degree of
Master of Science
in
WATER RESOURCES ENGINEERING

APPROVED BY:

Dr. Ghulam Nabi
Research Advisor/
Internal Examiner

Dr. Ashraf
External Examiner

DIRECTOR, CEWRE

Approval Date: _____

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE

© 2022

RANA WAQAS NAZIR

All Rights Reserved

Any part of this thesis cannot be copied, reproduced or published without the written approval of the Scholar.

ABSTRACT

Pakistan is an agricultural country, out of 79.6 million hectares, 22.74 million hectares are cultivated irrigated by ground and surface water. The population in 2020 was 220 million, and the annual per capita availability of water was estimated at 1,000 cubic meters in 2016. An increase in population demands more food production. With the passage of time, water availability is decreasing. The irrigation system was designed for cropping intensity of 60% which has increased up to 160%. Due to the increase in cropping intensity, more water is required for agricultural production. The groundwater is pumped for irrigation, which results in water level and quantity depletion. Groundwater recharge is an option for its replenishment. This study is focused on the identification of suitable sites for water conservation in Punjab province. The annual mean precipitation varies over 800 mm (in the northern part) to less than 300 mm (in the southern part).

Java script was developed to analyze the excess water potential, to download data and identification of suitable locations for its storage. SRTM digital elevation model, landsat, sentinel, soil, elevation, slope, drainage density, lineament density, infiltration, rainfall, land-use/land-cover, and evapotranspiration maps were utilized. A pairwise weighted overlay analysis was done for the identification of suitable sites for water storage.

The five-year (2016-2020) data of rainfall was used. The results show that from 2016 to 2020 the runoff volume in the monsoon period (July – September) for Punjab varies from 4.55 to 6.07 MAF. It was concluded that there was 6.07 MAF potential in the year 2016, 5.75 MAF in 2017, 5.69 MAF in 2018, 5.29 MAF in 2019, and 4.55 MAF in 2020. The regions of high surface water storage potential cover an area of

58.60% (13.78 Mha) while the areas having low and moderate surface water storage potential are 1.69 Mha (7.17%) and 8.05 Mha (34.23%) respectively.

The average annual (2016-20) runoff, with runoff magnitude greater than 420 mm covering 8.09% area of Punjab and producing 4.58 MAF runoff. The runoff was in the magnitude of 220 - 420 mm covering 20.84% of the area, with a volume of 9.83 MAF. The water depth of 220 mm covers an area of 16.63% and generates 2.64 MAF annually. The average annual runoff volume was 17.05 MAF. The groundwater depletion can be replenished by groundwater recharge at a different location as identified in this study.