

Investigating the Effect of Flood-Spreading Structure on Discharge of Downstream Qanats: A Case Study of Mehriz Flood-Spreading Project

Ali Talebi^{1*}, Khademorad Foroohar², Mohammad Taghi Dasturani³, Sara Parvizi⁴

Received: 07/04/2020

Accepted: 05/01/2021

Expanded abstracts

Introduction: In recent decades, flood-spreading and artificial flood recharge have been used at the proper time and place for optimal utilization of floods in arid and semi-arid regions. The importance of these projects in Iran is mainly due to the excessive use of groundwater resources and recent droughts, which have rapidly decreased the level of underground aquifers. Therefore, in a country like Iran, which is regarded as an arid and semi-arid region, performing such projects is essential for water resources management and flood control. Evaluation of the performance of watershed management projects in different countries worldwide has a history of more than 80 years. Thus, this study sought to determine the long-term effects of this project on flood control and underground water recharges, especially in dry years, through a technical investigation of the Mehriz flood-spreading project.

1. Professor, Department of Rangeland and Watershed Management, Faculty of Natural Resources and Desert Studies, Yazd University, Corresponding Author; talebisf@yazd.ac.ir

2. Master of Desert Management, Faculty of Natural Resources and Desert Studies, Yazd University

3. Professor, Faculty of Natural Resources, Faculty of Natural Resources and Environment, Ferdowsi University of Mashhad professor in Department of Watershed Management Engineering, Ferdowsi University of Mashhad.Iran

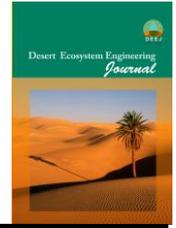
4. PhD student in Watershed Management, Faculty of Natural Resources and Desert Studies, Yazd University

DOI: 10.22052/deej.2021.10.31.21



University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: <http://deej.kashanu.ac.ir>

Material and Method: This study used technical evaluation methods to evaluate the Mehriz flood-spreading project, which was carried out in two ways: statistical analysis and fieldwork. In the first method, all necessary data were collected and analyzed. In the second method, field visits to the project were made, the pros and cons of the note plan were identified, and the technical evaluation of the plan was performed. This way, the discharge of qanats was investigated before and after applying the water-spreading project.

Result: The comparison of average annual discharge in Fakhrabad River's hydrograph before and after the project shows that from July to November, the flow rate in each period was equal to zero, and from December to April, the river's flow rate was less in the pre-project period than what it was in the post-project period. Moreover, the average discharge rate in the month before the project began was lower than the rate reported after the project finished. Also, the average rate of post-project discharge in May and June was less than the rate reported for the pre-project period. The study's results indicate that while most pre-project floods occurred in late spring and early summer, the post-project floods occurred in late winter and early spring.

Discussion and conclusion: As mentioned earlier, this study investigated the effect of the Mehriz flood-spreading project on qanat discharge. According to the study's results, Baghdadabad's qanat in pre-project years was less than that of control 1 (Ibrahim Abad) and control 2 (Henza). During the years since the project was implemented, these qanats' discharge rate was higher than that of both control qanats. A comparison of the three-year mean discharge of the Baghdad qanats in May, August, and February in two ten-year periods before and after the implementation of the project showed that these qanats' discharge rate was increased in pre-project years. Therefore, implementing the flood-spreading project has helped increase the volume of water in those qanats. Also, the result of the statistical t-test showed that this aqueduct's flow rate has increased in pre-project years.

The changing trend of the Khairabad qanat's discharge in Yazd indicated the positive effect of implementing the flood-spreading project on the qanat's discharge in post-project years. On the other hand, the result of the t-test for Mohammadabad qanat before and after the implementation of the project suggested that the qanat's discharge rate in pre-project years was less than the rate reported for the post-project years. Also, a hydrological comparison of the average quarterly discharge rates of the qanats with those of the control qanats pre and post-project years showed that the discharge rates of Khairabad and Mohammadabad qanats had gone through a downward trend from 1987 to 2007, indicating no effect of the flood-spreading project on increasing the discharge rate, which is considered as one of the drawbacks of the flood distribution plan. This could be attributed to the fact that the project area is located in a place where flood water naturally spreads and nourishes most channels. Moreover, diverting the water of the Fakhrabad channel and spreading the flood water to a particular place prevents some downstream qanats (such as Mohammadabad) from being fed by the floodwater, which, in turn, may upset the floods' balance and negatively affect the behavior of the basin's residents.

Keywords: Qanat, Flood Spreading, Project Evaluation, Yazd.