Journal of Water and Soil
Vol. 29, No. 5, Nov.-Dec. 2015, p. 1232-1246

نشریه آب و خاک (علوم و صنایع کشاورزی)
جلد ۲۹، شماره ۵، آذر – دی ۱۳۹۴، ص. ۱۲۴۶-۱۲۳۲

Evaluating Reliability Index and Determining the Allocation Levels of Water Resources in Water User Association of Alborz Scheme

S.F. Hashemi[1] - A. Shahnazari[2]*

Received: 27-04-2014
Accepted: 24-05-2015

Introduction: Water allocation management should be performed in a way that the various practical irrigation parts and drainage networks remain stable. Thus, irrigation management transfer and participatory irrigation management have been proposed in more than 57 countries. Such issue along with institutional mechanisms for participation severely emphasizes a new adjustable organization to transfer the investment from public resources to non-governmental sources and thus granting and handling the burden on public WUAs. In this study, the reliability of irrigation indicator was used to evaluate general irrigation planning performance of 20 WUAs along areas at Alborz Integrated Water and Land Management Project in Mazandaran province.

Materials and Methods: The overall project area encompassed the watersheds of the BabolRiver, Talar and Saih River of the Mazandaran Province, Iran. The Alborz Irrigation and Drainage network is located in the lower catchment between the Babol and Siah Rivers (western and eastern boundaries respectively) and with the Caspian Sea to the north in. The site located between 36 15 N and 36 46 N latitude and 52 35 E and 53 E longitude and covers 90520 ha. In downstream of Alborz reservoir, two diversion dam, Raiskola and Ganjafroz is located and two irrigation channels depends on these dam are constructed.

Organizing the WUAs is also important in other respects, so that the sources and utilization areas will be limited to 2,000 hectares to 6,000 hectares from 10000 hectares to 30000 hectares, respectively, which increases the simulation accuracy in a small-scale model. WUAs are classified based on the following principles:

- Adaptation of hydrological and water boundaries,
- Land use and cropping pattern
- Main and secondary irrigation and drainage channels location,
- Ensuring the financial stability and independence,
- Considering the cultural needs, local farmers' roles and social studies in the region.

In order to evaluate the water allocation, the reliability index must also be defined which stands as the oldest and most practical criterion for water resource systems analysis serving as the indicator which identifies and analyzes the system status for failure or non-failure condition. In some studies, to determine the reliability index, the entire month in which the system was successful in providing the required water divided by the entire system operation duration. Accordingly, the system can be considered as reliable if the deficiency in not more than 20% in simulation, that is, the probability of 80% can be used to provide the water supply level over four years out of five years. The application of the given method will be used in evaluating the demand balance simulation.

Results and Discussion: The results of estimating the reliability index showed that the water users association with the highest priority in terms of location priority have approximately a reliability index of 70%, representing considerable shortages and deficiency making inevitable use of other resources (BMC1, HATKI1, B3-1-1, TMC1 and RaiskolaWUAs) among which Raiskola had the highest priority relative to other WUAs, with about 91 percent, and was successful in providing the required water. WUAs with lower location priority adjacent to Siahrood River have been successful in approximately 75 percent of their water supply. The WUAs with the lowest priority (HATKI3, TMC3 and BMC3) had the lowest reliability index of about 50% meaning they were successful in meeting the water supply for only 50%. The C24-1 WUAs was 100 percent successful in its water supply which could be also noticeable among other WUAs. In order to assess the success of the system to meet the demand of WUAs, the Alborz network functionality was investigated. The major water utilization from river channels and the release of Alborz Dam were analyzed based on the statistical normal distribution function governing the However, the volume can be varied between160 to 480 million cubic meters. The possibility of 80% supply level (supplying four out of five years) for standing as an example of a guaranteed

1,2- PhD. Student of Irrigation and Drainage, and Associate Professor, Department of Water Engineering Agricultural Sciences and Natural Resources University, Sari
(*-Corresponding Author Email: Aliponh@yahoo.com)

supply of an irrigation project is about 198 million cubic meters. The probability of 20% of the water supply (a complete supply of a year out of five years) is about 347 million cubic meters. This means that the system is only able to provide an estimate of one year out of five years. The overview of which reveals a considerable value (347 million cubic meters), while from the total surface water flowing in the Alborz network (585 million cubic meters), requirements of Alborz dam supply, environmental needs and output to the sea must be considered. Regarding the 50% probability, the supply value is equal to 277 million cubic meters. Based on the given points and also the conducted analyses, the Alborz network water resources balance results can be estimated. Considering the water resources allocation management among WUAs in Alborz Dam irrigation systems, it was found that among 20 selected WUAss in the area, 5 WUAs of BMC2, B3-2, HATKI3, C25-3 and C25-4 were not able to supply all their needs despite using all resources available in the project.

Conclusion: With aim of minimizing the deficiencies and spatial priorities each one of WUAs were evaluated. Result showed that demand of 460 MCM of WUAs, 277.02 MCM is supplied from surface water. It could be concluded that average reliability is 70 percent and probability of 20 and 80 percent of reliability are 347 and 198 MCM that should be taken into account as total level allocation and first level allocation, respectively. It also could be used to estimate water balance in drought and wet periods, as the application of different management scenarios in withdrawals of AB- bandans and aquifer of Alborz scheme. The results of estimating the reliability index showed that the WUAs with the highest priority in terms of location priority have approximately a reliability index of 60%, representing considerable shortages and deficiency.

Keywords: MIKEBASIN Model, Participatory Management, Performance Index, Water Balance, Wet and Drought Periods