

Optimal water management of Vushmgir reservoir system under uncertainty conditions

Abstract

In the present study, dealing with water deficit challenges for Gorgan River Basin has been considered. Golestan province's economy is dependent on agriculture but occurrence of drought periods reduced the agricultural production and consequently the region's economy is in crisis. Therefore, performing studies for programming and management of the water resources of the province and the water allocation in the margin of Voshmgir dam in Gorganrood basin has a great deal of importance. Accordingly, in this study it was tried to consider Voshmgir dam water allocation issue between agricultural, aquaculture and environmental consumers. The main objectives of this study were to determine the cropping pattern, the amount of water allocated to each sector (agriculture, aquaculture and the environment), the amount of water scarcity of each sector, and the amount of the net profit of the system in three-year time horizon (2014-2016) using linear programming under certainty and multi-stage stochastic programming under uncertainty, under the efficiencies of 37, 45 and 51 percent and different scenarios. Required data were collected from Regional Water and Agriculture Organization of Golestan province from 1991 to 2013. The results showed that under uncertainty efficiencies of 37, 45 and 51 percent during the three-year planning horizon, water allocation to the agricultural sector will decrease but the amount of water allocated to the environmental and aquaculture sectors will remain unchanged. In addition, the acreage of some products in the region will not change under these efficiencies, the target water demand of aquaculture and environmental sectors will be provided under uncertainty, and there will be no water shortage for these sectors under scenarios studied and the efficiencies of 37, 45 and 51 percent. But in scenarios that we have drought and normal years, the target water demand for agriculture sector is not met. Water shortage in the worst case and during the time horizon considered for agriculture sector under low- low - low scenario for 2014 and under the efficiency of 37 percent is 68.67 million cubic meters. Benefit of the system increased with the increase of irrigation efficiency, but the acreage of most products has remained unchanged.

Keywords: Reservoir Management, Water Allocation , Uncertainty, Monte Carlo simulation, Vushmgir Dam



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