MIKE BASIN APPLICATION FOR PLANNING IRRGIATION RELEASES AND RESERVOIR OPERATION

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ABSTRACT

The Indian economy is primarily based on agriculture and more than 75 % population depends on agriculture and agro based jobs. Despite the high priority and massive investment in the irrigation sector and its phenomenal growth since independence, the performance of irrigation systems, both in economic terms of crop yields, farm incomes and cost recovery, as well as in water distribution terms of adequacy, equity, timeliness of water supplies, has not been encouraging. The main reasons behind not achieving requisite success may be the disparity in supply of water, improper reservoir operation, losses and irrigation management. The water requirements for a command vary significantly and depend on multiple factors such as crop types, soil moisture, rainfall, losses and climatic conditions. The MIKE BASIN software can be used to operate reservoir system with efficient operation policy under variable climate, rainfall, crops and efficiencies conditions. The MIKE BASIN philosophy is to keep modelling simple and intuitive, yet provide in-depth insight for planning and management. For hydrological simulations, MIKE BASIN builds on a network model in which branches represent individual stream sections and the nodes represent confluences, diversions, reservoirs, or water users. The present paper describe the application of MIKE BASIN model for planning of irrigation releases in Rangawan reservoir having water sharing issues and command of Harsi complex reservoir system in India.

The Rangawan reservoir is operated under water sharing agreement between Madhya Pradesh. and Uttar Pradesh of India where M.P. can use 56.63 MCM water up to 31st October and remaining water as on 1st November will be distribute in the ratio of 15:36 between M.P. and U.P. The allocation pool reservoir which distributes water as per share rights among the users cannot compute irrigation demands if connected with command node in MIKE BASIN model. To overcome this problem, two separate models have been setup in which first model compute irrigation demand of command in M.P. part using information of crops, soils, irrigation system, rainfall and climate. The outputs from first model were used as inputs in the second model where Rangawan reservoir was operated as per water sharing agreement between M.P. & U.P. For irrigation management and operate reservoir efficiently, twelve scenarios have been generated under variable conditions of reservoir storages, field efficiencies and application of groundwater etc for irrigating design cropping pattern(DCP-1 to DCP-12). The irrigation water requirement for design cropping pattern in the Rangawan command of M.P. part has been estimated as 37.81 MCM during average/wet rainfall years that increased to 45.16 MCM in dry years due to less rainfall, low soil moisture and higher temperature.

The Harsi reservoir situated in Gwalior district of M.P. (India) is supplemented from Kaketo reservoir, Madikheda and and Mohini Pickup Weir to meet irrigation demand of Harsi command. Considering different climatic, efficiency, conjunctive use variations, sixteen different scenarios runs were generated for design cropping pattern to assess irrigation demand, supply to command, demand deficit, reservoir level and capacity at different period of year. The simulation results confirmed that the demand of design cropping pattern may vary from 313.6 MCM (MB-DCP-1 & 2) in wet rainfall years to 372.4 MCM (MB-DCP-9 & 10) in dry or drought years. The demand deficit of 41.2 MCM under existing 77% conveyance and 71% application efficiencies without using groundwater in wet years can be reduced to 2 MCM by improving conditions of canals (81% conveyance and 76% application efficiencies), conjunctive use (10% demand from groundwater) and operation of reservoir as suggested by model.