ABSTRACT

Water being a prime natural resource, its essentiality and need is getting increased constantly. The management of water is crucial keeping in view the assessment and the availability and utilization. It needs proper planning and efficient management of water is foremost for development of a country.

The resources of water are in four forms, i.e., Rain water, surface water, ground water and soil moisture. These four sources of water are known as ‘Four Waters’ and these should be put to effective use, as and when they occur. Rain water harvesting, storage and diversion of surface water, pumping of the dynamic part of ground water without exceeding the recharging possibilities, conservation and utilization of soil moisture are some of the measures to be adopted under the Four Waters Concept.

Planned storage and diversion of surface water resource with development projects should be scientifically analyzed and designed as to their technical, social and economic feasibilities to obtain the necessary political and financial support for the final selection. Many project proposals formulated by the agencies consequently suffer as they lack in the concerned feasibility study resulting in delays in their clearance or rejection.

In the present study an attempt has been made to provide methodology to assess the feasibility of Srisailam Left Bank Canal
(SLBC) gravity scheme of Allimneti Madhava Reddy Project (AMRP), to evaluate optimal usage of water for the cropping pattern of SLBC and to design the main components of SLBC according to the demand of water. Source of water to SLBC gravity scheme is foreshore of Srisailam Reservoir. SLBC has no water allotment as per the Krishna Water Dispute Tribunal (KWDT), therefore it has to meet the demand from excess flow of Srisailam Reservoir.

Chapter 1 presents a general introduction of present work. In chapter 2 the literature is reviewed on a comprehensive background of the optimal operation of reservoirs, evaluation of crop water requirement. Chapter 3 focuses the study of source of water to SLBC project and also the features of the project. Chapter 4 emphasizes the methodologies that are applied to obtain the objectives of thesis.

Source of water for SLBC gravity scheme is Srisailam Reservoir which is geographically located in Kurnool district of Andhra Pradesh. Srisailam Reservoir’s operation model was developed using Stochastic Dynamic Programme Model (SDPM) without considering SLBC demand and with considering SLBC demand. The SDPM is similar to one described by Loucks et al.,(1981) and it is coded into ‘C’ language, to determine monthly operating rules for Srisailam Reservoir. Simulation program is coded in ‘C’ Language and jointly used with Stochastic Dynamic Program Model (SDPM) to evaluate the system performance. The system performance is measured in terms of reliability and resilience. The overall performance indicators through simulation with considering SLBC demand for irrigation & drinking
water release, power generation release, SLBC release and total release are 72.53%, 43.45%; 73.38%, 57.03%; 77.43%, 40.90% and 73.40%, 49.58% respectively.

SLBC release reliabilities for July, August, September, October, November, December and January are 94.4%, 98.4%, 93.4%, 84.6%, 88.8%, 63.0% and 19.4% respectively.

Optimal simulated releases from the simulation study without considering SLBC demand are compared with actual releases of past to identify the feasibility of the project. It is noted that the excess flow available to SLBC during July, August, September, October are $2279.52 \, \text{Mm}^3 (80.50 \, \text{TMCft})$, $5956.20 \, \text{Mm}^3 (210.34 \, \text{TMCft})$, $2391.09 \, \text{Mm}^3 (84.44 \, \text{TMCft})$ and $2408.36 \, \text{Mm}^3 (85.05 \, \text{TMCft})$ respectively. The feasibility of SLBC project is critically reviewed in chapter 5.

SLBC gravity scheme is to irrigate 3 lakh acres for raising Irrigated Dry (I.D) crops and to facilitate drinking water for 516 villages of Nalgonda District, A.P. The essentiality of allocation of optimal water to the cropping pattern of SLBC is needed to be studied to maximize the yield of different crops. Optimal allocation of irrigation water to develop command area of SLBC is evaluated with the help of simulation result of CROPWAT model, software developed by land and water development division FAO (FAO 1998). The model uses the crops, soil, water, atmospheric parameters of SLBC command area to compute the timing and the amount of irrigation in a year. It is found that water demand of SLBC gravity scheme in the months of July,
August, September, October, November, December and January are 19.82 $Mm^3$ (0.7 TMCft), 113.26 $Mm^3$ (4.0 TMCft), 82.11 $Mm^3$ (2.90 TMCft), 138.75 $Mm^3$ (4.90 TMCft), 164.23 $Mm^3$ (5.80 TMCft), 235.03 $Mm^3$ (8.30 TMCft) and 172.73 $Mm^3$ (6.10 TMCft) respectively. Irrigation schedules are prepared for the crops of SLBC command area, for various timing options, application depth and different evaluation criteria. The results are critically reviewed and presented in chapter 6. Main components of SLBC are namely 1. Canal Head Regulator 2. Tunnels 3. Capacities of Balancing Reservoirs 4. Lined and Unlined portions of Main Canal are designed according to water demand of the SLBC scheme and these design particulars are reviewed in chapter 7. The conclusion remarks are summarized in chapter 8.