DETERMINATION OF THE VILLAGE TANK DYNAMICS IN RELATION TO WATER AVAILABILITY AND WATER USAGE IN A CASCADE SYSTEM OF THE DRY ZONE IN SRI LANKA

By

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Abstract

Sri Lanka has a proud history of irrigation development dating back to over 2000 years. Traditionally, the livelihoods of communities in the dry zone of Sri Lanka have revolved around the village tank systems. These systems have been developed for the primary purpose of rice cultivation, but are also put to a range of ancillary uses including bathing, domestic uses and livestock watering. Fish and aquatic plants collected from these tanks are a rich source of nutrients for the village communities

Erratic and uncertain rainfall distribution, in both space and time, is the main constraint for increasing agricultural, aqua-cultural productivity and implementation of other production activities under the small tank systems. Degradation of the upper catchment and intensive agrochemical usage, tank water quality has been deteriorated. The water use in the tanks can be economized through the application of scientific and efficient strategies and there by the risk of crop failures could be minimized and more land could be brought under cultivation. The other non-consumptive activities like domestic usage and aquaculture may also benefit from such improvements.

This study was conducted in a small cascade comprising of two tanks located in Maduragama village in Giribava Divisional secretariat, Kurunagala. The study had three main purposes that have been addressed in the three sections of this dissertation. First section helps predict water availability by contributing to further improvement of the cascade water balance model (CWBM) developed by (Jayathilake et al., 2001).

Two equations were additionally included to the CWBM. Relationship between seepage and water volume of the tank was developed using measured peso meter depths and soil data. A new co-efficient that helps estimate the total evpo-transpiration of tanks including the losses by way of aquatic weeds, was introduced in to the tank evaporation estimation. The results of the study show that the modified CWBM can be used to predict water availability in a small tank cascade. The study reveals that seepage is highly correlated with tank water volume ($r^2=0.93$) than with the tank water depth ($r^2=0.88$).

Second section examines the seasonal water quality variation of Dissolve Oxygen (DO), Temperature, Salinity, Total suspended solid, pH, alkalinity, Nitrite, and Phosphate to find its suitability for different uses. Measured water quality parameters were compared with the given guidelines (WHO/SLS). Water quality variations shows that they change over the season due to many reasons, however, they do not significantly affect the usage. The study further highlights the potential in small tank cascade systems for aquaculture though there is a limitation due to low level of DO at dawn. Third section of the study examines the livelihood of the villagers, water usage and the conflicts among users. Information collected through a questionnaire survey, filed observations and farmer interviews were used to identify conflicts and their occurrence. It is also evident from the research that communities are capable of solving the conflicts among different water users through negotiations. The highest number of conflicts occurs among the farmers and fishermen. The study also proposes ways to overcome conflicts and optimization of usage.