Productivity Thresholds in a Tank-Based Agriculture System: A Case Study

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Tank cascades are human-made systems of water retention in water deficient agricultural systems. The logic of a cascade lies in maintaining an appropriate balance between the catchment area and the command area, and facilitating a continuous water flow in the downstream direction. This study investigates the current status, water use efficiency and production thresholds in 17 tanks of Mahakanumulla, a small village tank cascade system in the North Central province of Sri Lanka, using the cross-sectional survey methodology. In this cascade system, we estimate a total water holding capacity of 0.0026 km^3 and a release volume of 0.0018 km^3, supplied to a total command area of 494.56 hectares. Average yields of 2156 kg per acre and 252.6 kg per acre were calculated based on the survey responses for Maha and Yala seasons, respectively. The large difference in productivity across Maha and Yala is characteristic of solely rain-fed systems. The calculated average water productivity in the cascade is 124.55 kg per m^3 of tank water. We calculate tank production thresholds varying from 40 kg per m^3 to 268 kg per m^3. There are productivity losses in the midstream arising from land use changes. Analysis reveals that while the quality of physical tank structures is not correlated with water productivity, the land uses in the command area are correlated with water productivity. This finding highlights the need for socio-economic interventions in addition to physical improvement in the tank structure for the sustainable functioning of cascade systems.

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