

TANK CASCADE SYSTEMS: REVIEW OF PRESENT KNOWLEDGE AND FUTURE RESEARCH PERSPECTIVES

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Abstract: The ancient dry zone of Sri Lanka had an intense water management system based on a series of small reservoirs constructed in low-lying areas called the tank cascade system (TCS) to harvest and store seasonal rainfall. Besides being an irrigation source, these tanks supply water for domestic needs and other income-generating activities. This narrative review selected articles published between 2011 and 2021 on tank cascades and water management to provide an overview of the current knowledge state and outline potential research directions for TCS. Considerable studies were focused on hydrochemistry, water balance studies, and flora and fauna assessments in TCS. It was noted that beyond serving as an irrigation system, the hydraulic system also acts as an ecosystem service provider, safeguarding biodiversity in the dry zone landscape. Hence, this system plays a significant role in food production and developing social structure, economic development, cultural heritage, and environmental sustainability in the dry zone landscape. Integral to addressing global food security and sustainable development challenges, these systems are recognized for their significance in sustainable agricultural practices and landscape management, especially in climate change. It was also understood that these TCS are vital to forming organized communities. Though the application of novel techniques such as isotope assessment, virtual sensing, cyber-physical systems, unmanned-aerial-vehicle photogrammetry, use of artificial intelligence, and data mining tools are prominent in studies related to water management, those applications were rarely used in research of TCS. Several studies have been conducted during the last decade, considering the significant role of tank cascade systems in the rural economy and environmental sustainability. However, investigations on reasons for failures, the role of TCS in groundwater recharging, flood protection and ecological balance were barely discussed.

Keywords: Ecosystem; Environmental sustainability; Groundwater recharging; Hydrochemistry; Isotope assessment