

**SPATIAL AND TEMPORAL VARIATIONS OF  
HYDROGEOCHEMISTRY IN ANCIENT TANK CASCADE  
SYSTEMS IN SRI LANKA: EVIDENCE FOR A CONSTRUCTED  
WETLAND**

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Tank cascade systems (TCS) are the back bone of the dry zone prosperity in Sri Lanka and supply water throughout the year to agricultural lands since the 2<sup>nd</sup> century BC. The main aim of this study is to understand the nutrient dynamics of small TCS and find out evidence for the sustainability of the system for thousands of years. Malagane tank cascade in the Deduru Oya Basin was selected for the study and water quality parameters were measured fortnightly throughout a year, followed by monthly measurements for a period of another six months. Daily rainfall was also measured during the study period. Thirteen sediment samples were collected from the tank bed and analyzed for basic physico-chemical parameters, available metals and total element contents.

In general, all the nutrient contents were increased in the tank water during the dry season and the maximum was reported in August to October, where the rainfall was minimal. Nitrate-nitrogen content varies from 0.62 to 14.9 mg/L while nitrite-nitrogen varies from 0.004 to 2.700 mg/L. Phosphate contents were found in the range of 0.03 to 0.38 mg/L. The other anions and cations also showed a similar seasonal variation. The spatial variation of physico-chemical parameters in water is more significant in the dry season than in the wet season. The highest nitrate concentration was recorded in the inflow and decreases after water passing the *Thaulla*. Most of the anionic parameters and heavy metals followed the same pattern. However, the phosphate concentrations showed a decreasing trend from paddy fields (0.26 mg/L) towards *Thaulla*, where the concentration was lowest (0.06 mg/L) and increased thereafter indicating the anthropogenic influences near the tank bund. The composition measurements show that the elemental composition is considerably low in rain water. The lower elemental concentration of the heavy metals in sediments showed that the tank sediment has not been subjected to considerable anthropogenic influence.

In a tank cascade system, *Thaulla* located in the peripheral region of a tank acts as a constructed wetland which removes nutrients and heavy metals effectively from inflow water. This segment helps to sustain the system for several thousand years without having any adverse environmental effect to the tank water although considerable content of pollutants were added to the system as different kind of fertilizers.