Restoring Traditional Cascading Tank Systems

For enhanced rural livelihoods and environmental services in Sri Lanka

Background

There are approximately 14,200 small tanks and 13,000 anicuts, feeding an extent of about 246,000 hectares (39% of the total irrigable area of the country) in Sri Lanka, relics of an ancient hydraulic civilisation. These systems contribute 191,000 million tons of rice to national production (approximately 20% of national production).

Small irrigation tanks do not exist as discrete individual units. The natural drainage system in a watershed is blocked by earth bunds in appropriate locations to store water, forming a series of tanks along the drainage system, distributed within a micro-catchment of the dry zone. Such series are called village tank cascade systems, each with key elements as described overleaf.

Climatic analyses of data from the past few decades in Sri Lanka have revealed that there have been changes.

Between 1961-1990, the average air temperature of the country increased annually by 0.016°C, while the average annual rainfall decreased by seven percent, compared to the three previous decades.

The Rambewa DS division of the Anuradhapura District has been identified by the Climate Change Secretariat of the Ministry of Environment and Renewable Energy as one of the Divisional Secretariat (DS) divisions that are highly vulnerable to the impacts of drought.

IUCN, partnering with the Department of Agrarian Development and HSBC, began a three year project in 2013 to restore the Kapiriggama small tank cascade in the above DS division, as a traditional cascading tank system that would provide enhanced rural livelihoods and environmental services to communities using the system.
The Village Tank Cascade System

Water is recycled and re-used across a system of small to large tanks.

Traditionally, there is one village tank for the use of each village. In addition, there are also a number of other tanks with different purposes associated with village tanks:

- **kulu wewa** (forest tank), created in the upper catchment of the village tank in order to provide water for wild animals, filter debris and silt, and capture the rainwater that will enter into the village tank through seepage. By providing water for wild animals, these forest tanks reduce the likelihood of these animals damaging crops while searching for water near the village;
- **kayan wewa**, built where the upper catchment has been cleared or degraded. It is used to trap sediment and control salinity;
- **olagam wewa**, which lies close to the village, but is not associated with a permanent settlement or cultivation. It is used a source of water for seasonal cultivation;
- **goda wala** (water hole): constructed for the trapping and deposition of silt, to avoid siltation and sedimentation of the main village tank;
- **ihala wewa** (storage tank): constructed for the storage of water, and associated with paddy cultivation and other community activities; and
- **maha wewa/pahala wewa** (village tank): the main component of the cascade system. Water from all other tanks in the system drain into this tank, which is used for agriculture.

Components of a Village Tank

Just as there are different tanks in the cascade system that serve different purposes, each tank has several components, each of which fulfils an ecological function and provides an ecosystem service to the communities which live near the tank. These components are

- **diya-para** (stream);
- **perahana** (sieve or filter): a strip of grass and reeds on the periphery of the water body that acts as filter to trap silt;
- **goda wala** (water hole): an upstream sediment trap;
- **gasgommana** (windbreak of trees): an area planted with large trees of the same species that act as a windbreak to minimise evaporation from the surface of the tank;
- **iswetiya** (soil ridge): an upstream bund built on the periphery of the water body to manage soil erosion and sedimentation;
- **kattakaduwa** (interceptor): the stretch between the tank bund and paddy fields consisting of three land phases (water hole, marshy land and dry upland). This acts as a downstream wind barrier, reduces tank seepage, prevents sodium, magnesium and iron from entering the paddy land and safeguards the tank bund;
- **wel yaya** (paddy field): developed for paddy cultivation; and
- **kivul ela** (drainage): common drain of the irrigated area.

* There are no known Tamil names.
Where is this project located?

Why is this project needed?

Several issues have been identified in the target area, such as the following:

**Low cropping intensity**
In a study carried out for the entire Anuradhapura District using rice cultivation statistics recorded from 1970 to 2003, it was observed that rice crops could be planted only once a year, and this fluctuated according to the rainfall received during the northeast monsoon (maha) season. Efforts made to date to restore small tanks under various projects implemented during this period in the Anuradhapura District showed no significant improvement in the number of harvests per year. This raises a concern about current strategies used to rehabilitate tanks, as well as their effect on the water storage efficiency of tanks.

**Tank sedimentation**
The cultivable area from water obtained from small tanks decreases gradually as a consequence of tank sedimentation, with subsequent high tank water losses. Siltation of tanks not only causes a reduction of storage capacity, but also leads to alteration of the shape and size of the tank bed. Some rehabilitation projects have raised the spill and the tank bund to improve water holding capacity, creating a shallow water body spreading over a larger surface area. This creates additional problems, including flooding of upstream paddy lands, increased water losses, upper areas becoming more saline, disappearance of the windbreak of trees, as well as the grass cover (perahana) underneath. Some indigenous fish species, which need deeper water to breed and live, also disappear.

**High tank water losses**
Water loss from small tanks is very high. Within two to three months after rains have stopped, most of these tanks look like marshy lands infested with aquatic weeds. Water losses are higher from tanks with shallower water bodies, than those with deep water. Therefore, it is clear that the size and shape of the tank bed is critical for the water storage efficiency of a tank. It follows that if the tank bed is altered suitably, water loss can be reduced drastically.

**Low productivity**
The failure of previous projects to increase productivity could be attributed to a lack of focus on restoration of the tank bed and its surrounding ecosystem; confinement of programmes to tank and command area development, without addressing the problems of rain-fed and homestead farming in the tank catchment; external interactions and socio-economic conditions, a poor social mobilisation process and the lack of a local institutional mechanism to continue activities, once the project ceases.
What does this project aim to do?

The main actions of this project are:

- Rehabilitating tanks and restoration of tank ecosystems to provide water for all needs of the community;
- Enhancing productivity in the command area;
- Managing tank catchments to release adequate water yields with a desirable quality;
- Strengthening local institutional mechanisms to ensure sustainable livelihoods;
- Developing a sound knowledge base for tank cascade management; and
- Enhancing learning, sharing and adaptive management in cascade tank systems.

What does this project aim to achieve?

The major impact of this project will be the achievement of sustainable livelihoods for communities living in the Kapiriggama tank cascade area. The communities will benefit from the following impacts on agriculture, environment, water, health and culture.

Increase in the availability of water for drinking and domestic use

Some communities directly obtain drinking water from tanks, while almost all local communities use the tank for bathing and other domestic purposes. Increased water storage will also contribute towards maintaining the groundwater table. Field observations revealed that many villagers suffered from kidney diseases, which are believed to be a consequence of using ground water polluted by agrochemicals.

Increase in income and agricultural produce

Agricultural activities are the predominant livelihood in the area. Because of the shortage of water, paddy and other field crops are cultivated mainly during the maha season. Project interventions in tank irrigation and rainfed upland farming will allow for an increased frequency of cultivation, resulting in increased production. This in turn will contribute to the food security of local people and the larger population. The increased harvest of paddy and opportunities for other agricultural activities will, in turn, increase the family income of local communities. Minimising crop failure by having a reliable water supply at crucial stages will be an added advantage.

Nutritional enrichment

Project interventions will enhance food security through increased production of paddy and other agricultural produce. Inland fishery will also be a valuable food source, with a steady supply of water from the tanks. Lack of protein is a major cause of malnutrition in rural areas, and providing such a source will contribute to better overall health of communities.

Cultural value

By increasing activity in tank-based agriculture, the villagers may become more involved in cultural events, as was the case in the past. Most of these events have been abandoned because of the uncertainty of farming in this area. Restoring tanks and ecosystems will enhance the social dignity of communities, and provide meaning to their cultural traditions.

Ecosystem goods and services

The cascade system of tanks can be considered as an ecosystem that has survived for centuries, providing various ecosystem services to communities dependent on them. Villagers have used this ecosystem for obtaining food, fuelwood and a variety of other goods. They also benefited from carbon sequestration, water purification, ground water and surface flow regulation, erosion control, and stream bank stabilisation. With the restoration of the tanks and their sustainable management, the potential of the ecosystem to provide these services again will also be restored.

Who benefits and who is involved?

The project activities span three Grama Niladhari (GN) divisions — Peenagama, Konakumbukwewa and Kapiriggama — in the Rambewa DS Division. There are 1,500 families who will be direct beneficiaries of the project, occupying the above three GN divisions. The project will also benefit another 60,000 families living in similar types of cascades in the North Central Province, through the sharing of experiences from this project. The stakeholders of the project can be categorised into four distinct groups based on their involvement in the implementation of the project, as follows:

- **At the National level**
  Department of Agrarian Development, International Water Management Institute, Mahaweli Authority of Sri Lanka, Agriculture Engineering Department, University of Peradeniya and the National Consultative Committee formed by IUCN including professionals in the field of water resources management within the country.

- **At the District level (Anuradhapura)**
  Department of Agrarian Development, Department of Agriculture and Irrigation Department.

- **At the Divisional level**
  Divisional Secretariat Rambewa, and Agrarian Service Centre-Kallanchiya.

- **At the Grama Niladhari level**
  Range agricultural instructor, grama niladhari, farmer organisations and approximately 1,500 families living in the three GN Divisions.

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