# A Holistic Approach to Ensure Food Security through Cascade System Development in the Dry Zone of Sri Lanka – A Practice from Plan Sri Lanka

*K. H. J. K. Harischandra*
*Presently works in 'Plan Sri Lanka' as the Project Leader in the Cascade System Development Project in Anuradhapura, Sri Lanka*

## Abstract

The lack of food security is caused by the disruption of agrarian systems, land fragmentation, lack of irrigable land, indebtedness and poor post harvest technology. The additional factors that are shown in secondary data are variable and erratic precipitation of farmer communities, poor development of hydraulic infrastructure and lack of access to water for domestic and productive uses, all of which further exacerbate poverty levels.

The economy of dry zone Sri Lanka is principally dependent on agriculture, on which over 85% of its population depend. As the rainfall distribution is largely unpredictable and uneven, communities have to rely, in addition to rainfall, on a system of complex cascade systems consisting of interdependent reservoirs (called 'tanks'). This ancient system strikes a delicate balance between water management and the physical and social environment. The condition of the cascades is vital for improving the availability of water in the community throughout the year. Tanks support the irrigation needs of farming households, and a variety of other uses – drinking, bathing and other domestic uses.

It is a deep rooted idea that irrigation infrastructure development is vital to address water related development issues. But, it is only a part of a broader range of necessary actions that need to be taken. In addition to physical improvement or physical capital improvements, the provision, retention and management of water in a water scarce environment depends on social, financial, natural and human capital that requires equal priority in development and protection.

Having realized the integrated nature of the systems of survival, 'Plan Sri Lanka' has designed and is implementing a holistic community development approach to cascade rehabilitation in the Anuradhapura District. The program involves restoration activities in five cascades covering 29 irrigation tanks that were selected based on hydrological viability .Farmer organizations that carry out tank restoration activities were provided technical support to ensure continuing follow-up operation and maintenance. They were also given training on appropriate farm technology and watershed management. Cascade management committees composed of

stakeholder representatives were also organized to coordinate development activities and resolve conflicts. Integrated agriculture schemes that incorporate suitable farming systems and improved cropping practices were introduced.

The approach identified the challenges that needed to be addressed and learning that was required by conventional approaches to water and food scarcity. These aspects could be addressed through comprehensive strategies that address a more holistic spectrum of issues. The paper discusses Plan Sri Lanka's experiences and lessons learned in implementing social, financial, physical and natural capital interventions that put the cascade as the operational unit for development. It will examine practical constraints and limitations that are faced in the implementation stage and the institutional and operational requirements which are to be discussed for further improvement in this kind of approach.

## Introduction

The overall objectives of this paper are to discuss the reasons for the implementation and the realized results of a participatory project for the village irrigation communities in the Anuradhapura District in Sri Lanka. The project is designed and implemented by Plan Sri Lanka, a nongovernmental organization with over 27 years of work experience. The content of this paper is organized into four sections. This introduction is followed by the second section titled 'Project and Project Activities' that describes the project and its activities. The third section titled 'Immediate Results of the Project' presents the immediate outcome of the project while the fourth section titled 'Lessons Learnt and Recommendations for Future Interventions' discusses recommendations based on the lessons learned.

## Project and Project Activities

### *The Project*

For operational purposes the program areas of 'Plan Sri Lanka' are grouped into four main geographical zones out of which the north-western program area comprising the Polpithigama DS area in the Kurunegala District and Mahawilachiya, Anuradhapura Central and Medawachiya DS areas in the Anuradhapura District. Through a technical feasibility study, Plan identified 40 minor irrigation tanks that are hydrologically feasible within 12 hydrological feasible cascades in Mahawilachiya, Anuradhapura Central, Kahatagasdigiliya and Medawachiya DS areas. At present, Plan Sri Lanka is in the process of developing five cascades in Anuradhapura Central, Medawachiya and Mahawilachiya Divisional Secretary areas in an approach that encompasses the conservation and improvement of watershed areas of the tanks within the respective cascades, emphasizing the multiple usage of water for optimal productivity. The objective of the project is to increase household disposable income and to ensure food security of farm families in the dry zone cascades in the Anuradhapura District.

### *Community Mobilization*

Sri Lanka has a long history of community-based organizations. However, prior to Plan initiated interventions, Farmer organizations (FOs) in the project location were dysfunctional, isolated and sometimes characterized by factional conflicts based on political patronage and sharing of resources. Although there is wide sweeping policy and legislative support for farmer organizations, there was a lack of effective mechanisms for service delivery in the project location, as the main plan for a service delivery mechanism sought to address the issues that affect the functionality of the FOs. Some of the key interventions that were conducted include a series of capacity building trainings for the farmer organizations on different aspects such as minor tanks development, operation and maintenance, integrated watershed management and multiple uses of cascade systems in Sri Lanka. Once the functionality of the FOs was established, a cascade management committee was established for each cascade to ensure that FOs worked together and were committed to managing resources efficiently and effectively. The lack of a strong single institution to manage the cascade is an issue in the process of embracing cascade principles into the planning process.

## *Partnering with Related Stakeholders*

Minor tanks (cascades) development requires a multifaceted approach that needs effective involvement of all relevant line agencies such as the District Secretariat, Department of Agrarian Development , Divisional Secretariats , Department of Agriculture (inter-provincial) , Provincial Department of Agriculture, Provincial Department of Animal Production and Health, Forest Department, Department of Wildlife Conservation, Survey General's Department, Land Use Planning Unit, Coconut Cultivation Board, Sri Lanka Cashew Corporation ,Provincial Engineering Department (PID) and the National Aquaculture Development Authority (NAQDA). So at the beginning of the project, a Project Steering Committee (PSC) was formed with the chairmanship of the Government Agent of Anuradhapura District. The presence of all the relevant government agencies at the PSC meeting played a vital role in acting as a coordinating body at the district level to develop multiple uses of irrigation systems. All project plans are sent for approval to the District and Divisional Agricultural and the Coordination Committees. This avoids duplication of activities with other development agencies. Each partner organization has to present a status of their interventions at the PSC in relation to the original plan of action. This helps to verify that the project is in line with, and to identify barriers that hamper, the achievement of project objectives.

## *Physical Improvement and Catchments Area Development in Minor Tanks*

After community mobilization the physical improvement of the tanks was initiated and Tank rehabilitation was done through the participation of farmer organizations and by assigning them to carryout rehabilitation activities (Figures 1 and 2)). Farmer consultation meetings were conducted to identify rehabilitation priorities and construction estimates were prepared in accordance with those priorities. The forest reservations in some tanks were demarcated and some reservations were reforested to provide favorable conditions for tank systems (Figure 3). The reforestation activities were carried out by the children's club with the technical support of the Department of Forest Conservation.

**Figures 1 and 2.** The bund is being repaired in Ethdathkalla.

(1)

(2)

**Figure 3.** Contour lining for soil water conservation bunds.

## *Partner Capacity Building*

In consultation with the project steering committee and after a needs assessment, several partner training series were conducted in order to develop capacities of field level extension workers. The lack of knowledge on integrated watershed management was a challenging problem right from the beginning. The knowledge on the concept of cascades and integrated watershed management was improved through training, and technical skills on soil and water conservation were improved through training given by the Natural Resources Management Center of the Department of Agriculture. Training skills in turn were improved by providing training programs for the trainers themselves.

## *Inland Fishery with Selected Tanks*

Traditionally, inland fisheries partly fulfilled the nutrition needs of these communities and it was imperative to re-introduce these sources of food intake to address poverty and food insecurity. In order to provide additional income generation activities and also to meet the protein requirement of villages, the project, in consultation with PSC decided to implement an inland fishery program with the technical support of the National Aquaculture Development Authority.

Out of the 19 rehabilitated irrigation schemes, 12 systems were identified as suitable for inland fisheries by the National Aquaculture Development Authority. In 2006 fingerlings were stocked in two tanks. The value of the harvested fish amounted to Rs.181, 400.00 against the cost incurred Rs.68, 500.00. In 2007, investment for fingerlings in five minor irrigation tanks was Rs.144, 900.00 and the value of harvested fish was Rs.700, 008.00. Rohu, Big-head carp, Catla and Common carp were the varieties introduced to the tanks that have no competition and predation on local/indigenous varieties.

Consequently, inland fishery committees were formed as a subcommittee in farmer organization to implement activities related to fisheries. A set of guidelines in line with the Agrarian Services Act was formulated and included in the constitutions of the farmer organizations, thus ensuring harmony between water users in downstream and upstream and avoiding conflict on water issues between committees of inland fisheries and farmers. (See Figure 4).

**Figure 4.** Fisheries activities.

## *Agro-based Entrepreneurship Skill Development*

With the recommendation of the project mid term review, an agro-based entrepreneurship skills development program was initiated to build the capacities of potential entrepreneurs. It was noted that mere capacity building was insufficient to enhance the businesses of entrepreneurs and therefore, a value chain development and market networking program were also started in consultation with stakeholders. But due to budgetary constraints and lack of capacity, few interventions on reed sector and diary sector development were carried out in the Medawachiya divisional secretariat area. (See Figure 5).

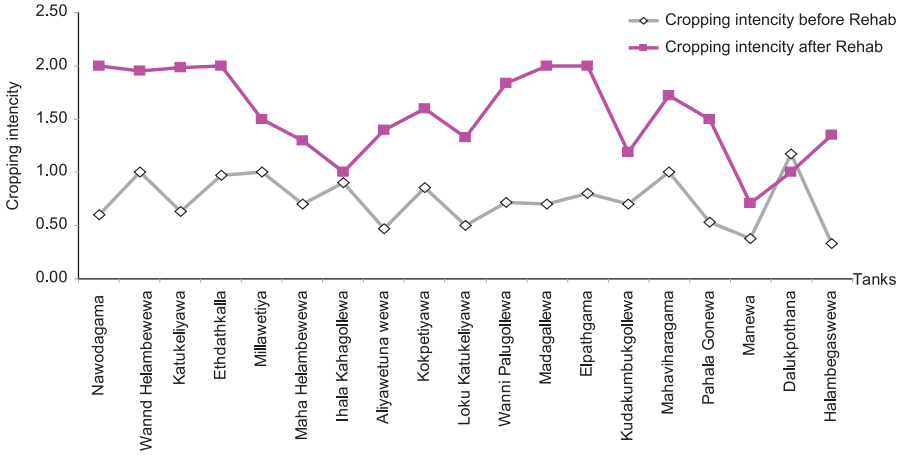
**Figure 5.** A training session on reed basket making.

## Immediate Results of the Project

Capacity improvement and renovation of canal systems have led to the reduction in water losses in the tanks and has ensured the availability of water throughout the year. The availability of water in the dead storage (volume of water retained in the tank below the sluice outlet and which cannot be taken from the sluice) of the tank during dry periods has ensured the survival of aquatic species. Increased groundwater enabled the survival of trees in home-gardens located below tank bed elevations during the dry periods. This is evident in the Ethdathkalla tank where 5 acres are being irrigated by agro-wells.

A production comparison before and after rehabilitation was carried out with rehabilitated tanks and it was found that the yield in the *maha* cultivation has increased from 1.6 t /ac to 2.1 t/ac with a 30 % increment of production. Cropping intensity has increased from 0.8 % to 1.08 % (Figure 6).

**Figure 6.** Cropping intensity comparisons before and after rehabilitation.



A value was added to water spread area of tanks by introducing inland fish into the tanks. The balance water that was available during the dry period's cultivation of other field crops such as maize, chili, and *mung* bean etc., in paddy lands assured food security in the dry season.

Inland fish production provides significant contributions to animal protein supplies in many rural areas. In the regions that are far away from sea, inland fish represent an essential, often irreplaceable source of high quality and cheap animal protein that is crucial to the balance of diets in marginally food secure communities. The fish harvest that could be obtained from tanks meets the protein requirement of the immediate beneficiaries of tanks while providing rice as the staple food. Much of the inland fish that is produced in tanks is being consumed locally and sells at a half rate which is affordable to the other communities.

Capacity-building of farmers and partner organizations on cascade system development have brought behavioral changes over the participation and protection of their own tanks and cascade systems. But continuous efforts and follow-up is needed to sensitize them and to institutionalize those practices in relevant community organizations especially farmer organizations.

## Lessons Learnt and Recommendations for Future Interventions

The multiplicity of services from tanks such as cultivation throughout the year, availability of fish and beneficiary's knowledge on integrated watershed management, and the integrated nature of minor tanks systems ensure the sustainability of tanks systems. The lack of a strong single institution to manage the cascade is an issue in the process of embarrassing cascade principles into the planning process. The role of farmer organizations should not be limited to operation and maintenance and they should have a strong network among upstream settlers and other communities living in the cascade geography.

In order to strengthen the institutional basis of Cascade Management Committees (CMC) a clear distinction has to be drawn between its functions and that of the FOs. The powers and responsibilities of the CMCs should devolve on: (a) resolving conflicts in the use of inter tank resources; (b) developing approaches to resolve common problems that affect cascade communities; (c) developing the bargaining strength of cascade communities vis-à-vis the bureaucracy of local authorities; and (d) creating an awareness among CMCs of the importance of an integrated approach to cascade development. The project effort was not sufficient enough to ensure the stability to some extent of CMCs due to the absence of the above factors.

Despite the Sinhala Buddhist identity, villages in the cascades are not homogenous. This heterogeneity must be taken into consideration in all realistic planning exercises. In particular, developing new institutions such as cascade management committees may have to take note of such differences. Ex. The established cascade management committee in Parana Halmillewa cascade. Stakeholders in Agriculture and irrigation alone cannot address the food security challenges in most cases, particularly since many of the problems are generated outside the agriculture sector. Therefore, approaches such as integrated watershed development and integrated resources management are especially relevant. The key elements for the success of a project are the coordinated and collaborative efforts of all agrarian and agriculture-related organizations and the early participation in planning for development and management.

Understanding a cross sector relationship, especially health and nutrition and livelihood development is vital for ensuring the food security of rural communities. Water resources (development minor tanks rehabilitation) in the dry zones in Sri Lanka are the entry points for broader social development. Health – malnutrition, water sanitation – watershed management /water quality improvement. Different user groups such as fishery society and paddy land holders in the same irrigation systems may create conflicts which need timely planning and implementation activities and unbiased mediation from authorities to minimize the conflicts.

Unlike in the past, the extent of paddy lands at present under each tank has increased due to increased populations. That means, in addition to the 'purana' wells some 'akkara' wells also have become operational. As the 'akkara' well is located at relatively higher elevation areas than the 'purana' well, the 'akkara' well receives less water during the *yala* and even in the *maha* (with drought condition). The farmer conflicts are prominent where this issue exists and as such, there is a need for strong rules and regulation for the management of water in an efficient and effective manner. The encroachment by paddy lands is an issue that needs special and immediate attention from the relevant authorities, and the demarcation of down stream and up stream reservations has now become compulsory to minimize further encroachment.

'Plan Sri Lanka' has made efforts to involve children in environmental projects in the upper watersheds, but this is not implemented consistently in all communities. The involvement of children not only creates an awareness of the importance of watershed management but also facilitates future action for environmental protection and sustained development.

Cascades have limited heterogeneity in land use pattern, land capability, soils, vegetation, micro-climate and the economic patterns of people, cultural perspectives and practices etc. Cascades also make it easier to identify upstream downstream linkages. Getting farmer contribution for reforestation and watershed-related improvement activities is difficult. Assigning construction activities to respective farmer organizations could develop a sense of ownership but the following problems were experienced during the project: a) difficulty in obtaining anticipated farmer contribution; b) gradual loss of interest; c) lack of construction experience; d) non-availability of experienced skilled labor; and e) high reduction of labor availability.

## Acknowledgements

The author thanks Michaela Kelly of 'Plan Sri Lanka' for his continuous guidance and the advice given. It is with deep appreciation that the author acknowledges the guidance and immeasurable support given by Mrs. Dharshani Samaranayake of 'Plan Sri Lanka'. The author also thanks the rest of the staff of 'Plan Sri Lanka' for the immeasurable support provided by them.

## References

Panabokke, C. R.; Amarasinghe, L. A. 2004. Report on Identification of Fifteen Cascade Systems in Five Divisional Secretary Divisions of the Anuradhapura District and Selection of Individual Tanks for Rehabilitation within them for 'Plan Sri Lanka', Colombo, Sri Lanka: Plan Sri Lanka.

Plan Sri Lanka. 2006. Mid-term Review Report of Cascade System Development Project Plan Sri Lanka in Collaboration with Centre for Development Research. Colombo, Sri Lanka: Plan Sri Lanka.

Plan Sri Lanka Baseline Survey of Parana Halmillewa Cascade in Medawachiya Divisional Secretariat Area.

Record of Farmer Organizations in the Project Area.