Public preferences for cascade development: A case in Weddewa Small Tank Cascade in Rambewa Divisional Secretariat area in Anuradhapura District, Sri Lanka

I. M. T. Lakmali* and P. S. K. Rajapakshe
Department of Environmental Management,
Rajarata University of Sri Lanka.
*Corresponding author: imtlakmali284@gmail.com

Introduction

Historical view of all communities was to develop their life patterns in peace and harmony with natural ecosystems. Since small tanks constitute a very important part of the rural landscape of the Dry Zone of Sri Lanka along with their ecosystems, there are a strong social, environmental and economic reasons for ensuring the sustainability of these settlements. These small tanks are connected to each other in those plains which are called as "Cascades" or "Clusters of tanks". Cascade system is a major component of water management in dry zone landscape. A cascade is defined as a "connected series of tanks organized within a 'meso-catchment' of the dry zone landscape, storing, conveying and utilizing water from an ephemeral rivulet" (Maddumabandara, 1985; Panabokke, 2000). According to Tennakoon (1994), the indigenous term for a cascade is *"Ellangawa"*, and it means the handing one after the other. Usually a cascade may contain 2 to 25 tanks. The purpose of this system is to store, convey and use water for various purposes. There are 1,166 cascade tank systems in Sri Lanka (Darmasena, 2004). The contribution of this system directly helps to rural livelihoods and indirectly helps many other aspects of rural communities. In ancient times, these systems were highly functioned and managed for multi purposes.

Most of the benefits from those ecosystems enter into markets or can be marketed, but the non-market benefits are always being overlooked. These non-marketed benefits are often high and sometimes more valuable than the marketed ones (Pushpakumara, 2013). If the prevailing situation of decay and destruction is allowed to continue, there is a risk of survival to this unique system of water conservation. So, rehabilitation and sustainable maintenance programs need to be launched to protect them. Department of Agrarian Development as a technical agency will have to take the lead with the active participation of farmer organizations in restoration and maintenance of these systems holistically. If scientific restoration of cascade systems is undertaken, they will provide a series of benefits to local communities who are directly dependent on these systems. Such benefits can be spreaded more widely through conserving bio-diversity and

providing educational, spiritual and aesthetic opportunities at both local and international levels (Vidanage, 2005).

Lack of finances for investing in cascade development is a common problem in initiating rehabilitation programs to enhance their benefits. It is important to measure values of cascade systems to gain a sound understanding of construction needs. In the literature of environmental economics, there are standard methods to quantify both market and non-market values. It is always feasible to convert benefits to prices directly when it is tradable.

Methodology

With the above background, this study attempts to estimate the benefits of cascade system by examining the public willingness to pay for cascade development. The study was conducted in the Rambewa Division of the North Central Province. Weddewa village is located 10km away from Rambewa town area and Weddewa tank is the upper tank of this Cascade system. The selected Cascade area has four main villages and four main tanks. The total number of households of the area is 278 households. Simple random sampling method was employed to select 20 percent of farm families to the sample. The primary data source was the information gathered from the farmers using structured questionnaires, interviews and field observations. Contingent valuation method (double bounded) was used to measure public willingness to pay. Secondary data collection method was utilized in collecting information from a few selected websites in the internet and related books. Both of them help to gather information with a satisfactory degree of reliability. Spread sheet applications (MS Excel) and statistical Software's (SPSS) are used for analyze different section of the study goals.

Results and discussion

The sample consisted of 29 females (48%) and 31 males (52%) in 60 households surveyed. The majority (65%) of the respondents were predominantly farmers while others were engaged in government and private sector jobs. Education level of the respondents varied from primary (10%) to Advanced Level. Many are schooled only up to grade 6-9 (41%). Monthly average household expenditure in the study area was LKR 18,650, against monthly average income about LKR 27,625. In general, community understands about Small Tank Cascade System (77%), even though most of them do not identify tank components accurately. Many people did not use soil conservation bunds (55%), where soil erosion was recorded. Many (64%) was believed that, there is a relationship between drought increment and degradation of the cascade system. Three-quarter of the

respondents are with the opinion that the Government and community support is necessary to rehabilitate and reconstruct Small Tank Cascade System (STCS). Public preference for cascade development was identified via monetary values and labor support. Of respondents, 46 agreed to extend monetary support for small tank rehabilitation. Average frequency value was LKR 1,000 which is the mode value from all bid values. Total WTP was LKR 246,864. When, average maximum WTP (LKR 888) was multiplied by number of households in study area. Total willingness to provide labor was 1,112 man days. This indicates that, authorities can launch restoration programs with the support of community in the form either monetary or labor donations.

Mean WTP (Bid values) is derived from the expression in Probit model via SPSS analysis followed below function.

$$\Sigma(\beta_1 \times x^a)/ \ \beta_2) \times \ -1 \tag{1}$$
$$X^a = Mean \ value \ of \ X \ variables$$

According to this model, mean WTP was LKR 779. Three socio-economic indicators namely: age, education and monthly income level were used in the evaluation. Although those indicators had been become insignificant, mean WTP was considered by using only bid values.

Conclusion

STCS are an ancient small scale irrigation technology adopted especially in the Dry Zone. It was clearly seen that community awareness is poor in identifying essential components of a tank system. It may contribute to degrade this ecosystem. Those ecosystems and their relationships should be conserved as a store of wealth and wealth creation opportunities.

Considering the weak sustainability position as a nation, we can use STCS to fulfill basic requirements such as water, food and biodiversity. Public willingness may change over time, due to many factors. Some reasons can be measured while others like perceptions and attitudes are more challenging.

The research mainly focused on the public preferences of rehabilitate or reconstructs the ecosystem to conserve benefits. It is found that total benefit of this system is about LKR 246,864 in monetary terms (Considering the average of their maximum WTP). It is a significant amount to launch a reconstruction program with the help of relevant authorities. Correlation between monthly income and WTP and between education level and WTP were weak. The signal behind these results is that WTP is not dependent on their knowledge or income level, and also related to their attitudes and perceptions towards the benefits of the Cascade System.

There is a lack of estimating ecosystems values in Sri Lanka. The people and commercial interests may tend to destroy those systems without understanding

their richness. When valuations are carried out, the awareness will increase among the members of the community. Thus, it is necessary to conduct awareness programs about the importance of the cascade system, conserve and enhance the components of STCS and stimulate infrastructure development to avoid migration from those areas. STCS can be improved as a drought adaptation method and total WTP can be used as a cascade restoration fund. This will facilitate the decision makers to integrate the ecosystem services into mainstream decision-making processes.

Keywords: *Cascades, conservation, public preferences, willingness to pay.*

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