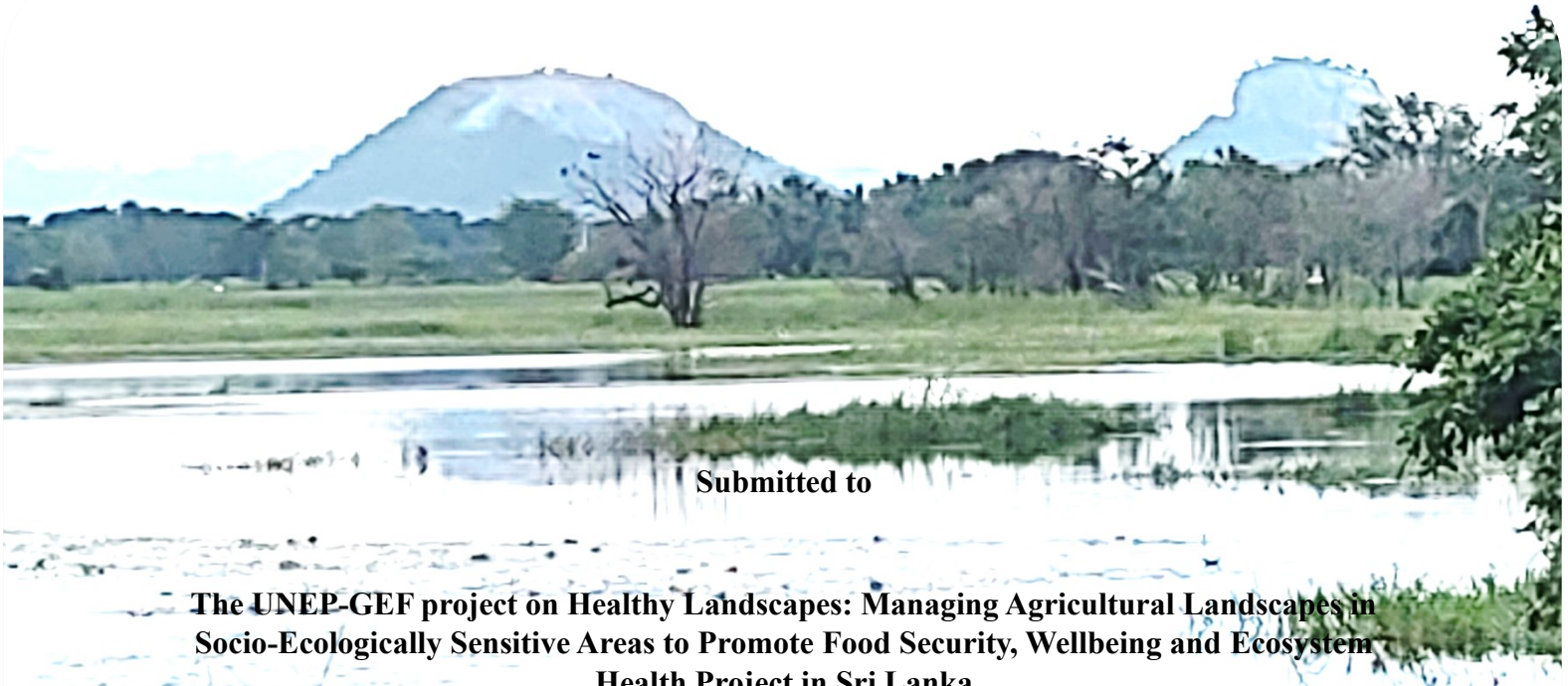
Consultancy Service for Undertaking Studies on Value Chain Development and Valuation of Ecosystem Services

FINAL REPORT

Assessment and valuation of cultural services arising from targeted eco- and agrotourism development villages at Hiriwadunna



Submitted to

The UNEP-GEF project on Healthy Landscapes: Managing Agricultural Landscapes in Socio-Ecologically Sensitive Areas to Promote Food Security, Wellbeing and Ecosystem Health Project in Sri Lanka

Submitted by

Prof. Keminda Herath
Department of Agribusiness Management
Faculty of Agriculture and Plantation Management
Wayamba University of Sri Lanka

Contents

EXECUTIVE SUMMARY 3
BACKGROUND 6
METHODOLOGY 7
Study area 7
Approach 7
Study design 8
Data types 8
Goods' description: 8
Sampling: 11
Design of data collection tool for contingent valuation 12
Enumerator training 12
Double Bound Dichotomous Contingent Valuation format and analysis 12
Few captions during the data collection from November 2023 – March 2024 15
RESULTS AND DISCUSSION 17
Spatial distribution of the study sample 17
Demographic features of the study sample 18
Knowledge assessment of visitors to Ecotourism site in Hiriwadunna 22
Tourists' perception about restoration and conservation of VTCS 28
Tourists open view on the restoration of VTCS 32
Assessment of the economic value of cultural services arising through ecotourism in VTCSs 33
Estimation of willingness to pay (WTP) for ecotourism in VTCSs. 33
Estimation of the total economic value of cultural services arising from ecotourism 37
Hiriwadunna village tour and tourists responses 38
Natural Attractions 40
Cultural attractions 40
Stakeholders of ecotourism in Hiriwadunna 40
Tour packages offered during ecotourism in Hiriwadunna 41
Benefit sharing amongst stakeholders of Hiriwadunna ecotourism 46
Prospects for further developments of Hiriwadunna Village Tour: The tourists view point 48
Tourists' suggestions for further development of ecotourism in Hiriwadunna. 51
CONCLUSIONS AND RECOMMENDATIONS 53
ANNEXTURE 56

EXECUTIVE SUMMARY

The project development objective (PDO) of the healthy landscape project (HLP) is mainstreaming biodiversity using an integrated sustainable land management approach to ensure, development, health and environment co-benefits that will be achieved implementing its all three components. Component one generates four outputs in favor of achieving PDO of the HLP. The 4th output is achieved by implementing two activities 1.4.1 and 1.4.2. This study (Assignment 3) is done under activity 1.4.1 that support completion of the output 4. This study report is the 7th deliverable stipulated in the TOR of the consultant.

Ecotourism is recognized as a potential cultural service from village tank cascade system (VTCS) which didn't exist in the ancient time. At present, this is being practiced associated with Hiriwadunna tank and the village located near Habarana in North central Province as a community originated venture. Hiriwadunna tank belongs to palugaswewa cascade and located in its upper region. Ecotourism can provide opportunities for reinstating the VTCS to receive its multiple benefits to the community. The economic value of ecotourism in a VTCS is not well known which hinders opportunities to create more livelihoods for the cascade community which finally support its ecological restoration. Consequently, the main objective of Assignment 03 is to assess and value cultural services arising from Hiriwadunna ecotourism site.

The total economic value of cultural services arising from ecotourism in Hiriwadunna was estimated based on the total annual arrivals of tourists and the willingness to pay (WTP). The WTP was estimated using a double bound dichotomous contingent valuation (DBDC CV). The research was done in two phases viz. design phase and execution phase. Based on the literature about DBDC CV, the research design is complex and consumes more time. The environment god, its definition and bid values need to be decided with some initial research work and pretested. At the completion of the design phase, data collection was carried from December 2023 to March 2024 from a representative sample of 371 tourists which was drawn by systematic sampling. We used a well-designed and pretested semi structured questioner and key informant interviews to collect data for tourists. Data from other key stakeholders were collected through a set of participatory methods. Data coding, entering and entering was carried in the google platform with google forms. Analysis was caried out using RStudio where we used DCchoice package to fit DBDC CV model.

The sample was consisted of little more female tourists that male tourists out of which there were comparatively significant number you female tourists. Male tourists in the sample were mostly middle-aged or elderly. More tourists on ecotourism were well educated and employed in the private sector whose knowledge about ecotourism, ecology, climate change ans sustainability was high. They had a fair knowledge about the historical background and functions of VTCS. However, their knowledge about current status of VTCS, cascade ecology and ecological economics were at a lower level. Their major information sources were respectively internet and social media; books, news papers and periodicals and their education.

They were in the strong perception that cascade system should be ecologically restored if country's productivity level needs to be further increased while being resilient to and mitigating adverse impacts of climate. Because VTCS is a climate smart agricultural system with higher productivity levels if it functions fully.

There are 25 village houses in the Hiriwadunna ecotourism site which are active year-round. The total annual arrivals of visitors to an average village house are 1595. The estimated average WTP is USD 57.58 with a 95% confidence interval of USD (55.04, 61.46). With this information the total economic value of cultural service arising from ecotourism in Hiriwadunna is estimated to USD million 2.3 per Anum which LKR million 747.5 per Anum.

There are different tour packages are available in the Hiriwadunna ecotourism which includes different sets of cultural services arising from a VTCS. The key cultural service that is marketed with all tour packages is traditional culinary practices and meals. Apart from this, another four services are included in most common package which offered to 95% of the tourist at a rate of USD 35.00. The most expensive package in very innovative and costs USD 80.00 per person.

Key core stakeholder of Hiriwadunna ecotourism are respectively village houses, bullock carts, catamaran boats and tuk-tuk while key direct stakeholders are respectively safari counters, tour guides, tour companies/agencies, hotels and village farmer organization. Direct benefits of ecotourism go to core and direct stakeholders only. Indirect stakeholders do not receive direct benefits from ecotourism. As far as benefit sharing between core stakeholders and direct stakeholders is concerned, it is shared at 1:2 ratio for a single visitor, 1:4 ration for a couple and 1:7 ration for a group of five. Benefit is shared to a fixed formular amongst core stakeholders which is more transparent. About 95% of the benefits goes to safari counter and tour guides if tourists are channeled through safari counters and tour guides which is the most common phenomenon.

Majority of tourists are satisfied with the services offered to them during ecotourism in Hiriwadunna and willing to come back if they visit Sri Lanka again. However, they suggest that tour package and the schedule should be more organized one. They are unhappy with the tourist congestion and busy environment apparently found in the Hiriwadunna ecotourism site. Ther expect more environment concerns with ecotourism that what is reflected currently at Hiriwadunna.

More results are presented in detain with report. With the finding of this study, we would bring the notice to following key conclusions and recommendations.

- ✓ The publicity about ecotourism in Hiriwadunna takes place mostly through tour guides and tour companies after they visited Sri Lanka. The publicity through internet and social media were found to be lower which is the most popular source of information of tourist. Thus, young tourists pay less attention to ecotourism in Hiriwadunna. We recommend tourist sector decision makers to pay more attention to use most popular sources of information of tourist for propaganda about ecotourism in VTCSs.
- ✓ There a significant demand for more valued added tour packages which are currently offered by very few innovative village house owners in a customized basis. The average WTP is USD 57.58 which is significantly higher than present prices. Thus, there are more opportunities to provide tourists with more value added packages for which future studies should be directed. Actions are recommended to make aware core stakeholders and encourage them to offer more value-added tour packages.
- ✓ The total economic value of cultural serviced offer through ecotourism associated with a tank of a VTCS is about USD million 2.3 per annum. If this can be implemented in other suitable location there is an ample opportunity to bring more foreign currency in

the short run. Thus, actions are recommended to seek appropriate location where ecotourism can be developed.

- ✓ Ecotourism in Hiriwadunna suffers from insufficient god practices in ecotourism which was highly concerned by tourists. We recommend future studies to develop good practices for ecotourism in VTCSs and actions to decimate good practices among relevant stakeholders

During this study, there were few constraints which slower dawn the study process. This study wanted a considerable time to design the DBDC CV which could not identify at the initial stage of this study was designed. Further, by its nature Hiriwadunna village tour is a tightly scheduled one where there is limited time that a tourist gets to answer the questionnaire which originally consumes maximum 40 minutes. The efficiency of data collection depends on how well core stakeholders, especially village house owners and tour guides support the data collection process. Wherever the tourist doesn't speak English enumerators had to heavily depend on the tour guide for translation which always delay the data collection. Some tour guides and village house owners are very reluctant to allocate a time from their schedules for data collection because village house owners maximize their profit by maximizing the number of arrivals of visitors. Consequently, we had to consume at least four months to compete the data collection process. We had to manage collection very professionally without disturbing the process of ecotourism in Hiriwadunna.

BACKGROUND

One of the key actions of component 1 of the healthy land scape project (HLP) is to identify key goods and services from cascade landscapes such as food and medicinal products and handicrafts for which value chains can be developed. Also, this includes other market-based incentives such as promoting ecotourism. As emphasized in the HLP appraisal document, promotion of ecotourism would be a key consideration in the development of Sustainable Village Models (SVM) through which restoration of VTCSs is planned to be achieved sustainably. Thus, the opportunities for ecotourism associated with VTCS should be explored. With this background assignment 03 is carried out under Activity 1.2.8 which results the deliverable 7 stipulated in the TOR.

Ecotourism is a form of responsible travel that focuses on visiting natural areas to conserve the environment, respect local cultures, and promote sustainability (Daianantis, 1999). The primary goals of ecotourism are to minimize the impact on the natural and cultural environments, contribute to their conservation, and provide meaningful experiences for visitors. This type of tourism is characterized by its commitment to environmental stewardship, education, and the well-being of local communities. Consequently, ecotourism can be viewed as a strategy on the sustainable restoration of village tank cascade system in Sri Lanka that can have several positive outcomes on the wellbeing of the community. Since, this approach combines environmental conservation, community development, it would become a constituent of proposed SVM through which restoration and conservation of VTCSs in Sri Lanka will be achieved.

Hiriwadunna Village Tour is a diverse tourism offering that provides visitors with a singular community-based experience which is famous among foreign visitors and offered as an ecotourism package by many travel agencies and through many travel websites. The Village Tour offers a wonderful blend of community, culture, nature, customs, and their straightforward but age-old way of life associated with a VTCS. This was initiated a few decades back with other nearby natural and cultural attractions. This provides an example that shows the potential of developing ecotourism associated with VTCSs which are in the proximity of ancient tourist attractions. However, the real recreational value arising from VTCSs is not well reflected due to various reasons such as the lack of language skills of village level service providers, limited emphasis on values and culture of VTCS duet to less awareness of village level service providers and tour guides and no proper attention given and studies on the real potentials of VTCS as ecotourism sites. Ecotourism's true potential value in relation to VTCSs has not been thoroughly investigated, which has led to its undervaluation and public revelation. There is a plethora of untapped opportunities for increasing foreign exchange earnings associated with VTCSs that need to be well understood. Assignment 03 attempts to fill this gap and to investigate the real value of cultural services arising from ecotourism in Hiriwadunna.

METHODOLOGY

Study area

This study was carried out in the ecotourism site associated with Hiriwadunna Wewa. It is located in Hiriwadunna GN Division (591), Palugaswewa DS division in Anuradhapura District which is depicted in Figure 1. The GN level information is given in Table 1.

Table 1. GN level demographics of Hiriwadunna tank

Criteria	Statistical figure
Extent of NG	9.02 Km^2
No 0f villages	2
No of houses	279
Population	1,117
Male	551
Female	566
No of families	348
Tank command area	135 Ac.
No of farmers	148
Tank capacity	475 Ac.ft.

Source: Resource profile, DS Office, Palugaswewa

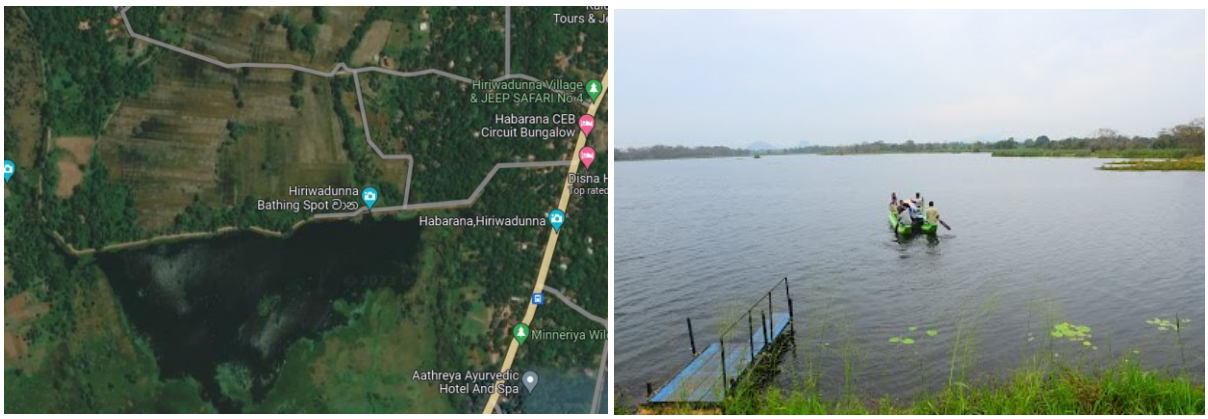


Figure 1. Ecotourism site associated with Hiriwadunna Wewa, Hiriwadunna, Anuradhapura District. **Source:** https://www.google.com/maps/place/Hiriwadunna+Wewa/@8.0181198,80.7356226,1584m/data=!3m1!1e3!4m6!3m5!1s0x3afca1ee96c5beff:0xf62f538e6217fb0f!8m2!3d8.0138889!4d80.7363889!16s%2Fg%2F12lv0j609?entry=ttu

The tank is located slightly off the A6 highway from Kandy to Trincomalee. Its strategic advantage as an ecotourism site is high since it is in the closest proximity to several tourist attractions such as Dambulla archeological sites, Sigiriya archeological sites and Habarana forest.

Approach

Cultural value includes scenic beauty of landscape, ecotourism, traditional knowledge and practices, recreation which the value is intangible. Although ecotourism has a market price it may not reflect the total cultural value. Thus, we accommodated contingent valuation approach, a stated preference method to estimate the cultural value arising from Hiriwadunna tank. We used a double-bounded dichotomous choice model of contingent valuation. The Contingent

Valuation Method (CVM) is a widely used economic technique for estimating the economic value of non-market goods and services, such as those associated with ecotourism. There is an ample amount of literature available on the application of estimating economic value of cultural services arising from various ecosystems.

On the theoretical background, CVM is rooted in welfare economics, which seeks to measure the well-being or welfare of individuals in society. In this context, it aims to measure the economic value people place on changes in environmental quality. Further, the theoretical foundation includes the concept of consumer surplus, representing the difference between what individuals are willing to pay for a good or service and what they pay. CVM estimates this surplus in the context of non-market goods. CVM also draws on the hedonic pricing theory, which suggests that the value of a good can be inferred from the prices people are willing to pay for related goods. In the case of environmental goods, CVM directly asks individuals about their willingness to pay.

Assessments of perceptions on the conservation, issues, opportunities, threats were carried out on a qualitative basis where a participatory approach will be taken. Designing of CVM takes fairly a long time and should be carried out carefully followed by a series of preliminary investigations. The features of the natural system should be full understood and well presented to the respondents since CVM is based on a set of hypothetical conditions. Further bids must be well defined minimizing the opportunity of misspecification. Thus, we collected data in two phases as designing phase and assessment phase. Data collected during the designing phase were used to design the contingent valuation where we identified all cultural services offered through the ecotourism package, goods description, bidding structure and margins, sampling information etc. We include outcome of data collected during designing phase in the study in the methodology.

Study design

Data types

Both primary and secondary data were collected by using various survey instruments in two phases.

1. **Designing phase:** We collected information on goods' description, sampling and designing the CVM during this phase. Secondary data was collected by a comprehensive literature survey. Primary data required for design the CVM was collected through KIIs and FGDs done with various stakeholders viz. both foreign and local visitors, tourist guides, village level service providers etc.

2. **Assessment phase:** We collected primary data through designed survey for CVM. An enumerator driven, pretested semi structured questionnaire was used for data collection from both local and foreign visitors.

Goods' description:

We comprehensively describe the cultural service offered by Hiriwadunna tank as a part of VTCS with the perspective of the ecotourism package which is being currently offered. This is the key element in CVM that is achieved through preliminary investigations and data collection carried out during the designing phase which the details are given in Table 02.

Table 2. List of FGDs and KIIs carried out during designing phase data collection

Stakeholder	Method	Remarks
HLP project staff	FGD (01)	Current status of ecotourism, interventions and HLP contribution, Stakeholders, identification of cultural services, secondary data available at HLP office, sustainability
Community	FGDs (01)	Role and contributions in ecotourism, Functions of Hirieadunna VTCS and cultural services, History, traditions, rituals, Knowledge and current status. Sustainability of ecotourism and conservation
Owners of traditional village houses and other service providers	KIIs (07)	Knowledge on VTCS and its functionality, Nature of the service provided, pricing, perception on conservation and restoration of VTCS, issues on sustainability, suggestions to improve, client base, system/business functioning, networking, access to information
Foreign tours	KIIs (03)	Knowledge on VTCS and ecosystem services, Willingness to pay, access to information, perception on conservation
Local tours	KII (02)	Knowledge on VTCS and ecosystem services, Willingness to pay, access to information, perception on conservation
Tour guides	KII (02)	Tour details, Knowledge on VTCS and ecosystem services, Willingness to pay, access to information, perception on conservation
Tourist counters	KII (01)	Tour details and history, Knowledge on VTCS and ecosystem services, Willingness to pay, access to information, perception on conservation, sustainability and current issues
HLP field assistants	FGD (02)	Community involvement in ecotourism venture, maintenance and community engagement, information on stakeholders and contacts, team coordination
Subject experts	KIIs (03)	Goods description, history and cultural services offering, knowledge component and questions, perception question on existence and sustainability, bidding information and their validity, validation of research design

Based on information collected during the design phase the goods' description was defined as following which was used as an aid to describe VTCS and its cultural services to the participants in the valuation survey administered in the assessment phase of this study.

Village Tank Cascade System (VTCS) description:

- A Village Tank Cascade System (VTCS) in Sri Lanka is a unique traditional and sophisticated water management infrastructure designed to harness and distribute water for agricultural purposes and created by ancient Sri Lankan civilizations.
- The system is a network of small tanks draining to a large reservoir that store rainwater and surface runoff for later use. Originating in the 1st millennium BCE, the system was designated as a Globally Important Agricultural Heritage System by the United Nations Food and Agriculture Organization in 2017
- Apart from agricultural outputs as provisional services that, it offers a variety of ecosystem services such as regulatory services (water regulation, climate resilience and mitigation), support services (habitat provision, pollination) and cultural services (recreation, scenic beauty, rituals and ecotourism).

– This is a climate resilient agroecological system which can mitigate the adverse impacts of climate change and also a climate smart irrigation system even for today

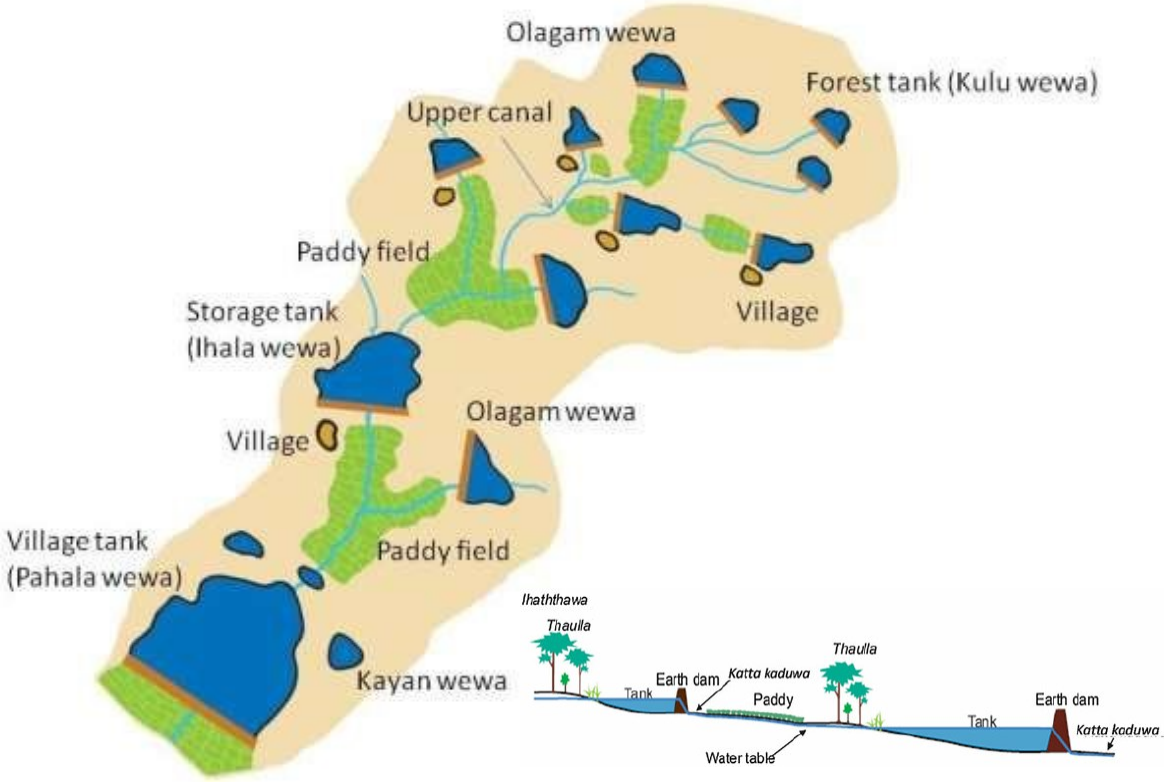


Figure 02. Orientation of the ansemble of tanks in a village tank cascade system; source: http://iucnsrila nka.org/Kapiriggama/cascade_named-ed/

Figure 03. Components of a village take system in a VTCS; Source: https://roar.media/english/life/in-the-know/heres-what-you-need-to-know-about-ellanga-gammana-sri-lankas-ancient-water-management-system

Table 3. Cultural services offer through Hiriwadunna village tour

Service	Description
Recreation	Traveling with bullock cart/ two-wheel tractor/ tuk-tuk
	Boat ride in the village tank
	Fishing in the tank
	Adventure travel through forest trail
	Engage in traditional culinary practices
Scenic beauty and amenity of the VTCS landscape	Amenity through seeing the village tank surrounding while walking on the bund and boat riding
	Scenic beauty while traveling through paddy fields, tree belts, hamlet and other upland farming lands
	View of the village house with garden and traditional surrounding
	Enjoying traditional meals
Education and knowledge	Photography, producing video documentaries, TikTok
	Birds, butterfly, insects, fauna and lora watching and scientific photography, documentation and exploration
	Study rituals and traditional practices associated with VTCS
	Study traditional industries of home appliances, tools and ornaments using martials collected from VTCSs
	Traditional dancing, music and medicinal treatments

Participants in the survey may have different idea about what is being offered through the village tour as cultural services. Prior to aske valuation questions each participant was adequately aware about VTCS and its' offering cultural services taking above information under goods' description as an aid which was highly accepted and accepted by the participants in the survey. This created a uniform hypothetical picture about the true cultural services that are offered for a VTCS which helped participants to give their desired bid regardless what they have already paid for the village tour.

Sampling:

There are two types of visitors coming on Hiriwadunna Village Tour (HVT) respectively foreign visitors and local visitors and thus we will accommodate a stratified random sampling method to get a representative sample of respondents to the survey of CVM. The factor of stratification is the type of visitors. After stratification, we will sample from both strata by systematic sampling procedure since there is no proper sampling frame. The sampling interval was 10. The sample size was estimated to 347 based on the [1]Cochran's formular where the confidence, estimates variance and degree of accuracy were set at 1.96, 0.951, 10% respectively. It was estimated to 382 by considering 10% nonrespondent which is in line with

[1] https://www.old-aj.cz/web/jfs.htm?type=article&id=4_2016-JFS

the cost and the time functions of the study. These parameters were determined based on similar studies found in the literature.

Design of data collection tool for contingent valuation

This is a semi structured questionnaire with five parts respectively, Part A – Demographic information, Part B – Knowledge about VTCS and cultural services, Part C – Perception on conservation and ecotourism, Part D – Contingent valuation questions and Part E – Satisfaction about the tour. Information collected during design phase was used to prepare all questions directed in all five parts in the semi structured questionnaire. We followed all standard procedures during the preparation of the questionnaire which was finalized after the pretest. The final questionnaire is included in the Annexture of this report.

Enumerator training

Enumerator training was conducted in end of the November 2023 where a team of five graduates were participated. The were given a class room training followed by an onsite training in Hiriwadunna ecotourism site for two daya. Data collection process was continuously monitored by the consultant in person.

Double Bound Dichotomous Contingent Valuation format and analysis

We accommodated parametric statistical estimation of mean WTP values using the Double Bound Dichotomous Contingent Valuation (DBDC CV) which the format is depicted in Figure 3.2. The DBDC CV involves respondents answering a Dichotomous Contingent Valuation (DCCV) question twice as depicted in Figure 3.2. Although the bid shown to respondents in the first stage (BIDI) is assigned randomly from a list of bids, the bid in the second stage is determined by the response to the first stage. Specifically, the second bid value is higher (BIDH) than the first when the first response is answered as YES that they are willing-to-pay the amount, and lower (BIDL) than the first, when the first response is NO. Thus, there are four possible patterns of responses to the DB-DCCV question: YES–YES, YES–NO, NO–YES and NO–NO (Aizaki et al., 2022).

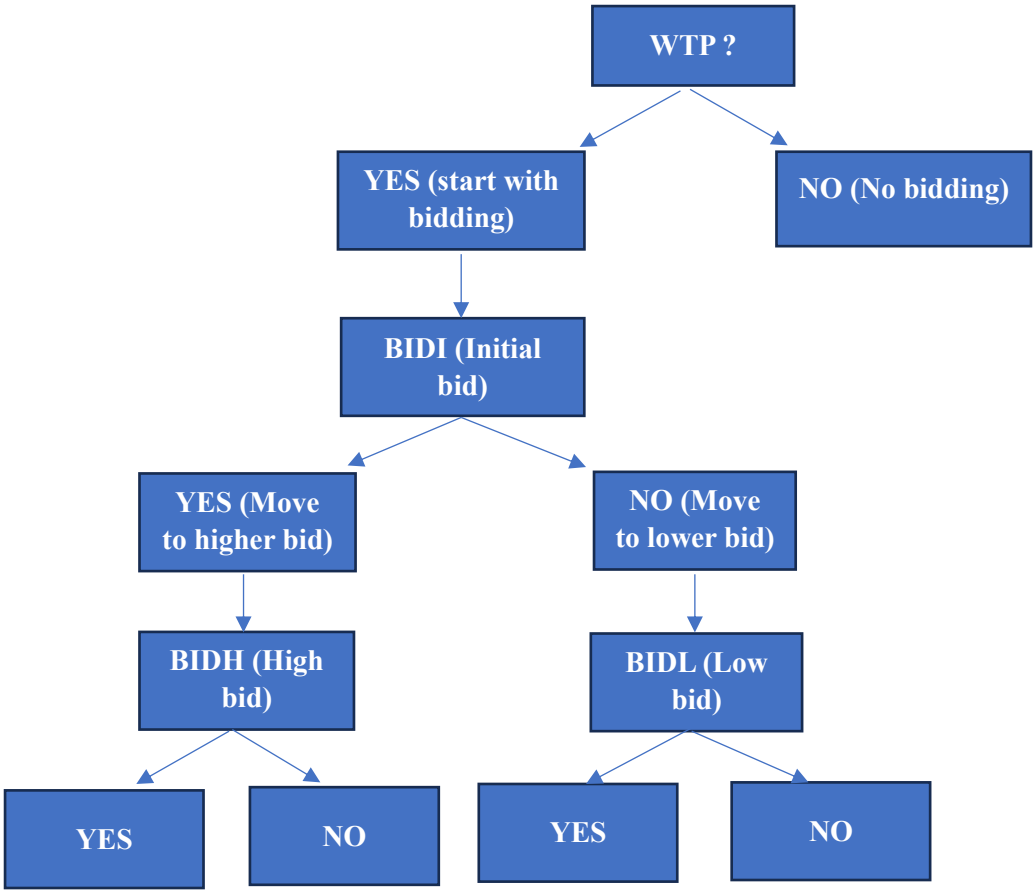


Figure 04. Double Bound Dichotomous Contingent Valuation format (DBDC CV format)

The bid structure was determined based on the data collected in the design phase which is given in the Table 04.

Table 04. The bid structure used for contingent valuation

Initial bid (BIDI)		Higher bid (BIDH)		Lower bid (BIDL)	
Local (Rs)	Foreign ($)	Local (Rs)	Foreign ($)	Local (Rs)	Foreign ($)
2500	30	4000	40	1500	20
4000	40	6000	60	2500	30
6000	60	8000	80	4000	40
8000	80	10000	100	6000	60

Under parametric estimation, the sample data collected is assumed to follow a particular distribution. For this study, the MLE estimation of DBDC CV model was adopted using `DCchoice`[2] package in RStudio which is an open-source statistical software.

In the DBDC CV model, a typical respondent can be signified by "i" and the maximum Willingness To Pay (WTP) for cultural services arising from VTCS be denoted by y_i^*. With the

[2] https://cran.r-project.org/web/packages/DCchoice/DCchoice.pdf

DBDC CV method, a typical response is one of the following four possible responses to the bid values presented (B^I = Initial Bid, B^H= Higher Bid and B^L = Lower bid)

i. "Yes" to $B^I$and a "Yes" to B^H=Yes-Yes (YY)
ii. "Yes" to $B^I$and a "No" to B^H=Yes-No (YN)
iii. "No" to $B^I$and a "Yes" to B^L=No-Yes (NY)
iv. "No" to $B^I$and a "No" to B^L= No-No (NN)

Respondents who fall into categories (i), (ii) and (iii) have positive WTP, those who fall into category (iv) are called protest respondents. Respondents may report zero WTP because they either have no actual willingness to pay for the good in question or the bid values presented are unable to capture the true WTP. This is one reason why bid values should be carefully chosen. Since each response format has a probability associated with, the likelihood functions must be estimated. The likelihood function helps to understand how likely it is for the sample data to come from the probability distribution that we have assumed.

Let Π be the likelihood function; then, the 4 answer formats in the DBDC CV model can be written as;

$$\Pi_i^{YY}(B^I; B^H) = Pr(y_i^* > B^I \; and \; y_i^* \geq B^H) = 1 - G(B^H, \delta) \quad (3.1)$$

where Π_i^{YY} denotes a consumer i, with a "Yes-Yes" response among presented bid values

Further, $G(B^j, \theta)$ where $j = \{H, L\}$ is a density function with associated parameter estimates vector δ, and $1 - G(B^H, \delta)$ represents the cumulative density function (*cdf*) of the respondent's true maximum WTP. Similarly, we can write likelihood function for other response as,

$$\Pi_i^{YN}(B^I; B^H) = Pr(y_i^* \geq B^I \; but \; y_i^* < B^H) = G(B^H, \delta) - G(B^I, \delta) \quad (3.2)$$

$$\Pi_i^{NY}(B^I; B^L) = Pr(y_i^* < B^I \; but \; y_i^* \geq B^L) = G(B^I, \delta) - G(B^L, \delta) \quad (3.3)$$

$$\Pi_i^{NN}(B^I; B^L) = Pr(y_i^* < B^I \; and \; y_i^* < B^L) = G(B^L, \delta) \quad (3.4)$$

All four functions (3.1 – 3.4) adds to the total likelihood function (L) which represent the joint density function of the sample as depicted in Equation 3.5 The parameter estimation will be done on the Log-Likelihood function which is depicted in Equation 3.6.

$$L(\theta) = \Pi_i^{YY} + \Pi_i^{YN} + \Pi_i^{NY} + \Pi_i^{NN} \quad (3.5)$$

$$\ln L(\theta) = \ln\Pi_i^{YY} + \ln\Pi_i^{YN} + \ln\Pi_i^{NY} + \ln\Pi_i^{NN} \quad (3.6)$$

For respondent i, the response will be any one from YY, YN, NY, or NN formats. Hence, a dummy binary variable; d_i={0, 1}should be necessarily present in the log-likelihood function based on the response of i^{th} despondent. Then final Log-Likelihood function can be written as

$$\ln L(\theta) = \sum_{i=1}^{N}\{d_i^{YY}\ln\Pi_i^{YY} + d_i^{YN}\ln\Pi_i^{YN} + d_i^{NY}\ln\Pi_i^{NY} + d_i^{NN}\ln\Pi_i^{NN}\} \quad (3.6)$$

where i = *1,2,3,.....N* and N is the sample size. And d_i^{YY}, d_i^{YY}, d_i^{YY} and d_i^{YY} are any binary response of the i^{th} respondent which take either *0* or *1*.

Few captions during the data collection from November 2023 – March 2024

RESULTS AND DISCUSSION

Spatial distribution of the study sample

During the survey conducted from February to April 2024, 371 visitors from 31 countries all over the world were interviewed by highly trained set of enumerators. Special distribution of the percentage visitors in the sample is depicted in Figure 05 while the frequency distribution of visitors country is depicted in Figure 06. It was observed that more than 95% of the visitors to Hiriwadunna village tour are foreigners. There were very few local visitors fond during the data collection period. Therefore, we excluded local tourists from the sample and included only foreign visitors in the sample of this study. We adopted a systematic sampling in order to get a representative sample of visitors to Hiriwadunna.

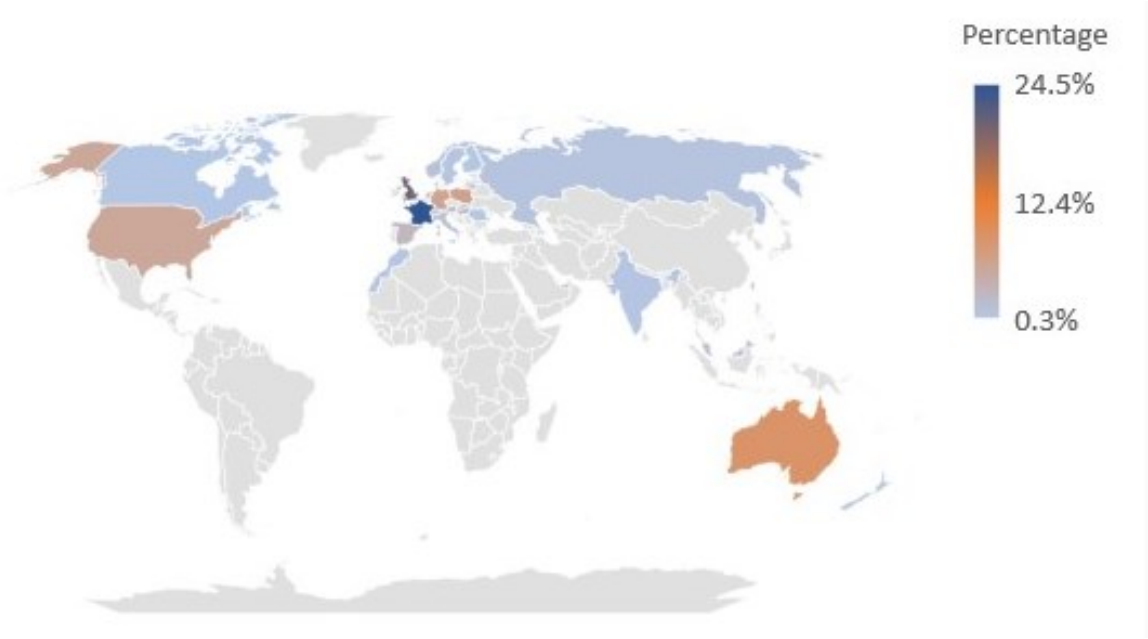


Figure 05. Spatial distribution of percentage visitors interviewed at the study site

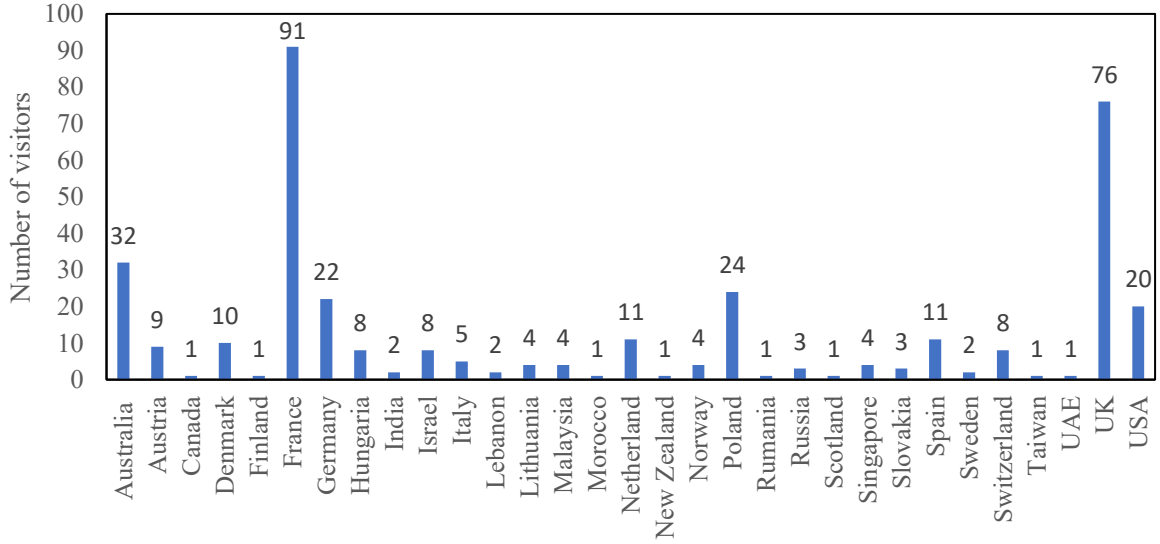
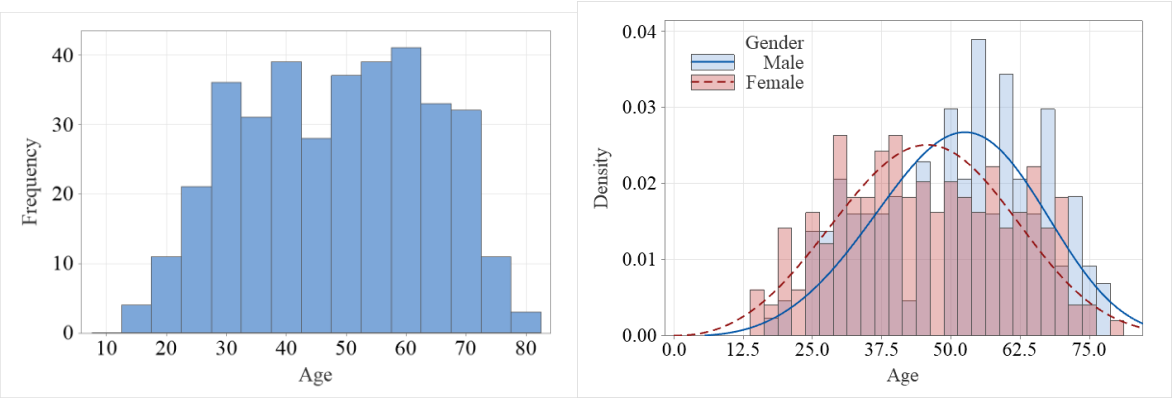


Figure 06. Distribution of number of interviewees by county

Based on Figure 05 and Figure 06, five countries where higher numbers of visitors arrived to Hiriwadunna are respectively France, UK, Australia, Poland and Germany. Out of that the highest number of visitors were from France. Continent wise, most of the visitors who were on the Hiriwadunna village tour were from the Europe. No visitors were found from the South American Continent. There were few visitors from African continent. A significant number of visitors from China were observed in the ecotourism site in Hiriwadunna. Some visitors from Middle East and Asian Pacific Region were also observed in the study site during the data collection period. However, we were unable to include them into the sample due to heavy communication barriers. The survey was conducted in English. Tour guides supported with translations when we collect data from a non-English speaking informant. However, tourists from Asian Pacific Region we on a tight tour schedule and also their tour guides were mostly reluctant to support the data collection with necessary translations.

Demographic features of the study sample

Age of visitors: Empirical distribution of the visitors' age is depicted in Figure 07a while their age distribution by gender is given in Figure 07b. Summary statistic of their age is given in Table 05. The sample mean age of visitors was about 48.3 years with a mean square error (MSE) of 2.99 years. Based of the shape of the histogram in Figure 07a and skewness of -1.13, the visitors age distribution is a right skewed one which indicate that most of the visitors on ecotourism in Hiriwadunna village are middle aged and elders.



(a) (b)

Figure 07. Empirical destribution of the age of visitors on Hiriwadunna Village tour; (a). Pooled distribution and (b) Destribution of age by gender

Table 05. Summary statistics of the age of visitors on Hiriwadunna village tour

Gender	Mean	Standard deviation	CV%	Minimum	Median	Maximum	Skewness	Kurtosis
Male	51.01	15.02	29.44	18	53.5	78	-0.26	-0.93
Female	45.64	15.5	33.96	14	45	80	0.02	-0.96
Pooled	48.292	15.523	32.14	14	50	80	-0.13	-0.98

Baded on the Skewedness values in Table 05 and the shapes of distributions in Figure 07b, the empirical distribution of age of female visitors can be identifies as symmetric while that of the male visitors is a right skewed one. Most of the male visitors were either middle aged or elderly

persons compared to ages of female visitors in the sample. There were more young female visitors in the sample compared that of the male visitors.

Figure 08 depicts the empirical age distribution of visitors by their level of education. Summary measures of age by education level of visitors are given in Table 06. There were only two visitors with elementary school levels who were teens. Lowest mean and median ages were reported with tourists with education backgrounds of pass at university entrance and graduates. Most of them were found to be either young or middle aged based on the evidence of boxplots in Figure 08. Consequently, they were the most youngest groups of visitors compared to visitors in other education classes. There were more elderly persons included the tourist group with the highest education background.

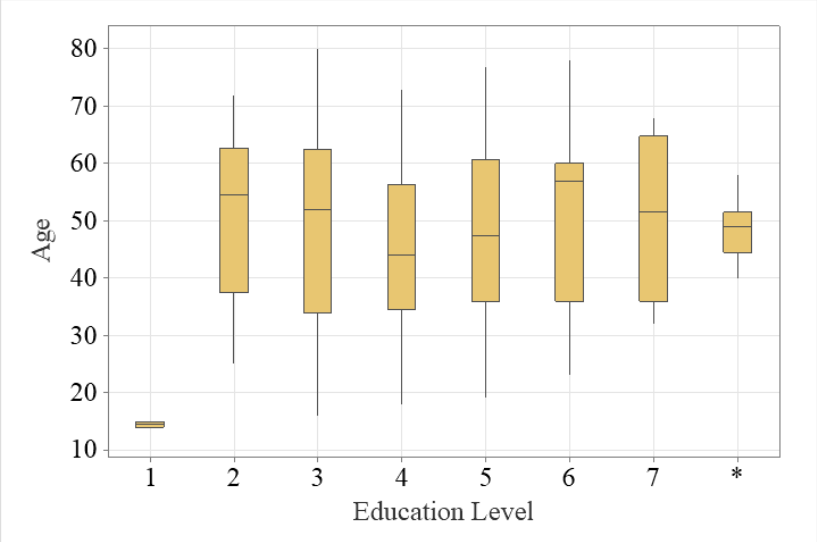


Figure 08. Age distribution of visitors on Hiriwadunna village tour by their level of education; 1 – Elementary school, 2 – Middle school, 3 – High school, 4 – Pass university entrance, 5 – Graduates, 6 – Post graduate degree and 7 – Other, * Non respondents to education status

Table 06. Summary statistics of the age of visitors on Hiriwadunna village tour by their education

Education	Mean	Standard Deviation	CV%	Min.	Median	Max,	Skewness	Kurtosis
Elementary school	14.50	0.707	4.88	14	14.50	15	*	*
Middle School	52.17	14.64	28.07	25	54.50	72	-0.60	-0.85
High school	48.61	17.53	36.07	16	52.00	80	-0.24	-1.06
Pass Uni entrance	46.08	14.55	31.58	18	44.00	73	0.17	-0.94
Degree	47.75	14.69	30.76	19	47.50	77	0.06	-1.14
Post graduate degree	51.09	15.57	30.48	23	57.00	78	-0.31	-1.06
Other	50.75	15.00	29.55	32	51.50	68	-0.28	0.50
* (Missing values)	48.00	5.02	10.45	40	49.00	58	0.28	-0.25

Table 07 illustrates frequency distributions of other demographic characteristics of visitors which are respectively Gender, Civil status, Employment, Monthly household income and Education status.

Gender and civil status of visitors: Out of the all visitors 47% were male visitors and 53% of were female visitors. The majority of visitors were married while 29% of visitors were unmarried.

Table 07. Frequency distributions of other demographic characteristics of visitors; Gender, Civil status, Employment, Monthly household income and Education status

Variable	Frequency	Relative frequency	Percentage	Cumulative %
Gender				
Male	174	0.47	47%	47%
Female	197	0.53	53%	100%
Missing	0	0.00	0%	
Civil Status				
Married	248	0.67	67%	67%
Unmarried	106	0.29	29%	95%
Other	12	0.03	3%	99%
Missing	5	0.01	1%	100%
Employment				
Private Sector	169	0.46	46%	46%
Govt. sector	67	0.18	18%	64%
Self-employment	52	0.14	14%	78%
Farming	1	0.00	0%	78%
Other	52	0.14	14%	92%
Missing	30	0.08	8%	100%
Monthly Family Income (USD)				
<5000	82	0.22	22%	22%
5000-10000	95	0.26	26%	48%
10000-15000	79	0.21	21%	69%
15000-25000	39	0.11	11%	80%
25000-40000	28	0.08	8%	87%
>40000	20	0.05	5%	92%
Missing	28	0.08	8%	100%
Education Status				
Elementary school	2	0.01	1%	1%
Middle School	18	0.05	5%	5%
High school	97	0.26	26%	32%
Passed Uni entrance	62	0.17	17%	48%
Graduates	132	0.36	36%	84%
Post graduate degree	43	0.12	12%	95%
Other	4	0.01	1%	96%
Missing	13	0.04	4%	100%

***Employment status of Visitors*:** Majority of visitors on ecotourism at Hiriwadunna were employed in the private sector that was about 46% of the sample. About 18% of the visitors were on government sector jobs. About 14% visitors were self-employed who were apparently Entrepreneurs, Business mans and Freelance. There was only one visitor in the sample who was a farmer by profession. A 14% of visitors fallen under other employment category where almost all of them were on their retirement after being employed either in the private sector or in the government sector. consequently it can be seen that people work in the private sector are more willing to go on ecotourism.

Education status of visitors: We inquired the education status of informants under seven categories respectively, Elementary school, Middle school, High school, Passed university entrance, Graduates, Post graduate degree and Other qualifications. Of the sample, there were only one visitor with elementary level education who was actually a teen on still schooling. There were 5% of visitors who has middle school level education backgrounds. About 26% of visitors has completed high school level education while another 17% of visitors has passed university entrance. Some of them may be either pursuing or prospecting undergraduate education. Out of the sample, 36% of visitors graduates in different field of studies. Meanwhile, 12% of the visitors have postgraduate qualification out of which some of the visitors have reached up to PhD level qualification. Consequently, we can observe that educated people are more willing ecotourism.

Of the study sample, we tested whether there is any association between education and employment status which was found to be statistically significant (χ^2 value = 29.5, df = 12 and $p - value$ = 0.003). Those who had higher qualification were found to be employed either in private sector or in government sectors more. Those who had lower education levels found to be engaged more in self-employments and other jobs than visitors with high education levels.

Income status of visitors: The income status of visitors were recorded under five income classes in USD viz. < 5,000; 5,000 – 10,000; 10,000 – 15,000; 15,000 – 25,000, 25,000 – 40,000 and > 40,000. Of the sample, 22% of visitors fall under the lowest income category (< USD 5,000). The highest percentage of visitors (26%) belonged the second lowest income class (USD 5000 – 10,000). Family income of 69% of the visitors were found below 15,000 USD. About 5% of the sample reported a family income of greater than 40,000 USD per month who can be considered as the richest among all other visitors.

The income is a measurement in the ratio scale which was measured in this study in the ordinal scale with the objective of avoiding bias when the income status is revealed by the informant. Usually, people are very reluctant to reveal their actual income which we experienced in the survey. Based on the frequency table of income, we estimated the average income of the visitors as 14,563 USD/month/Household with a MSE of 868 USD/month/Household. The 95% confidence interval of mean income of visitors were estimated to (12,862; 16,264) USD/month/Household. However, of the study sample we could not observe a statistically significant relationships among income status, employment status and education status of visitors. This indicate that visitors with different income status, employments and educations status tour the ecotourism site in Hiriwadunna.

Household size of visitors: The distribution of household size of the visitors is depicted in Figure 09. The mean, median and mode of household size of visitors are respectively 3, 3 and 2. Based on the shape of the histogram in Figure 09 and a Skewness coefficient of 0.88, the

distribution of household size of visitors is a left skewed distribution. This infers that visitors with small household sizes are more likely to visit Ecotourism site in Hiriwadunna.

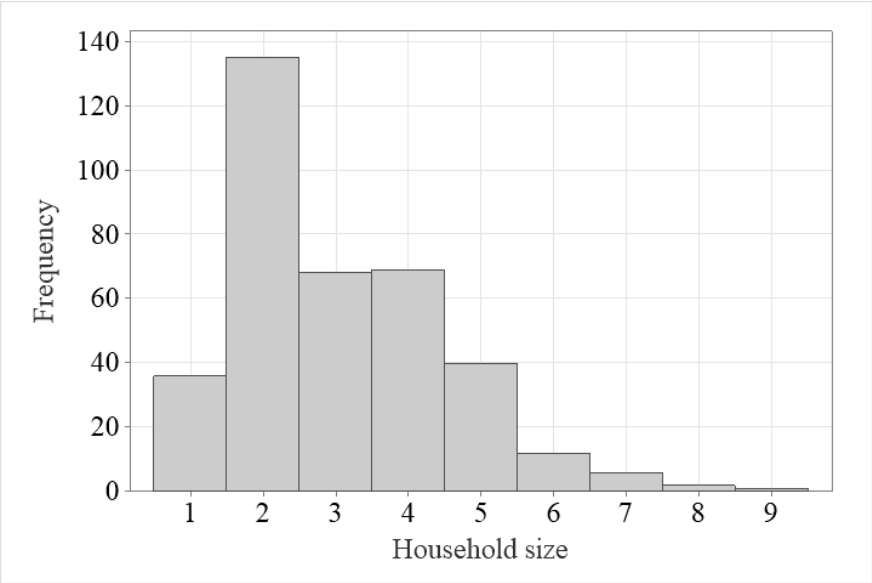


Figure 09. Empirical distribution of the household size of the visitors

Knowledge assessment of visitors to Ecotourism site in Hiriwadunna

During the study, the knowledge of tourists about VTCS was assessed under three thematic areas viz. history and originality, provision of ecosystem services, climate resilience and mitigation. Here, ten "True/False" type questions (Q1 – Q10) were asked from each tourist which were constricted in line with the objective of this study. The coverage of three specific thematic areas by ten questions is depicted in Figure 10.

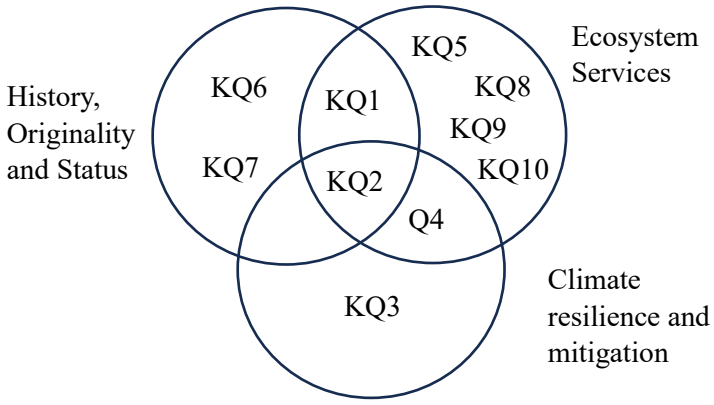


Figure 10. Coverage of thematic area by ten knowledge question.

***Note**: KQ1 – VTCS is a man-made irrigation system for agricultural water to be used during the dry season and exists over centuries, KQ2 – It resembles to a natural ecosystem than an artificial ecosystem, KQ3 – VTCS mitigates adverse impact of climate change and build resilience to climate change, KQ4 – VTCS is a climate smart irrigation system, KQ5 – VTCS regulate ground water and recharge the water table, KQ6 – VTCS is not unique to Sri Lanka, KQ7 – At present VTCS and its functionality has substantially degraded, KQ8 – VTCS provide habitats and support pollination, Q9 – There is a high potential for ecotourism in VTCS landscapes, KQ10 – Rituals, scenic beauty of landscape and recreation are some of cultural services provided by VTCS*

A summary of the response of tourists to ten true false type knowledge questions (Q1 – Q10) is given in Table 08.

History, originality and status: Four questions (Figure 10) contributed to the average knowledge score (Average true %) of this thematic area which was estimated to 50.75%. For this, KQ2 loaded the highest while KQ7 loaded the lowermost. This indicate that about 50% of tourists have faire understanding about this thematic area of the VTCSs. However, their knowledge about the current status of VTCSs remained low. This may be due to less availability of information about current status of VTCS published in the popular sources of information. However, there is an ample amount of literature about the history, functionality, originality and ecology of VTCS freely available in different sources information viz. internet, magazines, tour web sites etc.

Climate resilience and mitigation: As depicted in Figure 10, there were three knowledge questions (KQ2, KQ3 and KQ4) were directed about the thematic area resilient to climate change and mitigation of its adverse impacts. The mean knowledge score was estimated to 60.33% that indicate a majority of tourists has a significant knowledge in this thematic area related to VTCS. Many studies have been carried out about the role of VTCS for mitigating climate change and resilience to the climate change which are available in different sources of information.

Table 08. The summary of the response given by the tourists to all ten knowledge questions (Q1 – Q10)

Knowledge question (True/ False type)		Frequency			Percentage		
		True	Fales	Neutral	Treu	Fales	Neutral
KQ1	VTCS is a man-made irrigation system for agricultural water to be used during the dry season and exists over centuries	197	46	128	53%	12%	35%
KQ2	It resembles to a natural ecosystem than an artificial ecosystem	275	27	69	74%	7%	19%
KQ3	VTCS mitigates adverse impact of climate change and build resilience to climate change	201	18	152	54%	5%	41%
KQ4	VTCS is a climate smart irrigation system	196	14	161	53%	4%	43%
KQ5	VTCS regulate ground water and recharge the water table	182	16	173	49%	4%	47%
KQ6	VTCS is not unique to Sri Lanka	183	61	127	49%	16%	34%
KQ7	At present VTCS and its functionality has substantially degraded	102	49	220	27%	13%	59%
KQ8	VTCS provide habitats and support pollination	220	16	135	59%	4%	36%
KQ9	There is a high potential for ecotourism in VTCS landscapes	279	15	77	75%	4%	21%
KQ10	Rituals, scenic beauty of landscape and recreation are some of cultural services provided by VTCS	243	17	111	65%	5%	30%

Ecosystem services of VTCS: This study focusses more on the ecosystem services and their valuation. Therefore, more questions (seven questions) were devoted for testing the knowledge

about ecosystem services (Figure 10). The mean knowledge score on ecosystem services was estimated to 61.14% for which KQ2, KQ9 and KQ10 loaded more. This indicates that a majority of tourists had a knowledge about possible ecosystem services arising from VTCS. Out of three thematic areas, this area reported higher awareness among the visitors. About 75% of the visitors were aware about the high potential of VTCS for ecotourism. Further a majority of visitors (65%) had some knowhow about the cultural services arising from VTCSs.

During the study, we further tested tourists' awareness and the knowledge about ecology, its economics and VTCS using a set of ten key words respectively, Cascade ecology; Biodiversity; Ecological restoration; Environment conservation; Climate change, resilience and mitigation; Ecosystem services; Sustainability; Value of existence, Nonuse value; Natural capital and Village tank cascade system (VTCS). The status of the awareness of tourists about these keywords are presented Table 09 which the Perito analysis is depicted in Figure 11.

Table 09: The awareness of tourists about ten key words on ecology, its economics and VTCS

Technical term	Frequency		Percentage	
	Yes	No	Yes	No
Cascade ecology	43	328	12%	88%
Biodiversity	353	18	95%	5%
Ecological restoration	269	102	73%	27%
Environment conservation	337	34	91%	9%
Climate change, resilience and mitigation	337	34	91%	9%
Ecosystem services	227	144	61%	39%
Sustainability	310	61	84%	16%
Value of existence, Nonuse value	98	273	26%	74%
Natural capital	129	242	35%	65%
Village tank cascade system (VTCS)	44	327	12%	88%
Mean response	215	156	58%	42%

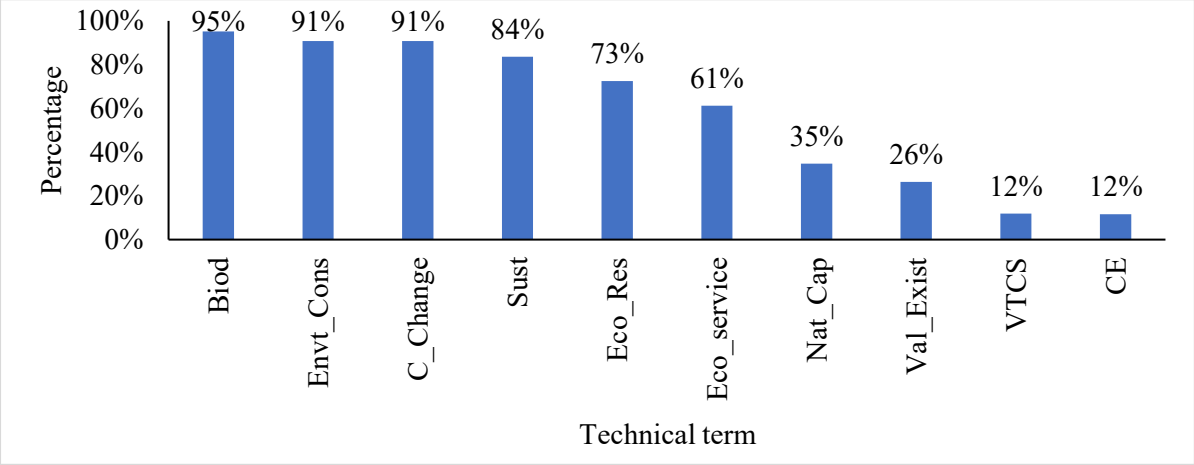


Figure 11. Perito analysis of tourists' awareness of ecology, its' economics and VTCS

CE – Cascade ecology, Biod – Biodiversity, Eco_Res – Ecological restoration, Envt_Cons – Environment conservation, C_Change – Climate change, resilience and mitigation, Eco_service – Ecosystem services, Sust – Sustainability, Val_Exist – Value of existence/ Nonuse value, Nat_Cap – Natural capital, VTCS – Village tank cascade system

Based on the Figure 11, more than 90% of tourists were aware about Biodiversity, Environment conservation and Climate change. About 84% of them were aware about the sustainability while 73% of the visitors knew about ecological restoration. A moderate number of visitors were aware about ecosystem services which was similarly reflected in the analysis reported in Table 08. There were lower number of visitors who are aware about ecological economics. Only about 35% of the visitors were aware about Natural capital while 26% of the visitors knew about the value of existence and nonuse value. Awareness about Cascade ecology and Village tank cascade system was the lowest among the tourists (12%). Although they are aware about functions of VTCS, it can be seen that they are not much familiar about the term "Village Tank Cascade System". There are many terms used for VTCS viz. "Ellanga" system, Village tank ensemble, Cascade system and Tank Cascade Village system. So, there may be some unclear idea about the key word VTCS. The cascade ecology is a recently introduced concept which the definition is yet being established and many studies are currently going on about the cascade ecology and its' definition.

Different sources where tourist got knowledge about different key terms were investigated which the summary is illustrated in Table 10. The percentage of respondents under each source (Table 10) was calculated based on the total positive response in Table 09. Based on the single responses, the most common source for information about all terms is internet and social media. Ther other sources respectively, Education, newspaper and magazine, TV/ Radio and word of mouth. Most frequently, on the average 56% of the tourist have learnt these terms from multiple sources where internet/ social media, education and newspaper/ magazines were the most common sources.

Table 10. Different information sources of various aspects of ecotourism in VTCSs where tourists look for information

Technical term	TV/ Radio	Newspaper/ Magazine	Internet/ social media	Friends/ Relatives	Through Education	Multiple sources
Cascade ecology	14%	2%	16%	5%	7%	56%
Biodiversity	4%	2%	18%	1%	7%	68%
Ecological restoration	3%	6%	25%	1%	7%	57%
Environment conservation	2%	4%	19%	2%	6%	68%
Climate change, resilience and mitigation	2%	5%	19%	2%	6%	65%
Ecosystem services	3%	4%	28%	3%	10%	52%
Sustainability	2%	5%	22%	3%	8%	60%
Value of existence/ Nonuse value	2%	7%	36%	3%	8%	44%
Natural capital	2%	7%	33%	2%	9%	47%
Village tank cascade system	2%	2%	41%	9%	5%	41%
Mean response	**4%**	**4%**	**26%**	**3%**	**7%**	**56%**

When single responses are concerned, the most popular source of information is the internet and social media for which the response rate is 26%. Among the multiple sources also, the highest number of respondents have mentioned internet as a source of information. The second

most common source is their education which indicate tourist who have some education background about abovementioned thematic areas would like ecotourism.

During the study, we investigated the level of hearing (hearing rate) of these key words by the visitors. The hearing rate was calculated based on the total positive responses in Table 09 which the summary is illustrated in Figure 12. It can be noticed that key words with low levels of hearing have also low levels of awareness. A significant number of tourists mentioned that they hear key words; Cascade ecology, value of existence, natural capital and VTCS less frequently compared to other key words. However, 56% of respondents who are aware about cascade ecology mentioned that they hear it occasionally. A significant number of tourists said that the level of hearing of key words Biodiversity, Ecological restoration and Climate change of significant number of respondents is very often which is the highest level. More than 40% respondents mentioned the rate of hearing as occasional (medium) for all words except two key words, Environment conservation and VTCS.

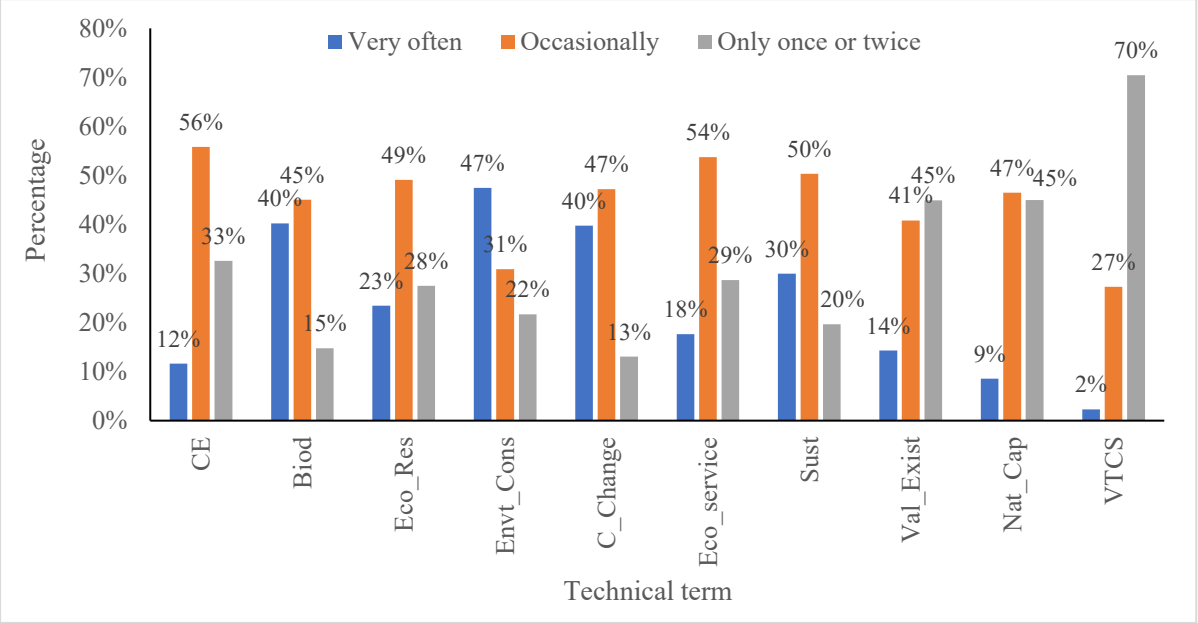


Figure 12. Estimated level of hearing of ten key words by the tourist

Note: *CE – Cascade ecology, Biod – Biodiversity, Eco_Res – Ecological restoration, Envt_Cons – Environment conservation, C_Change – Climate change, resilience and mitigation, Eco_service – Ecosystem services, Sust – Sustainability, Val_Exist – Value of existence/ Nonuse value, Nat_Cap – Natural capital, VTCS – Village tank cascade system*

The level of knowledge of the respondents about all ten key words were tested on a five-point Likert scale which a summary is presented in Table 11. A majority of respondents had fairly a low level of knowledge about cascade ecology even though they knew the respective technical term. About 62% of the respondents mentioned that they have either a very low or low level of knowledge about the VTCS. However, there was about 20% the respondents who had faire to high level of knowledge about the VTCS. Value of existence, Nonuse value and Natural capital are three key words in the area of ecological economics. About 38.5% of the respondents showed very low to low level of knowledge about ecological economics. However, out of the total respondents there were 25.5% of tourists who had either faire or high knowledge about ecological economics.

About 64% and 62% of the respondents had either a fair or high knowledge about Environment conservation and Biodiversity respectively. Of the positive respondent, 56% said that they have at least a faire knowledge about climate change, resilience and mitigation while another 52% said that they have at least a fair knowledge about the Sustainability. Ecological restoration of VTCS and realizing benefits from ecosystem services arising from VTCS are two major concerns of the Healthy Landscape project. They should be given a top priority if agricultural productivity needs to be elevated amidst adverse impacts of climate change in Dry Zone landscapes in the country. About 42% of tourists said that they have at least a fair knowledge about Ecological restoration. Another 36% tourist had at least a fair knowledge about Ecosystem services. We observed that about 40% of tourist has a medium level of knowledge about Ecological restoration while another 37% of respondents has a moderate knowledge about Ecosystem services.

Table 11. The summary of tourists' level of knowledge about ten key technical terms.

Technical term	Very Low	Low	Neither low nor high	Fair	High
Cascade ecology	5%	44%	30%	19%	2%
Biodiversity	1%	11%	26%	52%	10%
Ecological restoration	2%	16%	40%	38%	4%
Environment conservation	1%	12%	23%	45%	19%
Climate change, resilience and mitigation	1%	9%	34%	49%	7%
Ecosystem services	3%	25%	37%	31%	5%
Sustainability	0%	15%	33%	44%	8%
Value of existence/ Nonuse value	12%	30%	33%	18%	7%
Natural capital	6%	29%	36%	22%	6%
Village tank cascade system	23%	39%	18%	11%	9%
Average responses	**5%**	**23%**	**31%**	**33%**	**8%**

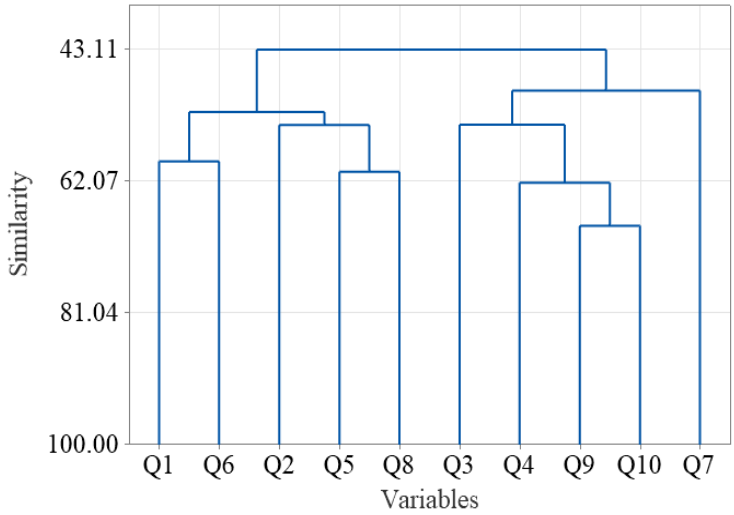
In conclusion, more than 50% of the respondents generally aware about three underlying thematic areas; ecology, its economics and VTCS. Mosty, they aware through multiple sources where internet, social media, newspapers, journals and their education were prominent. The most prominent source was Internes and social media. A significant percentage (about 70%) of the respondents had at least a moderate hearing rate of the key words viz. Biodiversity, Ecological restoration, Environment conservation, Climate change, Ecosystem services and Sustainability. Hearing rates were significantly low of Cascade ecology, Value of existence, Use value and Natural capital which the tourists knowledges were also low. However, 72% of the respondents had at least moderate level of knowledge about three underlying thematic areas. Visitors on Hiriwadunna village tour are more environmental concern and have a faire knowledge about the essence of ecotourism.

Tourists' perception about restoration and conservation of VTCS

During this study, perceptions of the tourists about restoration of VTCS was investigated using ten key questions which are listed below. They covered different aspects that are taken into granted when ecological restoration of an ecosystem is undertaken. Perception was measured with a five-point Likert scale viz. 1 – Highly disagree, 2 – Disagree, 3 – Neither disagree nor agree, 4 – Agree, 5 – Highly agree.

Q1 – TVCS is currently not fully functioning providing all its' ecosystem services
Q2 – VTCS cannot be restored to its original state seen in the ancient time
Q3 – Present challenges in agricultural production amidst adverse impacts of climate change can be won by restoring the VTCSs
Q4 – It is necessary to maintain all components associates with a tank in a VTCS during restoration
Q5 – It is an easy task to maintain ratio between tank components during present efforts of restoration of VTCS
Q6 – Illegal encroachments into different components of VTCSs cannot be reversed
Q7 – A fee/ tax dedicated for restoration should be claimed from the community/ visitors
Q8 – Government should not intervene the VTCS restoration process
Q9 – VTCS community should take the responsibility and leadership of restoration and maintenance
Q10 – Ecotourism in VTCSs should be promoted as a strategy of VTCS restoration

In the analysis, first, perception questions were classified based on tourists perceived responses about ecological restoration using a cluster analysis which the results are depicted in Figure 13. We used Complete Linkage and Correlation Coefficient Distance for clustering.



Step	number of Clusters	Similarity level	Distance level
1	9	68.46	0.63
2	8	62.29	0.75
3	7	60.70	0.79
4	6	59.19	0.82
5	5	53.96	0.92
6	4	53.94	0.92
7	3	52.09	0.96
8	2	49.01	1.02
9	1	43.11	1.14

Figure 13: Dendrogram and other statistical information about clustering

Based on results of the cluster analysis, ten perception questions can be classified into three clusters at a 52.1% similarity level. Q1, Q6, Q2, Q5 and Q8 fallen into the first cluster. For the questions in the first cluster, the perceived responses of tourists were either more negative or more neutral. The second cluster consists of Q3, Q4, Q9 and Q10. In this cluster, tourists perceived responses were mostly on the positive side. The Q7 grouped into the third cluster alone where perceptions were more positive with a peaked distribution comparatively.

Empirical distributions of the perceived responses for the first cluster of questions are depicted in Figure 14.

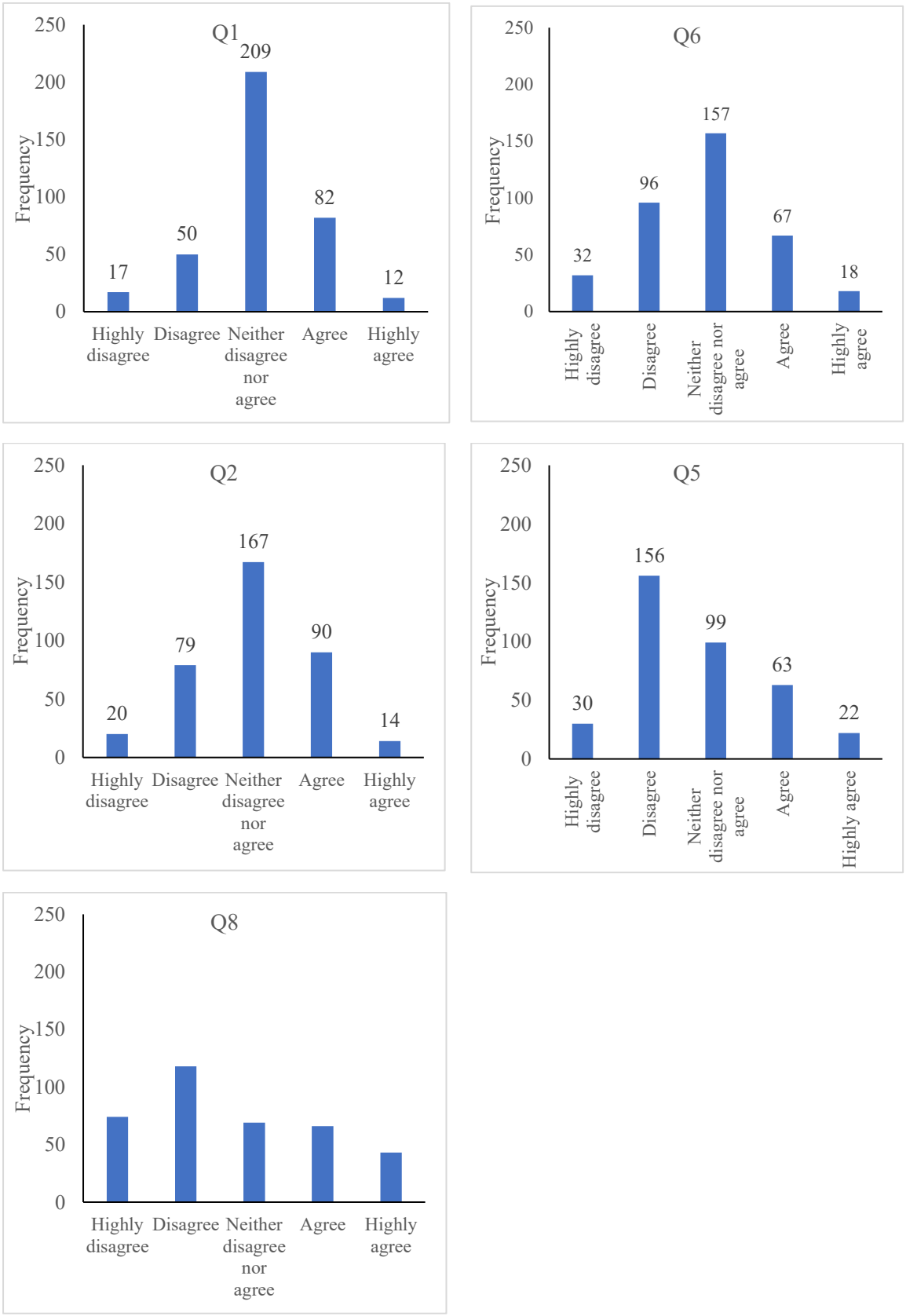


Figure 14: Empirical distributions of the perceived responses on the first cluster of questions

The empirical distribution of the perceived responses to Q1 is comparatively a peaked and symmetric one. About 56% of respondents had a neutral idea about the current status and the functionality of VTCS. Only 25% of respondents had an idea about the degraded functionality of VTCS at present. The empirical distribution of the perceived response to Q6 is slightly left skewed and depicts that about 77% of the respondent are at most on a neutral opinion that illegal encroachments into different components of VTCSs cannot be reversed. About 34% of them are in the opinion that illegal encroachments can be reversed which should be given attention by the policy makers. It can be noticed that Q1 and Q6 cluster together at 54% of similarity level.

The empirical distribution of the perceived response on Q2 is more or less a symmetric distribution. A 45% of respondent have neutral perception on ability of restoring VTCS to same status as it was in the ancient time. A 26% of the tourist are in the opinion that VTCS cannot be restored up to its original state while another 28% of respondents say that it could be reinstated as it was. Empirical distributions of perceived responses on Q5 and Q8 are right skewed ones. The majority, (>50%) are in the opinion that original ratios between respective components of VTCS will not be able to maintain during present efforts of restoration of VTCSs. A 52% of respondent express their view that the government should not heavily intervene in the restorations process.

Empirical distributions of the perceived responses on the questions in the second cluster are depicted in Figure 15. Empirical distributions of all four questions are left skewed ones. The Q3 is "present challenges in agricultural production amidst adverse impacts of climate change can be won by restoring the VTCSs" for which the majority of the tourist agree. Only 7% of them disagree with this statement.

The empirical distribution of the perceived response on Q4 is rather a peaked distribution which depicts that 72% of the tourist are in the perception that all components of VTCS should be maintained if the system is restored. The empirical distribution of the perceived response on Q9 is also a peaked distribution comparatively. A 79% of the respondents are in the perception that the community must take the leadership and the responsibility of restoration and maintenance of the VTCS. This brings an important insight that a community driven approach of restoration would be more appropriate than a fully government authoritative approach of restoration. Currently the most responsibility of maintenance, management and restoration of VTCS is on the government side which has not yet been fully successful and consequently VTCSs are currently in a dilapidated state. As per the empirical distribution of the perceived response of tourist on Q10, a 77% of them are in the opinion that ecotourism in VTCS would be a better opportunity to facilitate restoration process with funding.

The third cluster includes only the Q7 for which the empirical distribution of perceiver response of the visitors is depicted in Figure 16. The respective empirical distribution is comparatively a peaked and a left skewed distribution. This indicate that the most tourists are in the perception that a tax on the community and the visitors on ecotourism would be a best option for supporting restoration process with funds.

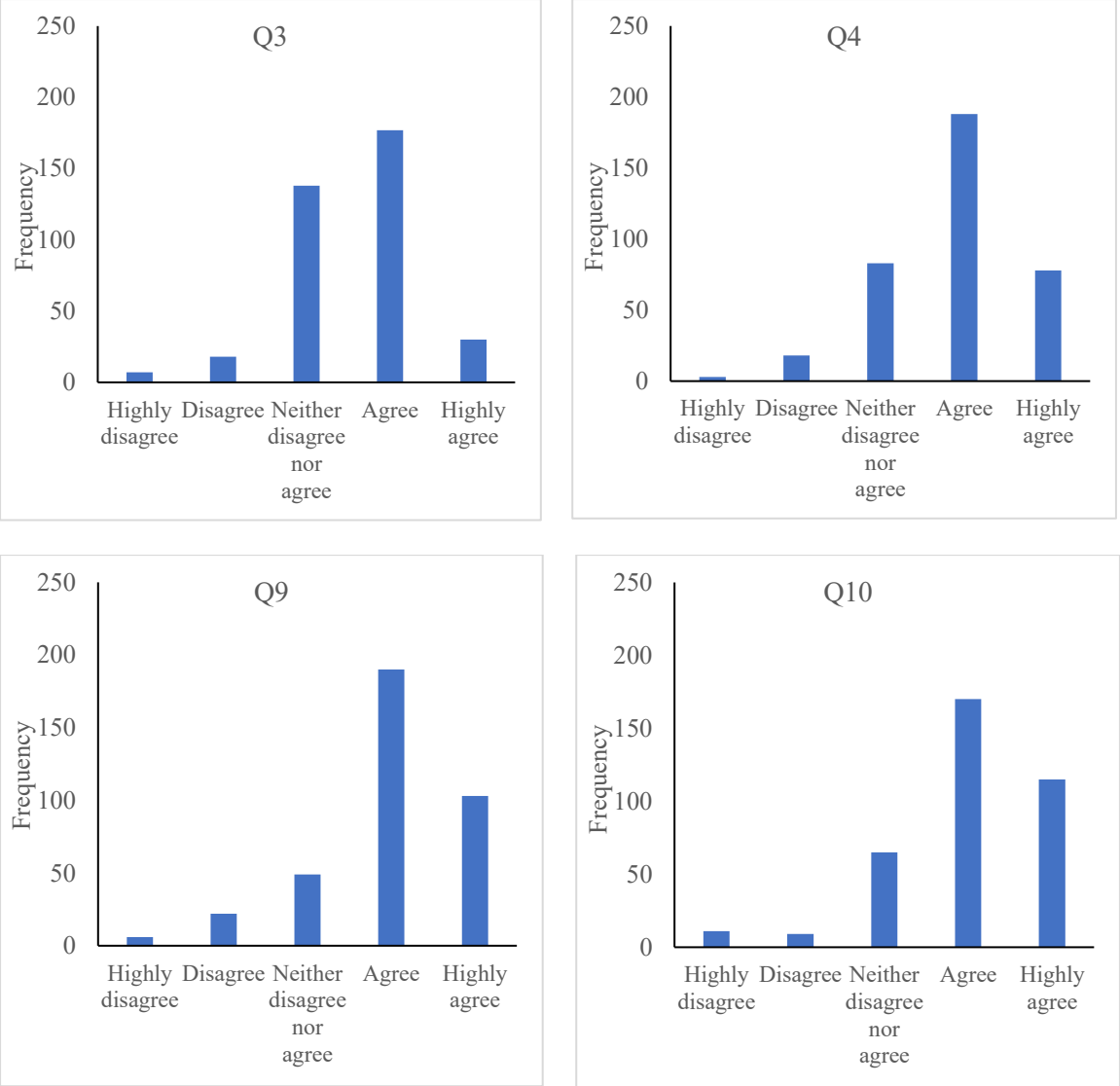


Figure 15: Empirical distributions of the perceived responses on questions in the second cluster

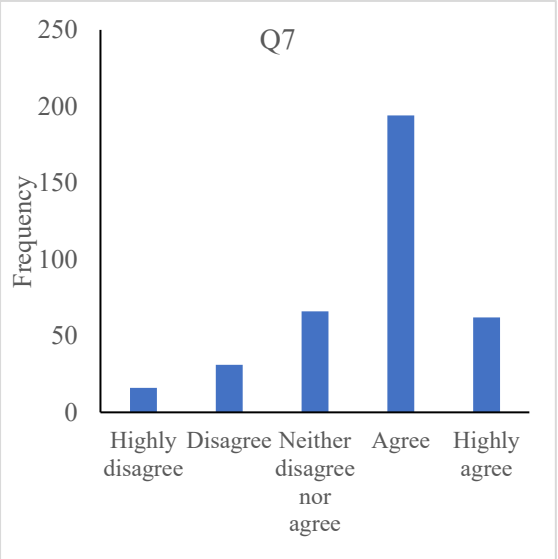


Figure 16: Empirical distributions of the perceived responses on Q7 in the third cluster

Tourists open view on the restoration of VTCS

The visitor opinions collected through the questionnaire provide valuable insights into their perspectives on the restoration and maintenance of the Hiriwaduna Village Tour (VTCS). Many visitors express strong support for the restoration efforts, highlighting the potential benefits for the village and its inhabitants. They believe that restoration will enhance the village's value and contribute positively to its community, improving the livelihoods of the people. There is a clear consensus that restoration is a very good idea that will lead to the improvement and recovery of ecosystems, thus increasing the overall appeal of the village.

However, concerns about the cost associated with visiting the village were also prominent. Several respondents suggested that lower fees might attract more visitors, indicating that while visitors are supportive of restoration, they are also sensitive to the pricing structure, which could influence the number of tourists willing to visit. Comments like "It is better if the fee for a visit is less than $50" and "This concept is not expensive than 30 dollars" reflect this sentiment.

A sense of urgency is conveyed in some responses, emphasizing the importance of timely restoration and maintenance. Visitors believe that immediate actions are needed to restore and maintain the system, considering it a very important aspect to address. There is a call for prompt action to preserve the village's unique features and prevent further degradation, underscoring the need for swift and effective restoration efforts.

Environmental and cultural considerations are significant concerns for many visitors. They emphasize the need to preserve the natural beauty and cultural heritage of the village while implementing restoration projects. There is a strong desire to maintain the village's traditional environment, with many visitors stating that restoration should not change the current situations or compromise the natural beauty. Additionally, visitors are aware that restoration efforts should also benefit the local community, indicating a need for a balanced approach that considers both environmental preservation and community development.

Despite the general support, some visitors provided ambiguous responses or indicated a lack of knowledge about the restoration process. This suggests that not all visitors are fully informed or confident in their opinions about the restoration efforts. Better communication and education regarding the goals and benefits of the restoration project might be necessary to address this gap.

Several respondents appreciated the current state of the village and expressed contentment with minimal changes. Some visitors are satisfied with the village as it currently stands and may prefer only minor adjustments rather than extensive restoration. Comments suggesting no need for significant changes highlight this perspective.

Visitors also provided specific suggestions for enhancing the village experience and infrastructure. Practical advice for improving accessibility and sustainability, such as developing roads and implementing eco-friendly techniques, indicates a desire for thoughtful improvements that enhance the visitor experience without compromising the village's charm. These suggestions reflect a balanced view of maintaining the village's appeal while making it more accessible and sustainable.

The potential social and economic benefits of restoration were also highlighted, focusing on improved livelihoods and community awareness. Visitors believe that restoration has the potential to bring significant benefits to society, including economic development and cultural preservation. They emphasize the importance of improving the system to function in a manner similar to the ancient and authentic ways of life, indicating a desire for a restoration approach that respects and enhances traditional practices.

Approximately 50.55% of the respondents mentioned the restoration as good, and approximately 20.88% mentioned the restoration as bad. The collected opinions indicate strong overall support for the restoration of the Hiriwaduna Village Tour, with significant emphasis on maintaining environmental and cultural integrity, addressing cost concerns, and ensuring community involvement and benefits. The feedback underscores the importance of careful planning to balance restoration efforts with preserving the village's natural and cultural heritage.

Assessment of the economic value of cultural services arising through ecotourism in VTCSs

Once nature of the Hiriwadunna Village Toure is reviewed carefully it can be clearly notice what we market are all cultural services arising from a VTCS. Because, all Hiriwadunna Village Packages offer a combination of cultural services to respective visitors some of which are listed in Table 15. Thus, what is measured in this study is the economic value of the cultural services that have been incorporated in different ecotourism packages offered at Hiriwadunna Village Tour site.

Estimation of willingness to pay (WTP) for ecotourism in VTCSs.

In double bind dichotomous contingent valuation (DBDC CV), we will estimate WTP on environment commodities based on a multinomial conditional logit model which the response variable was a in the ordinal scale (Responses: *yn, ny* and *nn*). The determinants of WTP were demographic characteristics. In the initial model fitting, we considered eight covariates respectively, gender, civil status, employment, family income, education, family size, region of residence and age. However, most of these prospective determinants were not statistically significant in the full model and best fit model consisted only three determinants respectively, gender, education status and employment status. We reclassified education statues into five categories since there were very few visitors in the lowermost category of education (Table 07). Then the first and second education categories were amalgamated in to one category labeled as “edu1” (Up to middle school or less). Similarly, only one observation reported under the employment category “Farming” which was excluded from the analysis and consequently the variable was recoded before the model fitting.

After cleaning and recoding the data set, the DBDC CV model fitting was carried out and model parameters of the best fit model with three covariates are given in Table 12. The likelihood ratio test on the model was statistically significate (114.572 on 8 DF, p-value: <0.001) which indicate that the model adequately captures the relationship between the multinomial response variable and respective covariates. The AIC and BIC values were respectively, 883.01 and 921.09 which were apparently smaller than those of the other fitted models with different

combinations of covariates. Thus, the goodness for fit of the model presented in Table 12 is adequate and can be used for estimation of WTP.

Table 12: Model parameters of the best fit DBDC CV model

Coefficient	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	4.369	0.553	7.90	< 0.001**
gender2	-0.425	0.212	-2.00	0.045*
edu2	-0.234	0.500	-0.47	0.640
edu3	0.019	0.526	0.04	0.971
edu4	0.172	0.500	0.34	0.732
edu5	0.911	0.548	1.66	0.096+
employ2	0.092	0.276	0.33	0.738
employ3	-0.005	0.297	-0.02	0.987
employ4	0.425	0.261	1.628	0.103+
BID	-0.076	0.005	-16.45	<0.001**

Note: *gender1 – Male, gender2 – Female; edu1 - ≤ Middle school, edu2 – up to high school, edu3 – pass uni entrance, edu4 – undergraduate qualification, edu5 – postgraduate qualification; employ1. – Employed in private sector, employ2. – Employed in Govt. sector, employ3. – Self-employment, employ4. – Other (retired form the job); BID – Bidding ammount. + - maginally significant; * significant at α < 0.05, ** significant at α < 0.01 and *** significant at α < 0.001.*

It can be noticed that the BID variable in the model is statistically significant (p-value < 0.001) with a negative coefficient which is the expected signe by a tipical the demand function. The implied demand curve is dipicted in Figure 17 where the respective relationship is hold. The the willingness to pay for the ecotourism (the demand) is decreasing when the ticket price (the bid) increases. Gender of torurists is a categorical variable with two out comes which is statistically significant in the model (p-value < 0.05) with a negative coefficient. This indicate that compred to male tourists, female tourist place a less value on the ecotourism at Hiriwadunna. That means their WTP recreases when the bid price is increased.

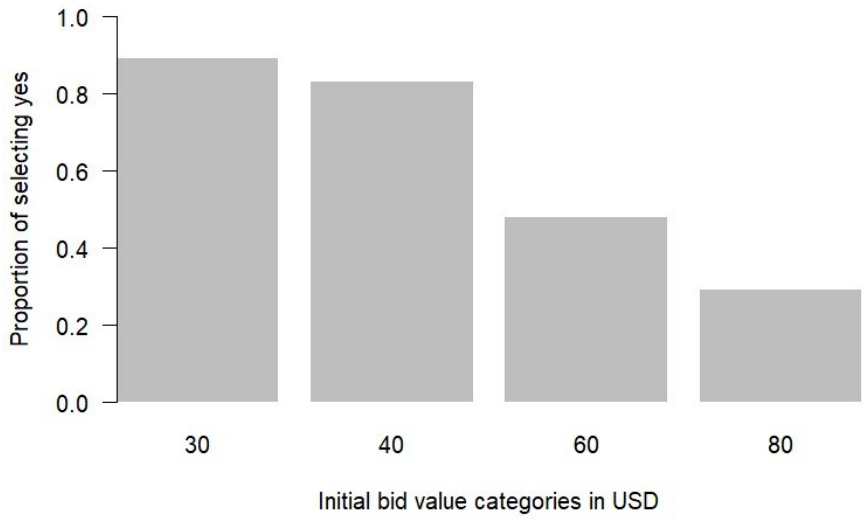


Figure 17: Implied demand curve on ecotourism in a VTCS

As far as the effect of education level is concerned on the WTP, all education levels except "edu5" are not statistically significantly different from WTP of the reference education level (up to middle school). However, "edu5" (postgraduate level qualifications) is marginally statistically significant (p-value$\leq$ 0.1) in the model with a positive coefficient. This indicated that those who with the heighest education levels would more likely to pay on ecotourism in VTCSs compared to those with lower educational backgrounds. Although other education levels do not show statistically significant difference from the reference education level, their model coefficients can be seen increasing when the level of education is increasing. This indicates that the higher the education backgroud the higher the WTP for ecotourism in VTCSs by tourists.

The employement is a variable in the nominal scale. It can be noticed that non of the employement classes except retired group of tourist were statistically significanly different from the reference employement class (employed in the provate sector) regarding WTP for ecotourism in VTCSs. The "employ4" (tourists on retirement) was marginally statisticaslly significantly (p-value$\leq$ 0.1) different from the reference employment level. This means that tourists on their retirement are more willing to pay for ecotourism in VTCSs compared to that of the tourists employed in the private sector. The model coefficient associated with "employ2" has a positive sign which indicate tourists employed in the government sector may willing to pay more than those who work in the private sevtor. The coefficient of "employ3" has a negative sign that means those who are self employed would willing to pay less than tourists employed in the private sector.

Based on the best fit DBDC CV model, WTP values on the average were estimated and the results are presented in Table 13. Confidence intervals given in Table 13 are 95% bootstrap confidence intervals. The mean WTP for ecotourism in VTCSs is estimated to USD 57.58 with a 95% confidence interval of USD (55.04, 61.46). The median WTP is USD 57.41 with a 95% confidence interval of USD (54.91, 61.20). There is no an apparent difference between the mean and median WTP estimates which gives an insight theat estimated WTP destributes symmetricaly. The change in WTP against different bid values is depicted in Figure 18 where the mean WTP and its confidence intervle has also been signified on the figure with read lines.

Table 13: Willingness to pay (WTP) estimates derived from the DBDC CV model

Statistic	WTP Estimate	LB	UB
Mean	57.58	55.04	61.46
truncated Mean	57.06	54.71	60.56
adjusted truncated Mean	59.33	56.16	64.29
Median	57.41	54.91	61.20

Note: *All values are given in USD.*

Usually, with DCchoice package, WTP is estimated for the range of the bid values used in the study (USD 20 – USD100) which can be clearly seen in Figure 18. It can be noticed that the WTP is nonlinearly changing with different bid values. The willingness of the tourist to pay for ecotourism in Hiriwadunna is decreasing with increasing of the ticket price. There is about 5% of tourists who are willing to pay less than UAS 20. However, about another 5% of tourists willing to pay even a USD 100 or more for ecotourism in Hiriwadunna.

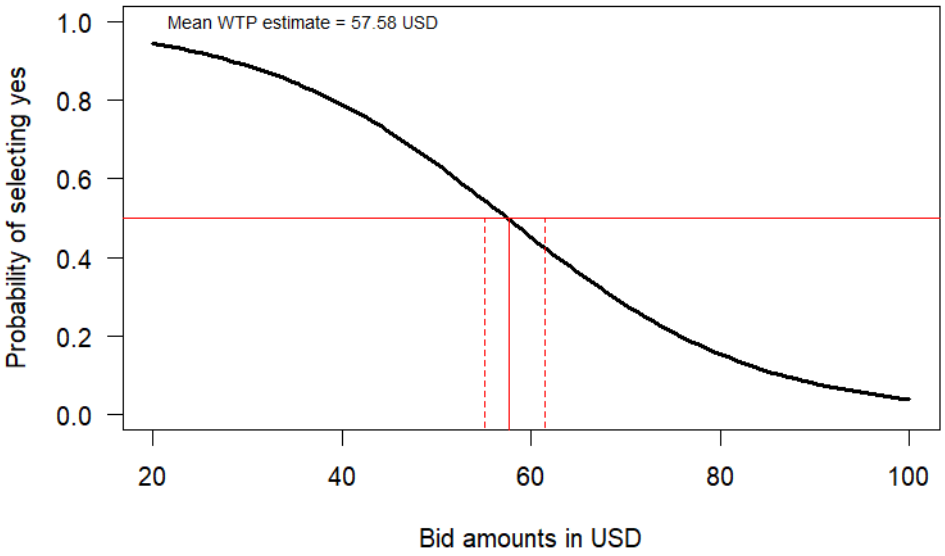


Figure 18: WTP against different bid values ranging from USD 20 to USD 100.

Further, we investigated changes in WTP by gender, education level and employment of the tourists. Estimated WTP at some selected levels of gender, education and employment of tourists are given in Table 14. These levels were selected based on their significance in the DBDC CV model. It can be noticed that mean WTP of male and female tourists are respectively USD57.82 and USD52.30 at reference levels of education and employment (learn up to middle school and working in the private sector). Male tourists are willing to pay USD5.52 more than what female tourists with same education level and employment status wish to pay. Further, it can be noticed that this gap in WTP approximately holds between male and female tourist with other education levels and employment status.

The mean WTP of a male tourist with an education background with post graduate qualifications and employed in the private sector is USD69.75 which is USD11.93 higher than the WTP of a male tourist educated up to middle school and employed in the private sector. Similarly, this difference in WTP of two such female tourist is USD11.88 which is more or less the same. This indicates that tourists educated up to postgraduate level are willing to pay at least USD 11 more than a tourist with a middle school level education. This was similarly observed during the data collection process also. Educated tourists most of the time showed their greater willing to pay for ecotourism in VTCSs.

Retired male tourists with a muddle school education background reported a mean WTP of USD63.38 which is USD5.56 more than the WTP of a male tourist with the same background of education and work in the private castor. The difference in WTP of two such female tourist was estimated to USD5.53. Further it can be noticed that tourist with high education background and on their retirement has the greatest WTP for ecotourism in VTCSs. Their mean WTP is USD75.34. Female tourists with the same background have a mean WTP of USD69.76. This information would help for tour planners and policy makers in the tourism sector to understand who can be more attracted to ecotourism in VTCSs.

Table 14: Estimated WTP at some selected settings of gender, education level and employment of tourists

Parameter	Male, edu1 and employ1			Female, edu1 and employ1		
	Estimate	LB	UB	Estimate	LB	UB
Mean	57.82	44.87	74.63	52.30	44.05	70.37
truncated Mean	57.30	44.72	72.72	51.96	43.91	68.85
adjusted truncated Mean	59.62	45.24	83.76	53.33	44.46	76.89
Median	57.66	44.52	74.57	52.05	43.72	70.29
	Male, edu5 and employ 1			**Female, edu5 and employ 1**		
	Estimate	LB	UB	Estimate	LB	UB
Mean	69.75	55.92	78.95	64.18	52.01	74.03
truncated Mean	68.48	55.60	76.27	63.34	51.74	72.27
adjusted truncated Mean	75.37	57.09	92.54	67.50	52.86	82.52
Median	69.68	55.79	78.90	64.08	51.81	73.98
	Male, edu1 and employ4			**Female, edu1 and employ4**		
	Estimate	LB	UB	Estimate	LB	UB
Mean	63.38	51.01	80.87	57.83	45.78	73.73
truncated Mean	62.59	50.79	78.01	57.31	45.58	72.00
adjusted truncated Mean	66.46	51.71	96.61	59.62	46.26	81.11
Median	63.27	50.82	80.84	57.66	45.37	73.68
	Male, edu5 and employ4			**Female, edu5 and employ4**		
	Estimate	LB	UB	Estimate	LB	UB
Mean	75.34	61.84	85.25	69.76	57.75	83.71
truncated Mean	73.45	61.23	81.49	68.49	57.39	80.28
adjusted truncated Mean	84.74	64.07	108.26	75.38	59.04	104.43
Median	75.29	61.75	85.23	69.69	57.66	83.68

Note: *edu1 – up to middle school, edu5 – postgraduate qualification; employ1. – Employed in private sector, 4. – on retirement*

Estimation of the total economic value of cultural services arising from ecotourism

Total number of visitors that reach Hiriwadunna ecotourism site in a year was estimated participatorily during the data collection. All core stakeholders of Hiriwadunna village tour (Figure 20) were included in the participatory assessment of total arrivals of tourists. The summary of the participatory assessment is depicted in Figure 19. It shows the monthly distribution of total arrivals of visitors to an average village house. During the data collection we found that there are 25 active village houses in the Hiriwadunna ecotourism site. Usually, all visitors don't miss stepping into a village house and experience traditional culinary practices and food which is the key feature of Hiriwadunna village tour. Thus, we assume that number of visitors who miss village houses is negligible in calculations.

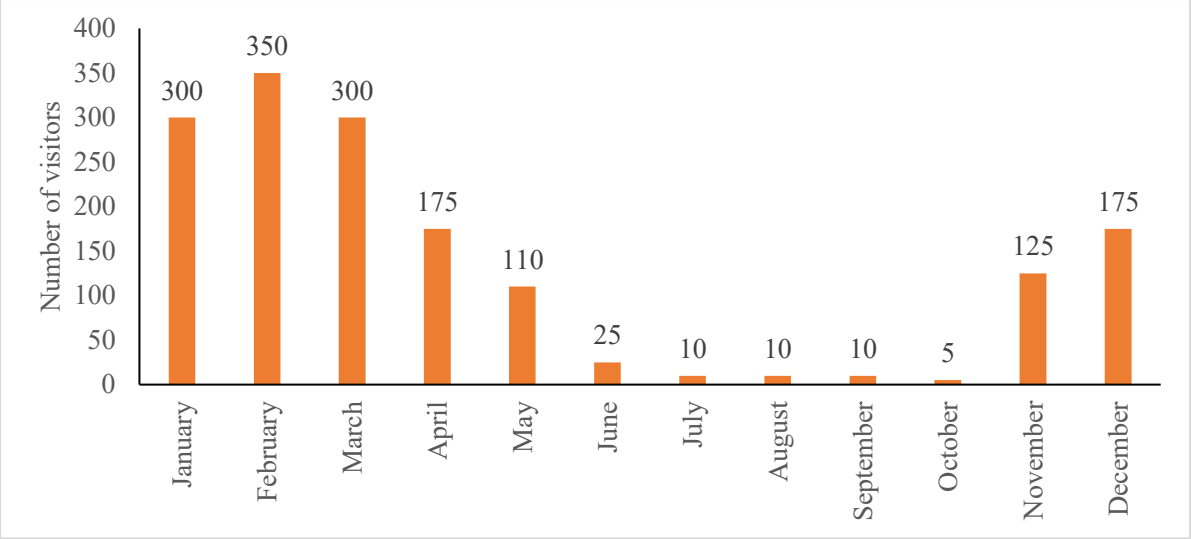


Figure 19. Monthly total number of tourists visiting to an average village house

The off season of tourists starts from May and prevail up to end of November. Number of visitors during the off season is minimum. However, some specific visitors from different parts of the world, especially Arabian visitors arrive at Hiriwadunna ecotourism site during the off-tourism season. The total economic value is estimated per Anum basis using mean MWT and total visitors coming to the ecotourism site in a year which the detailed calculation is presented below.

Total annual number of visitors to an average village house	1595
Total number of active village houses in Hiriwadunna ecotourism site	25
Total number of visitors to Hiriwadunna ecotourism site annually (*total annual visitors to an average village house x active number of village houses*)	39875
Mean WTP (USD)	$ 57.58
Total economic value (in USD) of cultural services arising from ecotourism in Hiriwadunna tank and suburb. (*WTP x Total annual visitors to the ecotourism site*)	**$ 2,296,002.50**

Consequently, the total economic value of cultural services arising from ecotourism site in Hiriwadunna is estimated to USG 2.3 million annually. There may be variation to this due to variations in the annual numbers of visitors and the WTP (Table 14). If the value is converted to LKR at today's currency rate (LKR 325 = USD 1) then to is estimated to LKR million 747.5 annually.

Hiriwadunna village tour and tourists responses

Hiriwadunna Village, located near the historical cities of Sigiriya and Habarana, serves as a rural haven. With approximately 400 families, the majority of whom are farmers and craftsmen, it boasts captivating natural beauty surrounded by picturesque paddy fields and peaceable lakes, providing visitors with a peaceful escape from the hustle and bustle of urban life. The village's rich cultural heritage, which includes ancient temples, memorials, and historic sites, offers glimpses into Sri Lanka's illustrious history.

Hiriwadunna Village Tour (HVT) was founded to provide an authentic experience of rural Sri Lankan life, and it invites travelers on a captivating journey that promotes ecotourism and environmental conservation. Established in Nineties, HVT has received recognition for its unwavering dedication to sustainable tourism practices and the preservation of the region's natural and cultural heritage. HVT strives to highlight the village's beauty while also instilling appreciation for its unique ecosystem and vibrant community through immersive experiences and meaningful engagement.

The Hiriwadunna Village Tour takes a unique approach to ecotourism, combining cultural immersion with sustainable practices to provide visitors with an enriching and responsible travel experience. Hiriwadunna Village, situated despite the natural beauty of rural Sri Lanka, illustrates ecotourism principles in action. HVT's core values include environmental conservation and community engagement. The tour aims to reduce its environmental impact by promoting sustainable transportation methods like bullock cart rides and catamaran boat tours. Responsible tourism practices also help to conserve natural resources and protect biodiversity.

One of the cornerstones of Hiriwadunna Village Tour’s ecotourism strategy is the emphasis on preserving the village's cultural heritage and traditional way of life. Visitors can interact with local communities, take part in traditional activities, and learn about long-standing customs and traditions. HVT promotes cultural exchange and appreciation, fostering a better understanding of the interconnectedness of culture, the environment, and sustainable development.

Furthermore, HVT actively engages the local community in tourism initiatives, empowering villagers to take responsibility for their cultural and natural resources. Local guides lead tours and share their knowledge of the village's history, flora, and fauna, giving visitors an authentic look at rural life. HVT helps the community's socioeconomic development while preserving its cultural identity by providing income and job opportunities for local residents. It prioritizes environmental conservation by protecting the village's natural ecosystems and wildlife habitats. Throughout their stay, visitors are encouraged to respect the natural environment, reduce waste, and promote eco-friendly practices. Educational programs and guided nature walks raise awareness about the importance of biodiversity conservation, as well as ecotourism's role in protecting fragile ecosystems.

Overall, Hiriwadunna Village Tour shows ecotourism principles such as sustainable tourism, cultural exchange, and natural resource conservation. HVT provides visitors with a transformative experience through responsible travel and meaningful engagement with local communities, enriching their lives while also contributing to the long-term sustainability of Hiriwadunna Village and its surroundings.

Hiriwadunna Village is centered on its remarkable cascade system, an ingenious feat of engineering that has sustained the community for generations. The village tank cascade system, a complex network of interconnected reservoirs and canals, exemplifies Sri Lankan historical creativity and resourcefulness. Built centuries ago, to harness and distribute water for agriculture, the cascade system remains a lifeline for local farmers, providing irrigation for rice paddies and other crops all year.

Natural Attractions

Paddy Fields: Massive paddy fields are an incredible sight to see, especially during harvest time. Visitors can walk or bike through the area and even try their hand at traditional farming methods.

Hiriwadunna Lake and its components: A peaceful water body surrounded by dense vegetation, ideal for a relaxing boat ride. Visitors can rent a boat and explore the lake, taking in the stunning views of the surrounding landscapes. The can walk through forest patches (Gasgommana) while getting adventures experience, bird watching, photographing and different educational and scientific exposure.

Cultural attractions

Hiriwadunna Temple is a historical site with remains of old structures scattered throughout the temple grounds. The temple is significant in Sri Lankan history and Buddhism, with stories and legends surrounding it.

A village walk is a great way to learn about the local lifestyle and traditions in Hiriwadunna Village where VTCSs' traditions and culture is inculcated in. Visitors can take guided tours of the village, visit local homes, meet the residents, and participate in traditional activities such as pottery making, weaving, and cooking.

Stakeholders of ecotourism in Hiriwadunna

There are various stakeholders associated with Hiriwadunna village tour which was comprehensively identified during this study. We conducted a stakeholder analysis and consequently prepared a stakeholder map which is depicted in Figure 20. The stakeholders were identified under three categories viz. core stakeholders, direct stakeholders and indirect stakeholders based on the operational ststus.

Core stakeholders: They are the stakeholder who are directly operating the village tour activities who are mostly the villagers in Hiriwadunna village. They are respectively, village house owners, workers in the village houses (culinarians and performers), community tour guides, bullock cart riders, two-wheel tractor riders, boat riders and tuk-tuk riders. They are the actors at the direct operational level of cultural activities undertaking in the Hiriwadunna ecotourism site which is in the upper cascade of the Palugaswewa VTCS. Although it is not included in the stakeholder map, there is another core stakeholder that can be identified as intermediate tour operator whose role is coordinating other core stakeholders with direct stakeholders; especially safari counters. However, there are some independent core stakeholders who don't depend on intermediate tour operators.

Direct stakeholders: They are the stakeholders who has high to medium involvement in ecotourism activities in Hiriwadunna village tank and suburb. This is one of their top interested businesses but they deal with other types of tourism as well. They have high levels of interests and influence to the ecotourism in Hiriwadunna. They are respectively, safari counters, safari jeeps, input an utility suppliers, national tour guides, shauffer guides, village farmer organization, tourists' hotels, tour companies and village house owners' society. Although village house owners' society's primary concern is Hiriwadunna village tour and its development, their role and level of influence are not that significant at present.

Indirect stakeholders: They are the stakeholders whose engagement and interest in ecotourism in Hriwadunna is less. They mostly make and decide the enabling environment of the business. Thus, some of these stakeholders' influence on ecotourism in Hiriwadunna could be high. Indirect stakeholders of this business can be recognized respectively, as tourist board, local government, ministry of tourism, forest department, cultural heritage department, divisional secretariate, department of agrarian development, department of irrigation, department of agriculture, village temple and department of wildlife.

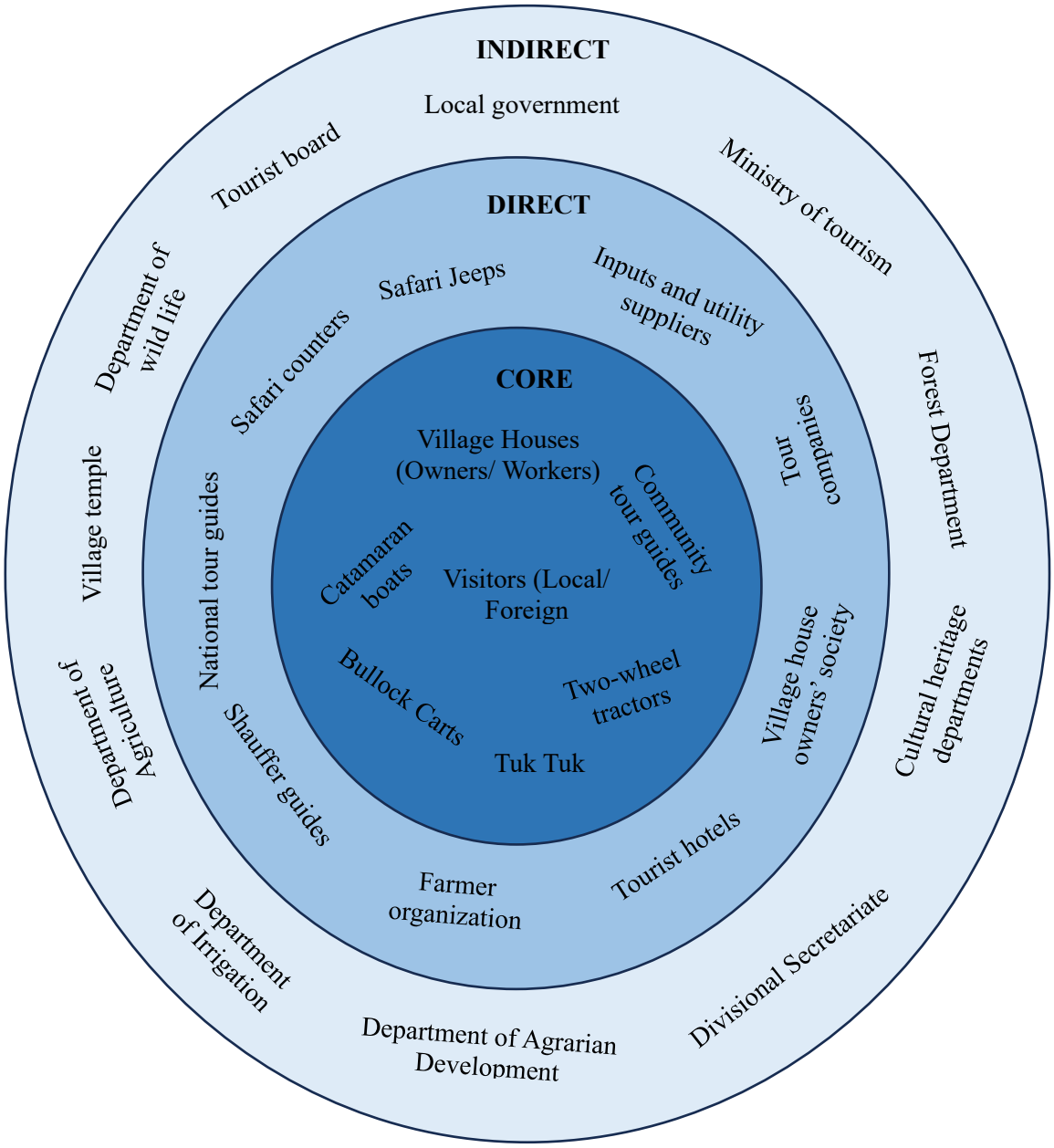


Figure:20: Stakeholder map of the ecotourism taken place in Hiriwadunna village tank in pallugaswewa VTCS

Tour packages offered during ecotourism in Hiriwadunna

The specific feature of tour packages offered in Hiriwadunna village tour is that all of those packages are exclusively comprised of various cultural services realizing from a typical VTCS.

The most common tour package runs over three hours duration. It includes bullock cart ride from the entrance of the village to the tank bund which is going through the village and paddy fields enjoying the scenic beauty of the VTCSs' landscape. Some tourists prefer to choose two-wheel reactor or safari jeep for this purpose instead of the bullock cart. At the bund, they will enjoy the lakeside view and the scenic beauty in a typical cascade environment and thereafter the catamaran boat ride begins. In the boat ride, tourists will boat deep into the lake enjoying the VTCSs' scenic beauty more. While the boat ride they will be wharfing a lotus flower necklace and a lotus leaf hat which adds more esthetic value this activity. At the end of the boat ride, they are accompanied into a village house located near by the lake. Most of them are located in an upland cropping landscape. They will walk through small-scale upland cropping lands and paddy to the village house. At the village house they are traditionally welcome by a traditional family. Tourists will be dressed with a set of traditional clothes that gives some close experience to the life of a village in a VTCS. They will engage in some traditional culinary practices and the lunch will be prepared with the support of villagers. Thereafter, they will be served the lunch. They will be sometimes offered village fruits and sweets as the desert. Instead of the lunch, some tourists come to village houses for morning or evening tea. At the tea, they are offered a local style coup of tea with "coconut rotee" made of rice flour and a "cutta sambal" (a chilly and onion mixed paste) or any other traditional short eat. After the hospitality in a village house and getting experience of the village life with traditional food, tourists will return to the tour site gate by a Tuk-tuk.

In addition to the common package, there are other different packages that are offered by some innovative village house owners. They are offered as customized combinations of other cultural, environmental and adventurous activities arising from VTCSs and based on the tourists' expectations which the rates are fairly high. The most expensive tour package is the exclusive tour package which is offered by very few innovative village house owners who are more independent on some of the direct stakeholders like safari counters. In addition to services of the common tour package, it includes;

An extended jungle tour: This tour includes more time spent exploring the lush jungles around Hiriwadunna, guided by local experts who share their knowledge about the flora and fauna

Household Activities: Tourists get to participate in a variety of household activities, offering a hands-on experience of village life. These activities include; *Neem Oil Extraction*: Learning the traditional process of extracting oil from neem seeds, an activity deeply rooted in local practices, *Traditional Cooking*: Preparing and cooking local dishes using traditional methods and ingredients and *Handicrafts*: Engaging in the creation of local handicrafts, such as weaving and pottery.

Cultural Performances: Exclusive packages may also include private cultural performances, showcasing traditional music and dance.

Personalized Interaction: With fewer tourists per group, these tours offer more personalized interactions with the villagers, fostering a deeper understanding of their way of life

During the study, we identified an inventory different service that can be offered with various tour packages which are listed below. They are all cultural services that would realize from a typical VTCS.

1. Welcome/ Hospitality at the entrance to the village
2. Travelling by bullock cart/ two-wheel tractor across the village
3. Travel with tuk-tuk (return)
4. Boat ride in the tank (with/ without lotus flower neckless and lead hat)
5. Recreational fishing in the boat
6. Traditional lunch with culinary practices
7. Traditional tea (morning/ evening) with rotee or any other traditional short eat
8. Travelling through the forest trail/ Adventure
9. Stay night in a village house/ tree house
10. Enjoy the scenic beauty of the cascade tank landscape
11. Photography/ filming/ video/ Tik Tok production
12. Watching birds/ wild animals/ butterflies/ insects/ other creatures in VTCS
13. Exposure to village traditions and rituals associated with VTCS culture
14. Education and knowledge about VTCS/ natural systems/ culture/ heritage
15. Any other

During the study, we investigated the inventory of services further for their level exposure, priority given to and satisfaction by tourists. We observed that the tour packages are designed by either village house owners or safari counters as a combination of some services in this inventory of services. They are sometimes flexible to customize items included in the tour package based on requests of tour guides and tourists.

The level of exposure to different activities offered through different tour packages are illustrated in Table 15. This measures how many tourists have been offered each activity listed in the inventory during ecotourism in Hiriwadunna.

Table 15: The level of exposure to different activities in tour packages of ecotourism in Hiriwadunna.

Service	Yes
1. Welcome/ Hospitality at the entrance of the village and village houses	98.9%
2. Travelling by bullock cart/ two-wheel tractor across the village	60.9%
3. Travel with tuk-tuk (return)	63.7%
4. Boat ride in the tank (with/ without lotus flower neckless and lotus leaf hat)	78.5%
5. Traditional lunch with culinary practices	83.1%
6. Traditional tea (morning/ evening) with rotee or any other short eat	23.2%
7. Enjoy the scenic beauty of the cascade tank landscape	91.5%
8. Recreational fishing in the boat	3.1%
9. Travelling through the forest trail/ Adventure	12.9%
10. Stay night in a village house/ tree house	0.3%
11. Photography/ filming/ video/ Tik Tok production	59.6%
12. Watching birds/ wild animals/ butterflies/ insects/ other creatures in VTCS	70.7%
13. Exposure to village traditions and rituals associated with VTCS culture	72.7%
14. Education and knowledge about VTCS/ natural systems/ culture/ heritage	23.9%
15. Other	1.9%

The first six services mentioned in Table 15 are the items included in the common tour package mentioned above. Almost all the tours receive a warm welcome at the entrance of the village and village houses. In the sample, 83.1% of tourists have enjoyed the traditional lunch and experienced traditional culinary practices. Only about 23.2% of the visitors have come for either morning or evening traditional tea which is consumed by the traditional cascade community. About 6% of the visitors enjoy both traditional tea and the lunch. Consequently, we can conclude that the majority of visitors come for the lunch and traditional culinary practices. About 78.5% of the visitors go on the boat ride to enjoy the scenic beauty of the tank and the vicinity. Mothe than 50% of the visitors prefer to return with the Tuk-Tuk while others chose safari jeep, walking, tourist bus and any other mode of transport. Usually, the return transport is arranged at the tank bund or near the tank spill. Village houses are mostly located in the proximity of 500 – 700m to the tank bund. In conclusion we can infer that the majority of visitors get the common tour package.

A significant number of visitors have engaged in bird/animal/insect watching, photography/video/Tuk-Tuk etc. and expose to village traditional culture which are not usually included in tour packages. There are very few visitors who come for education and knowledge about VTCS/ natural systems/ culture/ heritage. Under other activities some tourists were enjoyed king coconut offered at the village houses which were most appreciated by them. Based on the information received from tour organizers (mostly village house owners), there are special tourist who like education and knowledge, bird/animal/insect/butterfly watching, making documentaries and getting adventure experience. They are willing to pay more for such customized package than the common package. There were very few visitors found who are interested in staying a night or two in a village house/ tree house in the vicinity of the tank. Some visitors get arranged parties reserving a village house to celebrate special occasions like birthdays, anniversaries etc. So, it is clear that there are many opportunities available for village house owners to offer attractive tour packages with more value additions. However, most of the tour organizers offer only the most common tour package and interested in attracting more tourists in a short time than offering a high quality and innovative tour packages at a higher rate. Consequently, there is a tourist congestion and overcrowded situation in Hiriwadunna village tour site which is mostly criticized by tourists. They mostly expect a quality service in a calm, peaceful and less crowded environment.

During the study, we investigated how tourists prioritize different services in the inventory of services based on their expectations which the summary is given in Table 16. It can be observed that tourists most value the exposure to the culinary practices and enjoying the traditional lunch. About 63% of tourists ranked this as their top most priority while another 20 ranked it as their second priority. The way how village houses offer the traditional lunch giving them hands on experience of preparing the lunch by tourists themself is most valued by them. A majority of tourists who come for traditional tea also prioritized this on the top. However, about 25% prioritized the traditional tea at most in third place. With this, we can infer that the essence of Hiriwadunna village tour is provision of hands on exposure to traditional culinary practices and the meals of the community live in VTCSs.

About 12.9% of the visitors were on a tour package which included adventure in the forest trail suburb Hiriwadunnal tank in the Palugaswewa VTCS. This was most valued item by the tourist next to the traditional culinary practices and meals. However, only very few innovative village

house owners offer this to the tourist which the fee is significantly high. They are usually presented in customized tour packages based on the demand of the tourists and the tour organizers, especially of recognized tour companies.

Table 16. Perceived priority ranking of different services that has been offered with tour packages.

Service	Priority rank					Non response rate
	1	2	3	4	5	
Welcome/ Hospitality at the entrance to the village and village house	4.9%	22.1%	27.0%	21.1%	25.0%	45.0%
Travelling by bullock cart/ two-wheel tractor through village	9.4%	13.7%	23.9%	28.2%	24.8%	68.5%
Travel with tuk-tuk (return/ enter in/ through the village)	4.3%	10.6%	38.3%	21.3%	25.5%	87.3%
Boat ride in the tank (with/ without lotus flower neckless and lead hat)	27.3%	42.6%	13.7%	9.2%	7.2%	32.9%
Recreational fishing in the boat	0.0%	0.0%	33.3%	66.7%	0.0%	99.2%
Traditional lunch with culinary practices	62.7%	19.5%	12.0%	4.1%	1.7%	21.3%
Traditional tea (morning/ evening) with rotee or any other short eat	39.3%	34.4%	18.0%	8.2%	0.0%	83.6%
Travelling through the forest trail/ Adventure	46.4%	14.3%	17.9%	10.7%	10.7%	92.5%
Stay night in a village house/ tree house	0.0%	0.0%	0.0%	0.0%	100.0 %	99.7%
Enjoy the scenic beauty of the cascade tank landscape	12.1%	21.4%	28.1%	24.1%	14.3%	39.6%
Photography/ filming/ video/ Tik Tok production	7.0%	15.1%	25.6%	27.9%	24.4%	76.8%
Watching birds/ wild animals/ butterflies/ insects/ other creatures in VTCS	2.4%	9.7%	21.0%	35.5%	31.5%	66.6%
Exposure to village traditions and rituals associated with VTCS culture	4.8%	19.3%	26.2%	25.5%	24.1%	60.9%
Education and knowledge about VTCS/ natural systems/ culture/ heritage	0.0%	5.3%	21.1%	26.3%	47.4%	94.9%

The Satisfaction of tourists about different services offered by their tour packages was measured with a five-point Likert scale ranging from highly unsatisfactory to highly satisfactory. The results are summarized in Table 17. More than 95% of visitors rated all services except travelling with bullock cast and Tuk-tuk either as satisfactory or highly satisfied. The number of nonrespondents rate ranged from 15.6% to 99.7% depending on the services that they have obtained through various tour packages. It was found that most of the tourists are significantly satisfied with the services that they have been offered with their tour packages.

About 85% of the tourist who traveled in the site with the with the bullock cart at least said the service is satisfied. About 7.5% of travelers with the bullock cart were either unsatisfied on highly unsatisfied due to poor road conditions and animal right concerns. Some of the visitors were complained that bullock cart riders did not concern about animal rights of the bulls harnessed into the cart for which they were very unhappy. About 83% of tourist traveled with

the Tuk-tuk said that the service is fantastic. However, about 14% of the were on a neutral opinion while about 3% of the said the service is unsatisfied since the road conditions in the site is poor and wobbly.

Table 17. The level of satisfaction of the tourist about different services incorporated in their tour packages

Service	Level of satisfaction					Non response rate
	Highly unsatisfied	Unsatisfied	Neither unsatisfied nor satisfied	Satisfied	Highly satisfied	
Welcome/ Hospitality at the entrance to the village	0.0%	0.0%	0.3%	47.3%	52.4%	15.6%
Travelling by bullock cart/ two-wheel tractor through village	2.5%	5.1%	6.6%	42.1%	43.7%	46.9%
Travel with tuk-tuk (return/ enter in/ through the village)	0.0%	2.6%	13.8%	54.4%	29.2%	47.4%
Boat ride in the tank (with/ without lotus flower neckless and lead hat)	0.0%	0.7%	1.5%	27.0%	70.8%	28.0%
Recreational fishing in the boat	0.0%	0.0%	0.0%	80.0%	20.0%	98.2%
Traditional lunch with culinary practices	0.3%	0.0%	0.3%	16.4%	82.9%	21.0%
Traditional tea (morning/ evening) with rotee or any other short eat	0.0%	0.0%	1.4%	35.2%	63.4%	80.9%
Travelling through the forest trail/ Adventure	0.0%	0.0%	7.3%	39.0%	53.7%	88.9%
Stay night in a village house/ tree house	0.0%	0.0%	0.0%	0.0%	100.0%	99.7%
Enjoy the scenic beauty of the cascade tank landscape	0.0%	0.3%	1.6%	43.8%	54.2%	17.0%
Photography/ filming/ video/ Tik Tok production	0.0%	0.0%	1.7%	45.7%	52.6%	52.8%
Watching birds/ wild animals/ butterflies/ insects/ other creatures in VTCS	0.0%	0.5%	1.8%	50.0%	47.7%	40.2%
Exposure to village traditions and rituals associated with VTCS culture	0.0%	0.0%	1.7%	48.5%	49.8%	37.2%
Education and knowledge about VTCS/ natural systems/ culture/ heritage	0.0%	0.0%	4.8%	55.6%	39.7%	83.0%

Benefit sharing amongst stakeholders of Hiriwadunna ecotourism

The rates of tour packages available for ecotourism in Hiriwadunna range from USD 20 to USD 80. The very basic package with the fewest options costs USD 20 which is advertised in many tour websites. The fee of the most common package USD 35 during the period of data collection. The most expensive tour package is the Exclusive tour package which is offered by

only few innovative village house owners which the fee is USD80. Details of tour packages have been provided earlier in this report. We will discuss about the benefit sharing among core and direct stakeholders based on the fee of common package which is USD 35.

Details of the analysis about benefit sharing among different stakeholders are presented in Table 18. Relevant information was collected from a group of stakeholders represented all types of core and direct stakeholders through stakeholder interviews. We found difficult to collect income details since they were very sensitive to disclose such information. However, the reliability of such information was assured thought stakeholder triangulation and the enumerator triangulation. Fore single person visits, only 31% of the total earning are shared among the core stakeholders while the balance 69% is shared among direct stakeholder. Here, the benefit sharing ratio between core stakeholders and direct stakeholders is approximately 1:2. For tours of a couple and tours of a group of five, benefit sharing ratios between core and direct stakeholders are approximately 1:4 and 1:7. This concludes that the higher the size of the tourist group the more the disparity in benefit sharing between core stakeholders and direct stakeholders. There may be some variations in the analysis due to information asymmetry which should be further investigated. Further researches are needed in this context where information asymmetry needs to be carefully understood and bring reasonable solution to handle respective issues.

Table 18. Details of analysis of benefit sharing among the stakeholder

Description	Share under three different scenarios			
	Rate (LKR)	Tour of a single person	Tour of a Couple	Tour of a group of 5
Cart/ two-wheel rider (maximum capacity = 5 persons)	1000 per visit	1,000.00	1,000.00	1,000.00
Boat rider (maximum capacity = 5 persons)	1500 per visit	1,500.00	1,500.00	1,500.00
Villahe house owner (per meal)	750 per meal	750.00	1,500.00	3,750.00
Tuk-tuk driver (maximum capacity = 3 persons)	250 per vist	250.00	250.00	500.00
Total share for core stakeholders		3,500.00	4,250.00	6,750.00
As a percentage of total earning		31%	19%	12%
Total share for direct stakeholders		7,875.00	18,500.00	50,125.00
As a percentage of total earning		69%	81%	88%
Total earning		**11,375.00**	**22,750.00**	**56,875.00**

Note: USD 1.00 = LKR 325.00 as per February 2024 currency rates

Usually, tourist don't make payments directly to core stake holders. It will be chinned through different direct stakeholders mainly via Safari counters, Tour guides, Hotels and Tour companies. So, tourists are not aware about how benefit sharing among stakeholders taken place. Except very few core stakeholders, the most of core stakeholders are heavily dependent on the direct stakeholders which makes the benefit sharing process more inefficient and asymmetric. Further some direct stakeholders like Farmer organization get very little benefit who can have a high influence on the ecotourism. The most benefitted direct stakeholders are

tour guides and safari counter owners who gets nearly 80% of the benefits allocated for direct stakeholders.

Tips, or extra money offered by tourists, play a significant role in the financial benefits received core stakeholders. The tip depends on few factors viz. service quality, generosity of tourists, tour group size and the consent of the tour guide. Every core stakeholder has a random opportunity of receiving a tip on top of previously mentioned factors. Usually, they receive a tip ranging from 500 to 5000 LKR. It could be in USD ranging from 10 – 50 occasionally. This generosity is sometimes extended to the workers in village houses as well. However, it is worth noting that some local guides may discourage tourists from giving tips, leading to occasional dissatisfaction among core stakeholders who rely on these additional funds. While boat riders and cart riders also receive tips, the amounts tend to be considerably lower compared to those given to the village houses. Despite the variability in tip amounts, these extra contributions from tourists significantly enhance the income of the villagers, providing them with a greater incentive to participate in and sustain the tourism activities.

In conclusion, channeling tourist for core stakeholders is mostly taken place through safari counters and thus they control the whole process of benefit sharing. There are only few core stakeholder who are independent from the safari counters. They are operating connected with few innovative village house owners. They receive tourists through multiple channels viz. Tour companies, Hotels, Tour guides and safari counted on demand basis. Intermediate tour organizers, safari jeep drivers, and other types workers are employed under safari counter owners. Most of the guides are directly connected and working with safari counter owners who get a significantly higher portion from the benefit share of direct stake holders. The highest share from the allocation of direct stakeholders goes to both safari counter owners and tour guides. This situation could have a direct impact on the sustainability of the ecotourism and the service quality offered by core stakeholders since they try to cater a greater number of tourists in a shorter period of time aiming higher benefits. Some of the tourist showed their concern and unhappiness about the overcrowded situation in the Hiriwadunna ecotourism site. In-depth studies are required to understand this situation in detail and to assure sustainability measures in ecotourism while making the benefit sharing more efficient.

Prospects for further developments of Hiriwadunna Village Tour: The tourists view point

If tourists are highly impressed, then they would consider multiple visits to the country and to a specific site which could support the development of a country's tourism. We enquired details about this form tourists at Hiriwadunna which the summary is presented in Figure 21. Based on Figure 21-A, about 90% of the visitors came to Hiriwadunna were first time visitors to Sri Lanka. This is an era that Sri Lankan glorious tourism seemingly regaining which was suppressed during last few years due to COVID 19 pandemic followed by the economic crisis in Sri Lanka. Out of the total sample, about 5% of the tourist were non respondents. Another 5% of them have made multiple visits Sri Lanka and some of them are residing in the country for a long time. Out of the multiple visitors to the Island, 79% of foreigners have visited Hiriwadunna twice. About 21% of them have visited Hiriwadunna more than two times.

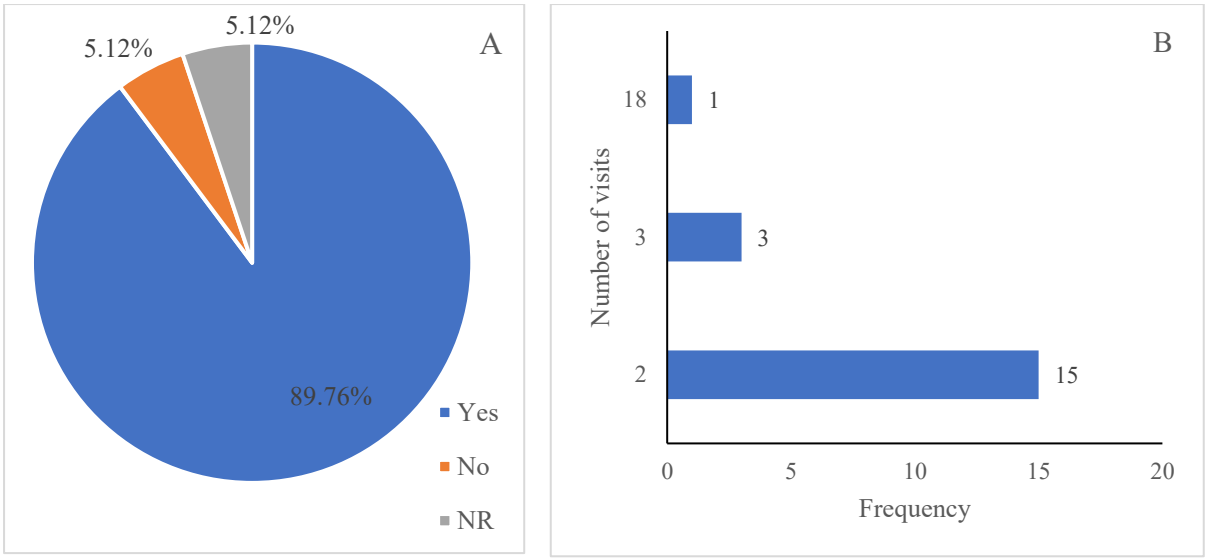


Figure 21. Visiting frequency of the sample of tourist to Sri Lanka; A – times of visits to Sri Lanka, B –, Frequency of visit to Sri Lanka by the multiple visitors

Out of all visitors to Hiriwadunna, about 99% we first time visitors (Figure 21-B). Only a 1% of them have made multiple visits to Hiriwadunna ecotourism site. Specifically, we found a visitor who has made for visit to Hiriwaqdunna ecotourism site. The likelihood tourist visiting Hiriwadunna ecotourism site again is depicted in Figure 22. Of the respondents who paid inters to coming back Sri Lanka, about 95% mentioned that they are willing to come back to Hiriwadunna in order to experience cultural services arising from VTCSs. About 5% of the visitors who wished to return Sri Lanka said that they would not visit Hiriwadunna again. However, Chi-squared test on the association between visiting to Sri Lanka and visiting to Hiriwadunna was statistical highly significant (Chi-square value = 202.9, p-value < 0.001) which confirm that significant number of visitors that would return to Sri Lanka would revisit Hiriwadunna ecotourism site.

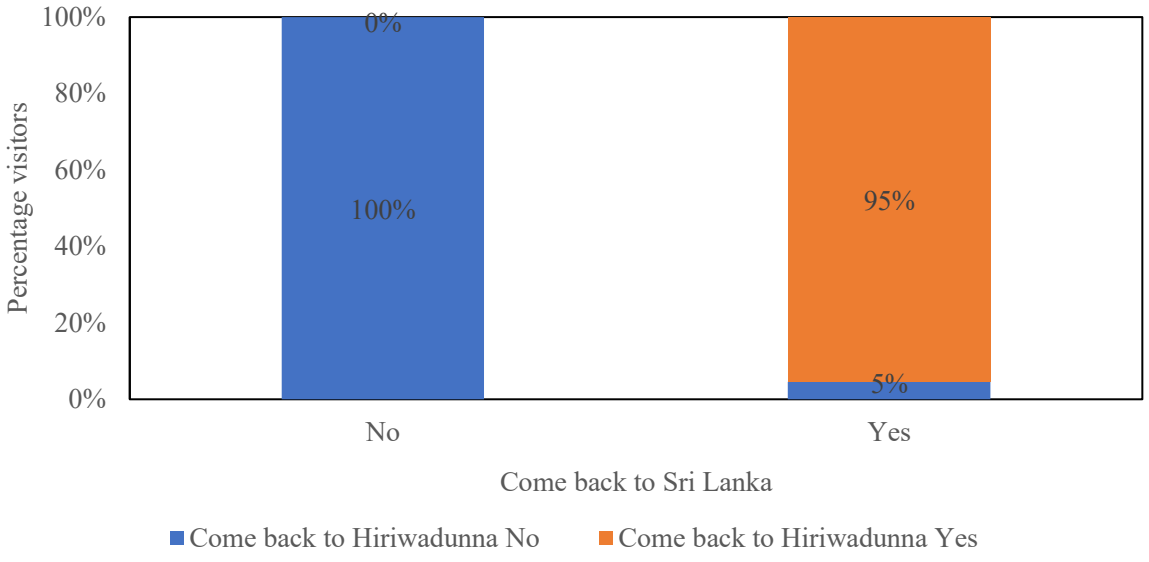


Figure 22. The potential of tourists for visiting Hiriwadunna ecotourism site again.

Results of the Perito analysis done about information sources of tourists about ecotourism in Hiriwadunna that motivated them to make a visit is depicted in Figure 23.

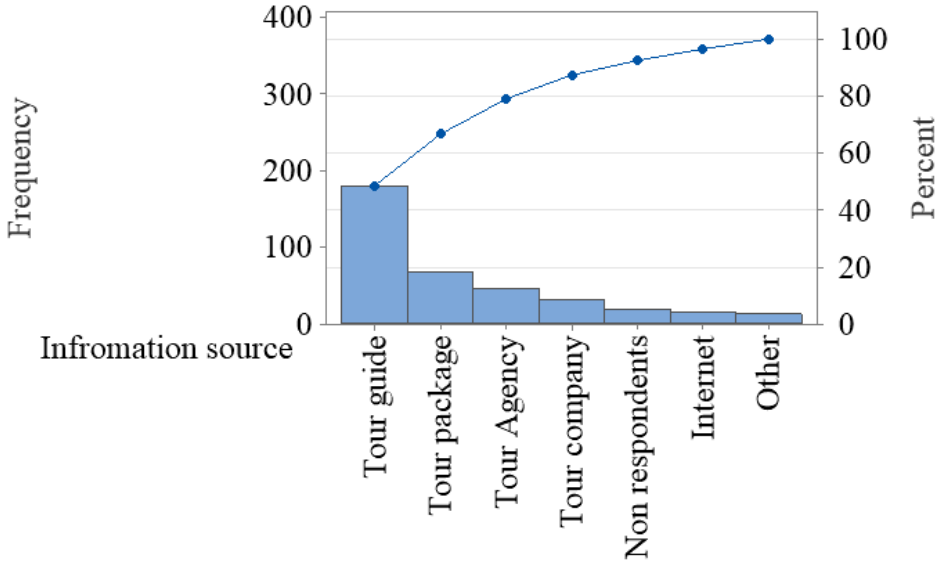


Figure 23. Perito analysis on the source that tourists were aware about the Hiriwadunna ecotourism site and compelled to visit

About 50% of the tourists have got to know about Hiriwadunna village tour from their tour guides. This indicate that it is the tour guide has played the key role in popularizing ecotourism in the Hiriwadunna. Thus, the role of the tourist is very much significant, if ecotourism should be promoted sustainably in VTCSs through which ample opportunities can be created to improve the livelihoods of the cascade community. Further this can definitely facilitate the ecological restoration of VTCSs. Tour companies, agencies and their tour packages altogether have introduced ecotourism in Hiriwadunns to another 38% of tourists in the sample. Only 4% of tourists have got to know about ecotourism opportunities in Hiriwadunna through the internet. This indicate that there may be a gap in promoting Hiriwadunna village tour through internet which is the most popular and effective source of information all over the world. Especially, the majority of your tourists exclusively seek information through the internet and social media who can be attracted to Hiriwadunna if actions can be taken to promote ecotourism opportunities in Hiriwadunna more through the internet. In this context, reasons behind less promotion through internet must be closely investigated. Because, during the knowledge testing exercise, we observed that the most popular knowledge source of tourist is internet and social medis.

The overall satisfaction of tourists about ecotourism in Hiriwadunna was finally inquired during the data collection process by using a five-point Likert scale which the summary is depicted in Figure 24. A 58% of tourists rated their satisfaction as highly satisfied. Of the sample, 33% of tourists said that they are satisfied about Hiriwadunna village tour. About 2% of the sample had a neutral perception while 1% of the them said that they are not satisfied about the tour. Some of unsatisfied tourists mentioned that use of animal for tourism is bad and respective service providers violate animals' rights which in intolerable. Plastic pollution and les environment concerns in Hiriwadunn is one of the other reasons. Further, some of them mentioned that they suffered during the tour due to unprofessional local tour guides which has

made the tour very unsatisfied. Most of them pointed out that good practices in ecotourism need to be incorporated with the ecotourism in Hiriwadunna if it should be further developed.

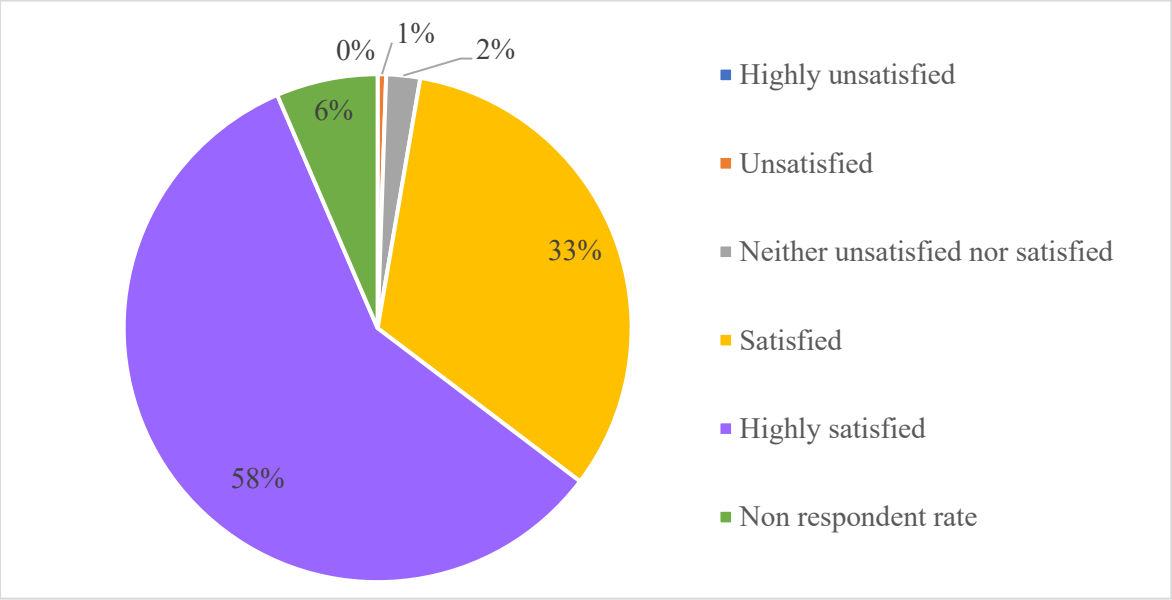


Figure 24. The summary of the perceived overall satisfaction of tourists about ecotourism in Hiriwadunna.

In current context, core stakeholders depend on the benefit function that maximizes the quantity, i.e. Number of visitors per day. However, beneficiaries expect greater service quality. Thus, it is very important to maximize the service quality than the service quantity. So, initiatives must be taken to assure the service quality and enhance margins of benefits.

Tourists' suggestions for further development of ecotourism in Hiriwadunna.

The feedback from visitors regarding the ecotourism experience in HVT Village reveals a diverse array of suggestions and observations, offering valuable insights into potential areas for improvement. The most frequent suggestion centered around the need to distribute visitors over a broader area to alleviate crowding in popular spots. This would not only enhance the visitor experience but also minimize environmental impact. Additionally, the introduction of wildlife watching as a new attraction was a popular idea, with many expressing a desire to see and learn more about the local fauna.

Several respondents were unequivocally satisfied with the current state of the village, describing their experience as "all good" and appreciating the preservation of traditional elements. They emphasized that the charm of the village lies in its authenticity and that significant changes might detract from its appeal. However, this sentiment was not universally shared, as others identified specific areas for enhancement. For instance, the development of vehicle parking facilities was seen as essential to accommodate the growing number of tourists. Improved promotion and advertising of the village tour were also suggested to attract more visitors and enhance the village's profile.

When it came to the pricing structure, there were mixed opinions. Some respondents believed that the current value was appropriate given the available activities, while others felt that the fee should be adjusted to reflect a wider range of experiences. A suggestion was made to increase the fee to $50-60 per person, especially if additional activities were introduced, which could enhance the value proposition for visitors.

Infrastructure improvements emerged as a significant concern for many respondents. Poor road conditions and inadequate sanitary facilities were frequently mentioned. Visitors highlighted the need for better road development within the village to facilitate easier and safer travel. Improving toilet facilities was repeatedly emphasized, with calls for cleaner, more accessible restrooms equipped with necessary supplies like toilet paper. These enhancements were seen as critical not only for visitor comfort but also for maintaining hygiene standards.

Waste management practices were another focal point. Many visitors were disturbed by the presence of plastic and polythene waste and suggested initiatives to reduce their use. Proposals included providing refillable water bottles instead of plastic ones and ensuring proper garbage collection and disposal. Establishing trash bins throughout the village was also recommended to encourage responsible waste disposal and keep the environment clean.

The introduction of new activities was widely supported as a means to enrich the visitor experience. Adventure activities such as kayaking, hiking, and forest tours were suggested to appeal to a broader audience. Interactive experiences, such as traditional cooking practices, learning about local customs, and participating in agricultural activities like paddy field work, were also recommended. These activities would provide visitors with a deeper understanding of the local culture and lifestyle, making their experience more immersive and educational.

Animal welfare was a significant concern for several respondents. The use of bullock carts for transportation was particularly controversial, with many expressing discomfort at the potential harm to animals. Suggestions included finding alternative transportation methods that do not involve animals, such as electric carts or bicycles. Ensuring the safety of tourists was another priority, with recommendations to provide safety jackets for boat rides and improve the training of boat operators to prevent accidents.

Preserving the natural and traditional aspects of the village was a recurring theme. Many visitors emphasized the importance of maintaining the village's authenticity and avoiding over-commercialization. They expressed a desire for a balanced approach that retains the traditional charm while incorporating modern conveniences. Increasing the number of traditional houses and ensuring that villagers benefit financially from tourism were seen as ways to enhance the experience without compromising the village's character.

Educational initiatives were also suggested to enrich the visitor experience. Some respondents wanted more information about the village's history, the local irrigation system, and traditional agricultural practices. Providing educational materials or guided tours that explain these aspects could deepen visitors' appreciation and understanding of the village.

Finally, some visitors highlighted the need for better organization and management of the village tour. They noted that larger groups sometimes faced delays due to insufficient

transportation options and suggested improving the coordination of activities to ensure a smooth and enjoyable experience for all.

While many visitors were satisfied with their experience in HVT Village, the feedback provided a wealth of ideas for potential improvements. These included better infrastructure, enhanced waste management, new and diverse activities, attention to animal welfare, preservation of traditional elements, and educational initiatives. By addressing these areas, the village could enhance the ecotourism experience, attract more visitors, and ensure sustainable development that benefits both the local community and the environment.

CONCLUSIONS AND RECOMMENDATIONS

Ecotourism in Hiriwadunna is a community originated endeavor which has a variety of tourists attractions which in the close proximity of several major tourist destinations viz. Dammublla, Sigiriya and Habarana. More than 95% of visitors on ecotourism in Hiriwadunna are foreign tourists and interest of the local tourists was found minimum. The majority of the visitors are from the Europe while significant number of tourists are coming from USA, Australia and China. However Chinese tourists were not accessible for data collection due to languages barrios and limited translation opportunities which should be counted in future research. A lesser number of visitors were from south American region, African region, Arabian region and Asian region for which reasons should be found out.

There were more female visitors than male among visitors arrived at Hiriwadunna ecotourism site. Most of the tourists were in their middle age or above. Comparatively, there were more young visitors among female tourists compared to that of male visitors. More attention is required to attract more young tourists for which appropriate strategies should be found out through future studies. Most of the visitors to Hiriwadunna were employed in the private sector which may be due to more employment opportunities are available in the global private sector than the other sectors. There were significant number of visitors who were on their retirement. Nearly a half of the tourists arrived to Hiriwadunna ecotourism site were either graduates or postgraduates. A significant number of them have got qualified for university entrance. It can be concluded that more educated tourists are fond of ecotourism in Hiriwadunna. About 80% tourist revealed their monthly income is at most USD 25,000. The average monthly family income of visitors was about USD 14,563 with a 95% confidence interval of (USD 12,862, USD 16,264) which exceeds average global household income of USD 12,235 per year. It can be noticed that the spending capacity of tourist to Hiriwadunna is comparatively higher. With this background, it can be noticed that opportunities are available to offer more attractive and high value tour packages than what is being offered currently. We recommend policy makers in the tourism sector to take these findings into granted when their policy of promotion of ecotourism is decide.

Of the tourist, the majority were aware about common terms related ecology viz. biodiversity, environment conservation, climate change, sustainability, ecological restoration and ecosystem services. However, they were not much aware about ecological economics, VTCS and cascade ecology. The most popular sources of information of them were internet and social media but amount of information available in such media about current contexts viz. cascade ecology, ecological economics and present statis of VTCS was found to be inadequate. That was the

major reason behind tourists' less awareness about current topics related to VTCSs and its restoration. Therefore, prompt actions are needed to disseminate the latest information about VTCS, its' ecology and economics through the most popular information sources among tourists. This would definitely increase arrivals into ecotourism site in Hiriwadunna.

Majority of tourists suggest that actions should be taken to restore VTCSs ecologically while some of them suggest not to restore it and keep VTCSs as it is today. Majority of tourist are in the perception that current productivity challenges and adverse impact of climate change can be won if VTCS could be restored and actions are needed. However, some of them said that VTCS would not be restored back to its original state in the ancient time and it would be not an easy task to maintain the original ratios among the original components of a VTCS. However, they are in the perception that it is necessary to maintain its all components to assure its original functionality. Further, they say that illegal encroachments to components of VTCSs should be reversed if a genuine effort is taken to restore VTCSs. However, most of the tourists believe that the government should not directly intervene much of the restoration process and the CTVSs community should take the responsibility and leadership of restoration and maintenance of VTCSs. They further in a perception that a tax collected from the community and the visitors to VTCSs would be a best option to manage the cost of restoration and maintenance. They are in a strong perception that ecotourism in VTCSs would be a great opportunity to provide sustainable livelihoods to VTCS community and investment prospects for the restoration process. The perceptions of tourists about strategies of restoration of VTCSs bring an eye-opening massage to policy makers and relevant authorities to understand how important to take actions for restoration of VTCSs

The most common tour package offered at Hiriwadunna in the three-hour package which includes bullock cart ride from entrance of the village to the tank bund going through VTCS landscape, boat ride in the tank, cultural activities, culinary practices and traditional meals in a village house and return to the village entrance by a Tuk-tuk for which they charge USD 35.00. However, some innovative village house owners offer more attractive tour packages which is rated at a higher price maximum USD 80.00 and has a demand. However, tourists' satisfaction about their services remains at a higher level. However, they point out that tour packages must be organized more and actions are needed to reduce tourist congestion in the site. Further they are not happy with the current level of environmental concern and litter management and suggest all service providers to adhere to environment friendly good practices of ecotourism. Further they report that there were significant incidences for unprofessional behaviors of tour guides, especially local tour guides and requested authorities to introduce good practices of tourism and make them aware. We also had similar experience during the data collection process and witness tourists' highlights. We recommend authorities to take immediate actions to establish good practices of ecotourism and aware all core and direct stakeholders of ecotourism in Hiriwadunna.

Key core stakeholders of Hiriwadunna ecotourism are tourists, village house owners and workers, bullock cart riders, two-wheel tractor drivers, tuk-tuk drivers, boat riders and intermediate tour organizers. Major direct stakeholders were safely counters, tour guides, tour companies, hotels, safari jeeps, village farmer organization and village house owners' society. Most of the core stakeholder in all categories were heavily dependent on safari counters and tour guides and were less empowered. The whole process was found to be governed by safari

counters and tour guides and business were only channeled through them. However, some of the core stakeholders centered at few village house owners were independent from this situation and were well empowered in running the business. They had direct contact with tour companies, hotels and tour guides and received tourists from multiple channels. They were totally independent from safari counters and maintained a year-round sustainable ecotourism.

There is a significant asymmetry in benefit sharing among the stakeholders. For a single tourist benefit sharing ration between core stakeholders and direct stakeholders is 1:2 which is for a cupel and group of five tourists is respectively 1:4 and 1:7. Higher the group size higher the asymmetry in benefit sharing. Benefit share of core stakeholders distributes among everyone in fixed formular and with more transparency. However, 90% of the benefit share of direct stakeholders goes to the safari counter and to tour guides. No literally benefits transferred to the village farmer organization whose main tole is water management in the tank and maintenance of tank and its immediate components. This has created a conflict between farming community and core stakeholders of ecotourism in Hiriwadunna. Immediate actions are need to bring solution for these issues if the sustainability of ecotourism and crop production need to be asured.

This study concludes that ecotourism is a key opportunity to provide livelihoods of VTCS community and to support VTCS restoration. The average willingness to pay (WTP) of the tourist is USD 57.58. Further, tourists with higher education background and on their retirement has a mean WTP of USD 75.34 with a confidence interval of USD (61,84, 85.25). There some educated and rich tourists who were willing to even pay more than USD 100.00 for an attractive tour package. The current price of the common package of ecotourism is USD 35.00. Very few innovative villages house owners offer a more attractive tour package at a rate of USD 80.00. This concludes that there is an ample opportunity for introducing more attractive tour packages at a higher price than existing prices.

Ecotourism itself is a cultural service that can be realized from VTCSs. Tour packages for ecotourism in Hiriwadunna are consisted of several cultural services arising from VTCS which falls under recreation, aesthetic and amenity, rituals and education. The total economic value of cultural services realizing from the ecotourism site in Hiriwadunna is USD million 2.3 annually which 747.5 million in LKR. This was estimated based on the mean WTP and total annual visitor arrivals to Hiriwadunna.

ANNEXTURE

SURVEY QUESTIONNAIRE

Survey code:

Name of the enumerator:

The Survey is basically to study consumers' WTP and acceptance for ecotourism in VTCS in Sri Lanka

Greetings, this is _____, I am a student/ Academic of Wayamba University of Sri Lanka and I would like to ask you for assistance in participating in our survey. We conduct this research as a part of a national level project implemented by the Ministry of Environment, Sri Lanka

This survey is conducted to study consumer willingness for ecotourism in VTCS in line with estimating the cultural services arising from VTCS. Further we intend to investigate the opportunities for restoring this System which has a wide range of advantages on the sustainability of dry zone agriculture.

Your responses on the survey will be record anonymously. No identifying personal information will be collected. Only basic demographic information will be collected and the data will be sealed and maintained in confidentiality. Your participation is highly appreciated.

Consent for participating this survey

I agree to take part in the survey	Yes	No

……
(Signature)

A. Demographic information

1.1

Name						Country					
Aria/ County/ State/Province						DS & Village					
Age		Gender				Civil status				Household size:	
Family members	Children		Teenagers		Adults		Elders			Employment	
Specify the nature of the employment											
Email address if willing to provide											

Employment: 1. – Employed in private sector, 2. – Employed in Govt. sector, 3. – Self-employment, 4. – Farming 5- Other; **Gender:** 1 – Male, 2 – Female; **Civil status:** 1 – Married, 2 – Unmarried, 3 - Other

1.2 Monthly house hold income (select one income class)

For local visitors (in LKR)												
<25,000		25,000-50,000		50,000 – 100,000		100,000 – 200,000		200,000 – 500,000		>500,000		
For foreign visitors (in USD)												
<$5,000		$5,000-10,000		$10,000-15,000		$15,000-25,000		$25,000-40,000		>$40,000		

If not ask the amount roughly (specify currency and duration) **……**

1.3 Education (Ask as an open question from foreign tourists)

Up to 7/ Up to elementary school		Up to O/L/ Up to middle school		Up to A/L/ Up to high school		Pass A/L/ Pass uni. entrance		Undergraduate/ Degree	
Post graduate degree		Other (Specific):							

B. Knowledge testing segment: Ask following questions about VTCS

Statement	True	False	Not sure
1. VTCS is a man-made irrigation system for agricultural water to be used during the dry season and exists over centuries			
2. It resembles to a natural ecosystem than an artificial ecosystem			
3. VTCS mitigates adverse impact of climate change and build resilience to climate change			
4. VTCS is a climate smart irrigation system			
5. VTCS regulate ground water and recharge the water table			
6. VTCS is not unique to Sri Lanka			
7. At present VTCS and its functionality has substantially degraded			
8. VTCS provide habitats and support pollination			
9. There is a high potential for ecotourism in VTCS landscapes			
10. Rituals, scenic beauty of landscape and recreation are some of cultural services provided by VTCS			

Inquire about following key word-based knowledge testing: (Have you ever heard of the following)

Term/ Key word	Have you ever heard of this item? (Yes/ No)	Where did you hear this term from? (use the key 1)	How often do you hear this term? (use the key 2)	What is your overall knowledge about this term? (use the key 3)
1. Cascade ecology				
2. Biodiversity				
3. Ecological restoration				
4. Environment conservation				
5. Climate change, resilience and mitigation				
6. Ecosystem services				
7. Sustainability				
8. Value of existence/ Nonuse value				
9. Natural capital				
10. Village tank cascade system				

Key 1: 1 – TV/ radio, 2 – Newspaper/ magazine/ book, 3 – Internet/ social media, 4 – Friends/ relatives/ subject expert, 5 – Through education undergone, 6 – Other (specify)
Key 2: 1 – Very often, 2 – Occasionally, 3 – only once or twice
Key 3: 1 – Very low/ don't' know, 2 – Low, 3 – Neither low nor high, 4 – Fair, 5 - High

C. Perception segment: Inquire about following statement regarding the restoration and conservation of VTCS. Answers are expected in the scale given below the table

Statement	Response
1. TVCS is currently not fully functioning providing all its' ecosystem services	
2. VTCS cannot be restored to its original state seen in the ancient time	
3. Present challenges in agricultural production amidst adverse impacts of climate change can be won by restoring the VTCSs	
4. It is necessary to maintain all components associates with a tank in a VTCS during restoration	
5. It is an easy task to maintain ratio between tank components during present efforts of restoration of VTCS	
6. Illegal encroachments into different components of VTCSs cannot be reversed	
7. A fee/ tax dedicated for restoration should be claimed from the community/ visitors	
8. Government should not intervene the VTCS restoration process	
9. VTCS community should take the responsibility and leadership of restoration and maintenance	
10. Ecotourism in VTCSs should be promoted as a strategy of VTCS restoration	

Key: 1 – Highly disagree, 2 – Disagree, 3 – Neither disagree nor agree, 4 – Agree, 5 – Highly agree

D. **Contingent valuation questions** (Provide the goods' description before you ask these questions)

1. Do you Do you willing to pay (WTP) for a village tour in a VTCS as specified above?	Yes	No
If yes, please answer question number 2; If No THANKYOU		
2. Do you WTP $80/ LKR 8000 for the village tour in a VTCS as specified above?	Yes	No
If Yes, please answer question number 3; If No, Please answer to question number 4		
3. Do you WTP $100/ LKR 10000 for the village tour in a VTCS as specified above?	Yes	No
If Yes/ No, THANK YOU		
4. Do you WTP $60/ LKR 6000 for the village tour in a VTCS as specified above?	Yes	No
If Yes/ No, THANK YOU		

E. Few general questions about visit to Sri Lanka and village tour at Hiriwadunna

Is this your first visit to Sri Lanka?		No	Yes	If NO how many times?		
Is this your first visit on village tour in Hiriwadunna?		No	Yes	If NO how many times?		
Would you like to come back Sri Lanka?	No	Yes	Like to come back Hiriwadunna ?		No	Yes

Few questions about offering cultural services arising from village tour at Hiriwadunna

Component/ Service received	Offering	Interest	Satisfaction
1. Welcome/ Hospitality at the entrance of village and village houses			
2. Travelling by bullock cart/ two-wheel tractor through village			
3. Travel with tuk-tuk (return/ enter in/ through the village)			
4. Boat ride in the tank (with/ without lotus flower neckless and lead hat)			
5. Recreational fishing in the boat			
6. Traditional lunch with culinary practices			
7. Traditional tea (morning/ evening) with rotee or any other short eat			
8. Travelling through the forest trail/ Adventure			
9. Stay night in a village house/ tree house			
10. Enjoy the scenic beauty of the cascade tank landscape			
11. Photography/ filming/ video/ Tik Tok production			
12. Watching birds/ wild animals/ butterflies/ insects/ other creatures in VTCS			
13. Exposure to village traditions and rituals associated with VTCS culture			
14. Education and knowledge about VTCS/ natural systems/ culture/ heritage			
15. Any other……			

Offering – Yes, No; **Interest** – rant most five opportunities/ service from this list; **Satisfaction** – ask the satisfaction about the services received using the scale: 1 – Highly unsatisfied, 2 – Unsatisfied, 3 – Neither unsatisfied nor satisfied, 4 – Satisfied, 5 – Highly satisfied

Ask following questions if you the informant is willing to spend more time with you

How did you know about village tour?
What is the overall satisfaction about the tour? (use this key: 1 – Highly unsatisfied, 2 – Unsatisfied, 3 – Neither unsatisfied nor satisfied, 4 – Satisfied, 5 – Highly satisfied) Any comments?
Any suggestions to improve village tour/ Ecotourism in VTCSs?
What is your opinion about restoration of VTCS? / Any sugestions?
For your notes: