Contingent valuation of Rai-tollem Lake in Salcete Goa

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DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled, "Contingent valuation of Rai-tollem Lake in Salcete Goa" is based on the results of investigations carried out by me in the Economics Discipline at the Goa Business School, Goa University under the Supervision of Ms Heena Subarai Gaude and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities will be not responsible for the correctness of observations / experimental or other findings given the dissertation.

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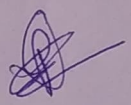

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COMPLETION CERTIFICATE

This is to certify that the dissertation report "Contingent valuation of Rai-tollem Lake in Salcete Goa" is a bonafide work carried out by Ms Rakshada Ramdas Gaunker under my supervision in partial fulfilment of the requirements for the award of the degree of Masters of Arts in the Discipline of Economics at the Goa Business School, Goa University.

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PREFACE

Knowing the importance that communities place on natural ecosystems becomes critical as we work through the challenges of resource management and environmental protection. The Rai-tollem Lake in Salcete, Goa is evidence of the complex interrelationship that exist between individuals and their surroundings. Using the perspective of contingent valuation, this study will uncover the value of Rai-tollem Lake. This study explores the relevance of Rai-tollem Lake as a natural resource and public area. And through the application of contingent valuation method study aims to quantify the monetary value that local residents attribute to the preservation and conservation of this cherished wetland.

By employing various methods and statistical analysis this study seeks to provide insights into the perceptions and willingness to pay of the stakeholders regarding the protection and management of the Rai-tollem Lake.

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I extend my heartfelt appreciation to my family for their unwavering love, understanding, and encouragement, which have sustained me during the challenges of completing this dissertation. Additionally, I am grateful to all my friends for their encouragement and moral support.

I would also like to extend my sincere gratitude to the faculty of Economics Discipline, Goa Business School, Goa University, for their constructive feedback, advice and critiques that have contributed significantly to my growth and has enriched my research.

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ABSTRACT

The importance of wetland protection is examined in this study, which focuses specifically on Raitollem Lake in Salcete, Goa, India. Wetlands are essential to the preservation of cultural traditions, local livelihoods, and biodiversity. However, a rise in human activities frequently pose a threat to lake maintenance. This study used a contingent valuation method to assess the local population's willingness to pay and viewpoints on the preservation of Raitollem Lake and the advantages received by villagers. This study also analyses different socioeconomic factors that influence willingness to pay. The study revealed a negative correlation between occupation and willingness to pay, while indicating positive correlation between willingness to pay and farming type, production, and the perceived importance of preserving the lake. The average willingness to pay for conservation of the lake found here was INR 190.84.

CHAPTER 1

INTRODUCTION

1.1 Background

Wetlands are extremely important globally due to their great advantages to the ecosystem and other factors. According to the United States Environmental Protection Agency Wetlands are areas of land that are completely submerged in water throughout the year or seasonally for a shorter period. Wetlands support a variety of productive ecosystems that maintain a wide range of plants and animal species, preserving biodiversity and the stability of the ecosystem. This ecosystem is so important that it must be preserved and used responsibly. The Ramsar Convention, enacted in 1971, is a key global commitment to the conservation of sustainable use of wetlands. Under the Convention of Ramsar (Article 1.1), a wetland is defined as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six meters".

Wetlands are essential to the lives of millions of people because they offer a wide range of products and services (Barbier et al., 1997) wetland resources are directly used by people for farming, fishing, timber, fuelwood, and crafts. Wetlands can also provide recreational possibilities and are used as study sites for scientific disciplines like archeology, etc. Wetlands serve important purposes and offer critical services beyond direct usage. For example, by temporarily retaining water, they serve as natural flood barriers that help towns downstream. Mangrove wetlands safeguard the shoreline by lowering wave energy, while wetlands that recycle nitrogen improve water quality.

According to the Ministry of Environment, Forest and Climate Change’s Wetland of India Portal, India has 80 wetlands designated as Ramsar sites, which covers an area of 13,41,884 hectares. Wetlands in Goa consist of mangroves forests, estuaries, marshes, lakes, etc. Beyond

their ecological values wetlands hold immense cultural significance for the people as they are extremely important for traditional fishing techniques and also for agriculture. According to the Wetland Authority of Goa, in Goa out of 15 notified wetlands only 1 is designated as Ramsar site. An aquatic ecosystem is the most diverse ecosystem which includes static water bodies of wetland such as lakes and ponds along with other types and serves as vital habitats for a wide range of plants and animal species, providing shelter and food. Static water bodies are characterized as still or slow-moving waters. Lakes are aquatic ecosystems with significant scientific, cultural, and economic value. They can be called “bowls of water” which are surrounded by land. Additionally, lakes are excellent natural rainwater harvesters, which adds to the eye-pleasing beauty of Goa as well as recharged into groundwater. The water from lakes is used for irrigation purposes in paddy cultivation which has been an eminent source of livelihood and lifestyle for Goans for centuries. Goa’s rich aquatic and freshwater ecosystems provide free, extremely diversified fishery resources as lakes are the ecological assets that contribute to the region's biodiversity, provide livelihoods, and preserve cultural traditions. As preservers of these precious ecosystems, we must prioritize conservation and sustainable management. With these practices we not only safeguard biodiversity and ecological services, but also maintain the rich cultural history that is intrinsically connected to these landscapes.

Wetland management relies heavily on economic valuation since it measures the worth of its products and services even in the absence of easily accessible market pricing. This procedure assists in educating stakeholders on the value of wetlands and helps in making informed decisions regarding wetland’s conservation and sustainable use. Non-marketed goods of natural resources are the ones not having market value and are not traded in the market and as they are not bought or sold in conventional economic transactions their value is not reflected in market prices. Such as the water bodies which are essential for human health and

ecosystem, which might be protected by rules and various policies to protect their quality. These non-marketed goods are often known as public goods or non-excludable and non-rivalrous goods where no individual is restricted from using it as well as one person's use does not decline its availability for others. These non-marketed goods of nature are as important as other marketed goods of nature and it is important to understand these goods' monetary value in order to conserve them for future use, as we always focus on goods with price tags and these non-marketed goods remain undervalued. There are various approaches available for estimating the monetary value of goods or services of nature such as contingent valuation method, travel cost method, hedonic pricing. (Carson, 2012) Contingent valuation method is the most discussed one where the respondents in a survey are asked their willingness to pay for the non-marketed goods. Studies on contingent valuation address questions that shed light on the financial trade-offs people would be willing to make about the worth of goods or services.

The current study will estimate the average willingness to pay (WTP) for the wetland conservation and will also study the various benefits received by nearby communities along with understanding villagers' perspective of conserving wetland.

1.2 Objectives

- To examine the perspective of local communities for conserving the lake and the benefits derived by people living in nearby villages.
- To assess the willingness to pay for the conservation of wetland ecosystems.

1.3 Research Questions

- How does the presence of the lake contribute to the economic well- being of nearby communities through the provision of ecosystem services?
- What is the local community's participation in the management and conservation of the lake?

1.4 Scope of the study

This study aims to look at the possible advantages of protecting the wetland by looking at the ecological services the lake provides, particularly its impact on the local populations' economic well-being. The study will focus on how Raitollem Lake's existence boosts the livelihood of local communities by offering vital ecosystem services including irrigation facility, flood control, and water purification. It will also examine how much the local community is involved in the management and preservation of the lake by assessing their willingness to pay.

1.5. About Curtorim village

Curtorim is a picturesque, tranquil, and serene village with hills and hillocks covered in green paddy fields and an array of coconut palm trees. The various water bodies, particularly the lakes and ponds, as well as khazans, give the village its distinct character, as does the river Zuari that flows along its border.

Curtorim has an area of 1735.5 hectares. It is known as the “granary of Salcete", and it is because of this feature that the village got its name, which was originally KUDD + TARI or KUDD + TODDI, simply because the village has many fields and the kudds or rooms to store the grain were built along the river bank (toddir) (The Goan., 2013). Curtorim village, which

covers more than 6.1 lakh square meters and includes multiple large water bodies, and has also been designated as Goa's second biodiversity heritage site. These enormous paddy fields and other vegetables cultivated in this town may be credited to the presence of six large lakes, which greatly aid in the irrigation and preserving soil fertility.

1.6. About Rai-tollem Lake

Rai-tollem is a lake located in Curtorim, surrounded by lush flora, making a stunning view. This is the largest lake among all 6 lakes in Curtorim. The lake attracts numerous fishing enthusiasts. Along with fishing the people in the surrounding area are dependent on lake water for paddy cultivation, as in Curtorim rice is a highly cultivated crop. In Curtorim rice is cultivated twice a year. The monsoon crop is called 'Kharif' also known as 'sorod'. During the monsoon season rainwater is stored in lake and the same is used during winter for 'Rabi' crop cultivation. 'Rabi' crop which is also known as 'vaigonn' cultivation begins in the month of October and is harvested in April month.

When water level in the lake decreases, the barren and fertile land in the lake is used for growing a variety of vegetables using traditional methods. Vegetables grown here are ladyfinger, brinjal, chilli, pumpkin, radish, red spinach, cluster beans, yardlong beans, etc which are later sold in the market. During the same period huge amounts of fish are also traditionally harvested. In the Rai-tollem two big pillars like rocks can be seen, one placed horizontal and the other vertical. The villagers believe that these two pillars never get submerged in water and the day it will be covered completely the village will be flooded. People with cultural beliefs visit the lake to pay tribute to these two pillars.

CHAPTER 2

LITERATURE REVIEW

Barbier, (2011) says that wetlands offer a wide array of benefits to humanity, ranging from hydrological regulation to habitual provision, they studied how important it is to value wetland functions in order to balance between development and conservation initiatives. Here two case studies were examined, one on the floodplain in northern Nigeria and the other on mangroves in southern Thailand. They examined the trade-offs between turning mangroves into shrimp farms and the many advantages mangroves offer, such as links between habitat and fisheries, storm protection, and locally sourced goods.

Mamboleo & Adem,(2022) a study conducted in the Kenyan counties of Migori, Siaya, Busia, Kisumu, and Homa Bay examines people's willingness to pay (WTP) for conserving the lake Victoria ecosystem. Data collected from the counties was analysed using the SPSS statistical software, and it was discovered that 40.9% of the population is willing to contribute around KES 500 per year towards the conservation. Those that directly benefit from the resources in the lake were likely to support these initiatives. The study offers important insights for biodiversity conservation efforts by estimating the yearly WTP at KES 616,279,069.

Bueno et al., (2016) measured willingness to pay using the contingent valuation method for the quality restoration of the urban lake in the Philippines. For analysing willingness to pay SPSS Statistics software was used along with Chi-square test, Cramer's and Somer's correlation coefficient and Kruskal Wallis test. The results found that people were willing to pay PHP 177.09 per household every month.

Baral et al., (2016) in this study an economic valuation of wetland ecosystem services was carried out in Jagadishpur Reservoir, Nepal. Here the three types of values were included, direct, indirect and non-use values. To estimate the economic value of the reservoir a total economic valuation approach has been used for estimating the data collected through survey among different stakeholders like wetland users, government officials, local government and tourism services. And after considering six top most use and non-use values of the reservoir which includes wetland goods, irrigation, carbon sequestration, biodiversity conservation, tourism and future use value, the total value of the reservoir was found to be NRs 94.5 million per year (Rs 4825 per year per ha).

Jala & Nandagiri, (2015) also employed contingent valuation and travel cost method for estimating economic value of the Pilikula Lake water. Here the data was collected through direct interviews with visitors at the study location. To draw the consumer's willingness to pay, preferences and factors that influence individual consumer's willingness to pay, the Zonal Travel Cost method was employed for Travel Cost Method and open ended questions for contingent valuation method. For analysing the collected data MS Excel and SPSS statistical software were used. The average willingness to pay of the respondents9 (tourist) was Rs 238/- per individual visit for the benefits provided by the lake. Also the mean willingness to pay for improving extra facilities at lake were Rs 36.75 (8%) and the mean willingness to pay for improving lake water quality as it was claimed dirty by some respondents was calculated at Rs. 40.13. When comparing travel cost method and contingent valuation method it was found that the difference between the two was very high as the travel cost method is based on observed behaviour of the respondent in the actual market, whereas contingent valuation method is based on stated preferences.

Oglethorpe & Miliadou, (2000) study which took place in Greece, where the wetland area was threatened by undervaluation and overexploitation due to commercial purposes. This

study used a contingent valuation method for determining the non-use values associated with Lake Kerkini. It examines how factors like distance from the lake and personal characteristics influence an individual's willingness to pay to protect the lake.

Halkos, (2013) uses a contingent valuation method to collect the data from 510 randomly selected sample size in Greece. Here the Pinios River was taken as a case study. The main objective was to understand the relationship between people's attitude and willingness to pay for river conservation, for which methods like principal component and cluster analyses along with logistic regression were used.

Thapa et al., (2020) this study carried out in Nepal for understanding the value of Begnas Watershed System by assessing the economic value of its selective ecosystem services. In this study they conducted household surveys as well as interviewed other stakeholders by using market and non-market based valuation methods such as contingent valuation method along with other methods, like market price method, travel cost method, revealed price method and benefit transfer method. Here each method is used for different ecosystem services. And with the help of obtained results the study found that the Begnas Watershed System is economically beneficial for local communities.

Clouston, (2003) the study conducted in Moreton Bay uses contingent valuation method with other methods. The purpose here for using this method was to determine if ecological values of wetland could be captured with this method. With the help of willingness to pay they were able to understand the respondent's attitude towards protection of wetlands. And it was found difficult to convince respondents about the importance of ecological values of wetland as information supplied was not adequate enough.

Irawan, (2019) used a contingent valuation method for their study, where the aim was to estimate willingness to pay of water consumers for Rawa Pening Lake in Ambarawa Basin in

Indonesia, for the improvement of the lake. Based on the results they found that the youngest educated respondents, households with higher income and with fewer members were willing to pay more.

Costa & Dionne, (2010) The study assessed the tourism capacity, management plan effectiveness, and visitors' willingness to pay (WTP) using a contingent valuation method for increased conservation efforts in the Buccoo Reef Marine Park in Tobago. A survey of 164 tourists revealed that 88% of local residents lacked trust in the park agency and felt the park was not well managed. The density of tourists exceeded socially acceptable crowding norms, and tourists were willing to pay an additional entry fee of US$11.72 per person, which could generate additional revenue for park management. The study concluded that BRMP management needs modification to boost stakeholder trust, reduce crowding intensity, and generate additional revenue.

Lamsal et al., (2016) another study carried out in Nepal, which used the case of Ghodaghodi Lake Complex, a designated Ramsar Site. Here, a contingent valuation method has been used to sum up the total willingness to pay (WTP) of visitors in the form of entry fee for the conservation of the lake. They conducted a survey over a period of one month and analysed the collected data using SPSS 16.0 software. Also to identify influence of other factors on visitation rate and maximum willingness to pay the Ordinary least squares (OLS) regression was used. With the use of these methods they found how age and distance affect negatively for willingness to pay.

Subanti et al., (2017) another study carried out in Indonesia’s Rawa Pening Lake along with Semarang Regency and Central Java Province which uses contingent valuation method. Here were surveyed regarding their willingness to pay for ecological function. And for estimating the received information logit and probit model were used.

Shah & Atisa, (2021) the study uses education and awareness to examine its influence on communities efforts to protect the lake. This study was carried out in Kenya at inland wetland lakes of Naivasha, Nakuru, and Bogoria which are designated as Ramsar sites. For collecting data they surveyed all communities living near the studied lakes. And for analysis Logistic regression model was used for estimating binary dependent variables along with chi-squared test.

Mamat et al., (2013) this study conducted in Malaysia's Pulau Redang Marine Park uses data on the willingness to pay for environmental protection. They have used the dichotomous choice – double bounded format of contingent valuation method where the respondents are given options (bids) to select the WTP amount. For analysing the data they used a logistic regression model and for estimating binary dependent variables that are "yes" and "no" the bivariate probit model was used. With the help of these models they found that age and willingness to pay are positively related, along with years of education, monthly income, and perception on recreation facilities.

Vijayan et al., (2015) this study carried out in Kerala, India whose objective was to determine Vellayani Lake's economic value by applying a double bounded dichotomous choice contingent valuation method. This study used an interview method to collect respondents willingness to pay. Based on the analysis results it can be identified that distance from the lake influences the willingness to pay, people living closest to the lake were more willing to pay than the ones living the farthest from the lake.

Hema & Kau, (2013) another study carried out in Kerala to estimate the total economic valuation of the mangrove ecosystem in two districts. The study used both primary as well as secondary data and for primary data 480 respondents were interviewed belonging to four different categories: residents, paddy farmers, fisherman, and general public. The study used

a contingent valuation method where respondents were asked their willingness to contribute towards conservation of the ecosystem in the form of cash and kind. And to understand the influence of other factors on willingness to pay the multiple regression model was employed in the analyses.

Lamsal et al., (2015) another study carried out in Nepal's Ghodagodi Lake Complex which estimated willingness to pay of local people for community based conservation activities and also the variable affecting it. It used a contingent valuation method and for data analyses robust regression model was used through STATA/MP 13.0 version from which they identified the factors affecting households WTP. Also estimated R^2 through the 'rregfit' STATA program for the robust regression measure of fit. With the analyses they found that age, wetland income, agricultural income and prior experiences of participating in activities of conservation positively affects the households willingness to pay.

2.1. Research gap

From the existing studies, it was found that there are similar studies carried out in other parts of India as well as in the other parts of the world but no study was carried out using a contingent valuation method for assessing the willingness to pay for Rai-tollem Lake in Goa.

CHAPTER 3

METHODOLOGY

3.1. Data collection

The current study is based on both primary as well as secondary sources of data. For collecting the primary data questionnaire was formed using Google forms and respondents were interviewed. The information was collected from Curtorim locals who reside near Rai-tollem Lake for agriculture and other activities to support their livelihood. The data was collected using a random sampling approach, and the sample size was 71. The secondary data was collected from village panchayat Curtorim and news articles from The Goan and Times of India.

3.2. Methods

The present study analysed the respondents' choices for Rai-tollem lake water with the help of a hypothetical situation to determine their willingness to pay. The knowledge, attitudes, and views of the respondents were also analysed. Descriptive analyses were done with the help of charts and graphs to analyse the primary data. For analysis of the correlation between variables Rstudio software was used, and correlation test was done using Pearson's correlation test.

3.3. Contingent valuation method

Contingent valuation is a survey-based economic approach used to value non-marketed goods or services, such as environmental preservation or the impact of externalities like pollution. While these resources provide individuals with benefits, certain components of them like the lack of market value since they are not directly sold. This method uses a structured survey in which the respondents are openly asked how much they are prepared to pay for a hypothetical change in an environmental product or services. Contingent valuation method is one of the most used valuation methodology specially for freshwater ecosystems because of its flexibility and capacity to evaluate non-market values. The contingent valuation approach is a useful instrument for determining the economic worth of environmental products and services that are not sold on the market. Insights from CVM studies are used to guide resource management and environmental policy decisions through careful data analysis and well-crafted surveys.

3.4. Willingness to pay

In economics and environmental economics, knowing the meaning of willingness to pay (WTP) is crucial since it offers important insights into welfare analysis, market dynamics, and consumer behaviour. The maximum price that customers are prepared to pay for a specific good or service is known as their willingness to pay and it reflects their preferences, financial constraints, and perceptions of the product's worth. This study explores the variables that affect willingness to pay for lake water in the context of environmental goods and how it affects resource management and conservation initiatives. It sheds light on how important people think it is to protect and preserve easily accessible and clean water sources. And also policymakers and resource managers can determine the level of society's willingness to

engage in lake water conservation and restoration initiatives by obtaining people's willingness to pay through surveys, questionnaires, or market research. There are various things that may influence an individual's willingness to pay, such as income levels, individual’s tastes and preferences.

CHAPTER 4

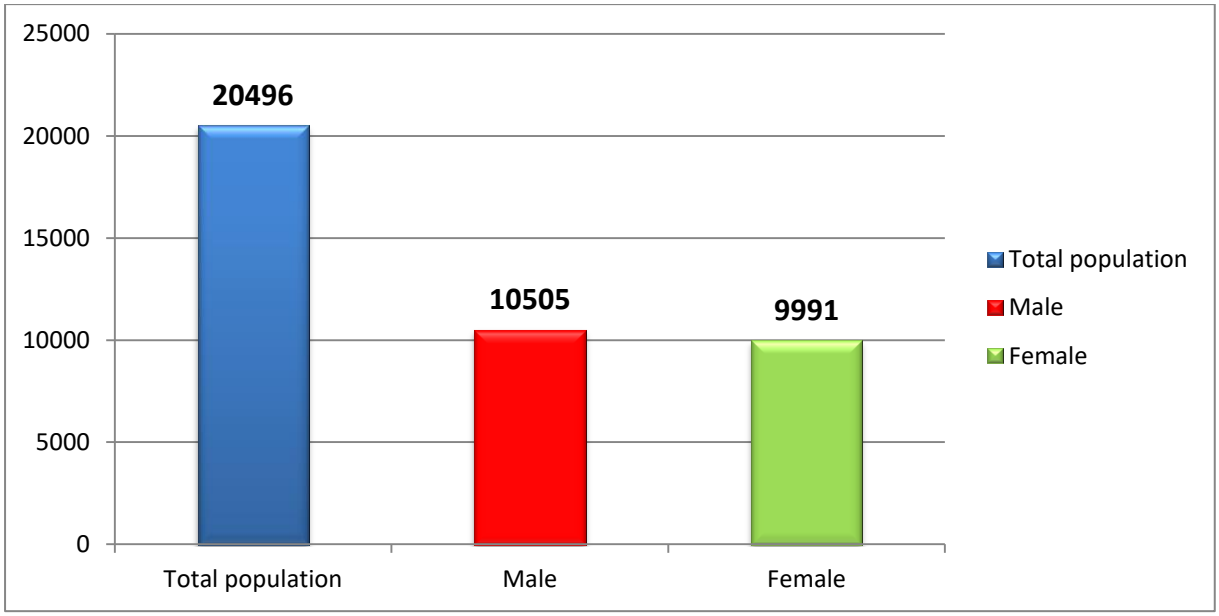
DATA ANALYSIS AND INTERPRETATION

4.1. Primary survey analyses

The below figures are the visual and descriptive presentation of primary data collected through survey which aims to understand and examine local communities perspectives regarding conservation of lake and to assess the willingness to pay for the same.

4.1.1. Total population of Curtorim village

Figure No.4.1.1. Total population of Curtorim village (2020)

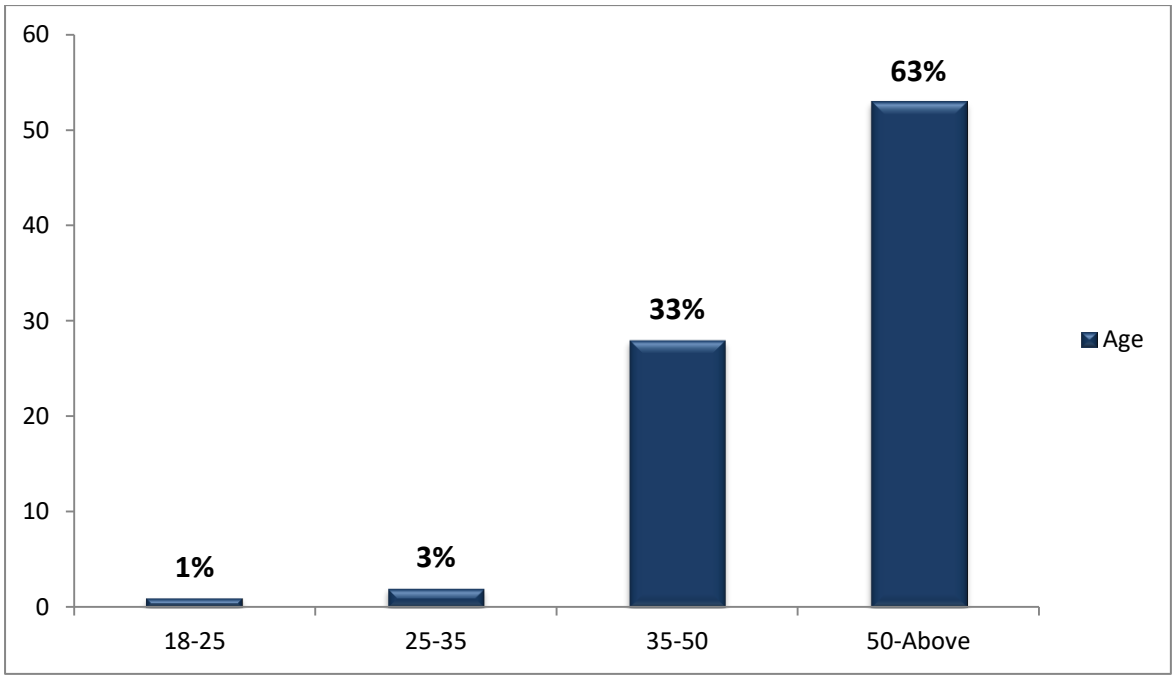


Source: Village panchayat Curtorim

The above figure no. 4.1.1 shows the population in Curtorim village for the year 2020. In the year 2020 total population was 20,496. The total male population is 10505 and the female population is 9991 in the village. This shows that the male population is more in the village as compared to females.

4.1.2. Age of the respondents

Figure No. 4.1.2. Respondent's age

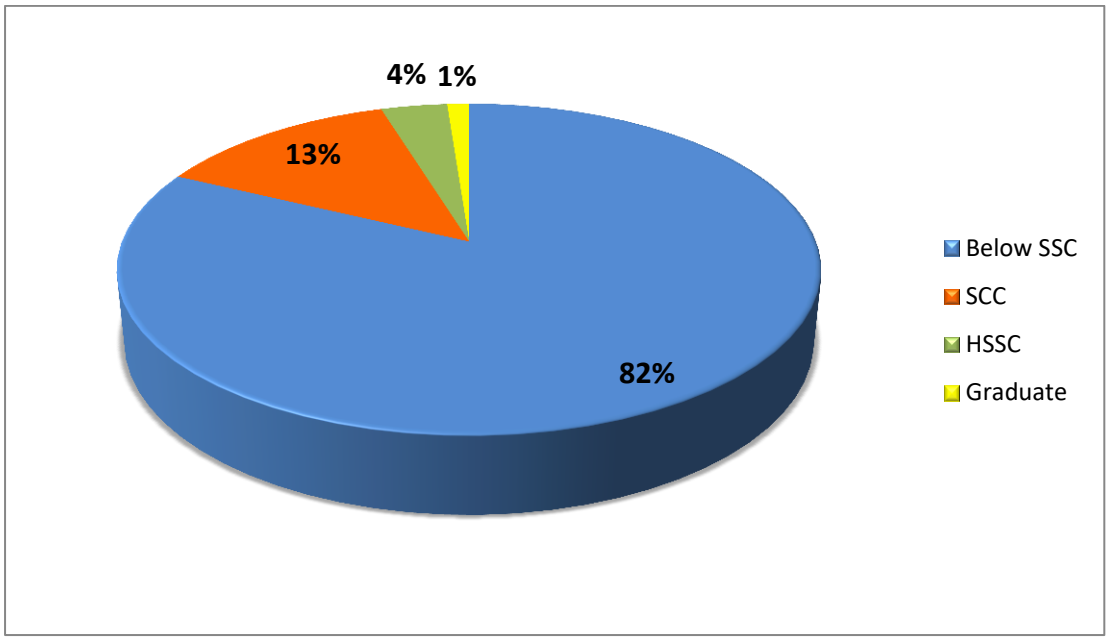


Source: Primary survey

Figure No. 4.1.2. shows the distribution of age of respondents in the sample size. The above figure represents the age categories of respondents. The result shows that the majority of the respondents were from the 50 and above category that is 63.1 percent, followed by the 35 to 50 age group with 33.3 percent. It can be seen that the 25 to 35 and 18 to 25 age groups have very few respondents.

4.1.3. Qualification level of the total respondents

Figure No. 4.1.3. Qualification level of the respondent's

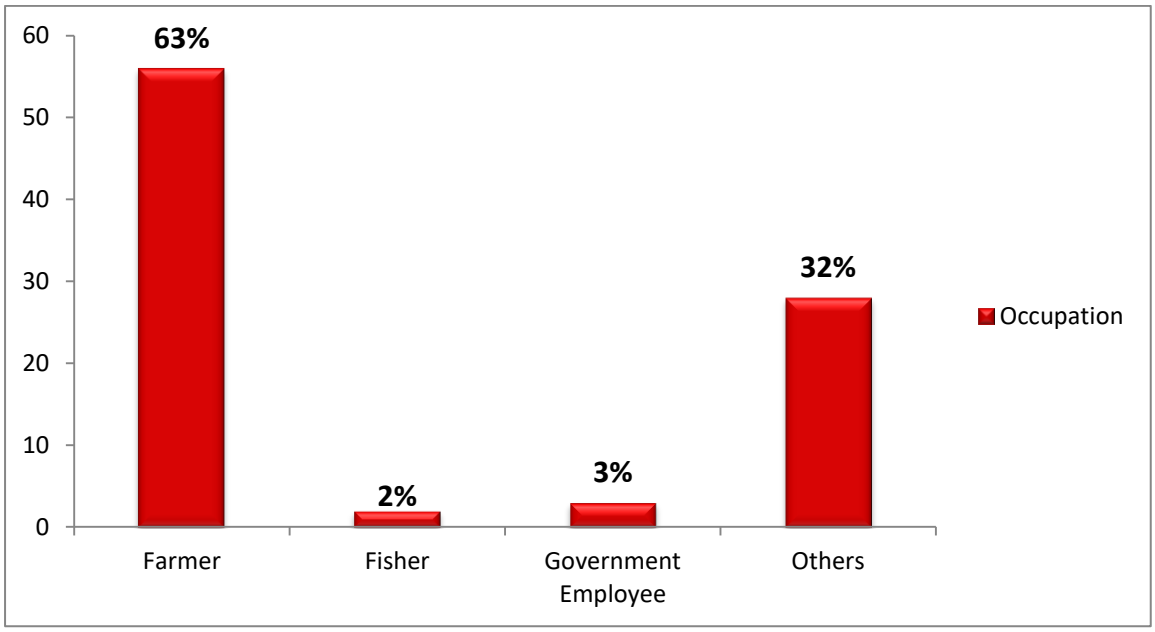


Source: Primary survey

Figure no. 4.1.3 results show the educational qualification of the respondents, the majority of the respondents have educational qualification below the Secondary School Certificate level, with 82 percent of respondents are from this category. Followed by SSC qualification with 13 percent. And HSSC and Graduate qualification with just 4 percent and 1 percent respectively.

4.1.4. Occupation of the respondents

Figure No. 4.1.4. Respondent's occupation

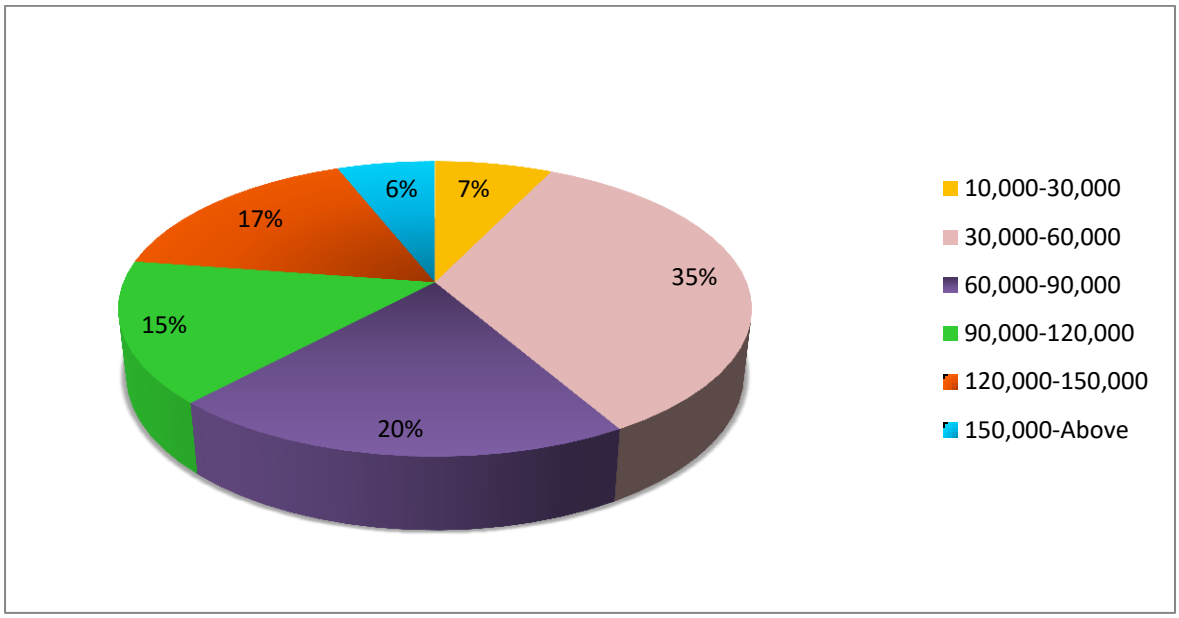


Source: Primary survey

Occupation of respondents is marked important as it influences their income level. The above figure no. 4.1.4 showcases respondents from different categories of occupation, the results indicate 63 percent respondents are farmers, followed by others that is 32 percent and government employee and fisher is 3 percent and 2 percent respectively.

4.1.5. Respondent's household income (annually)

Figure No.4.1.5. Respondent's household income (annually)

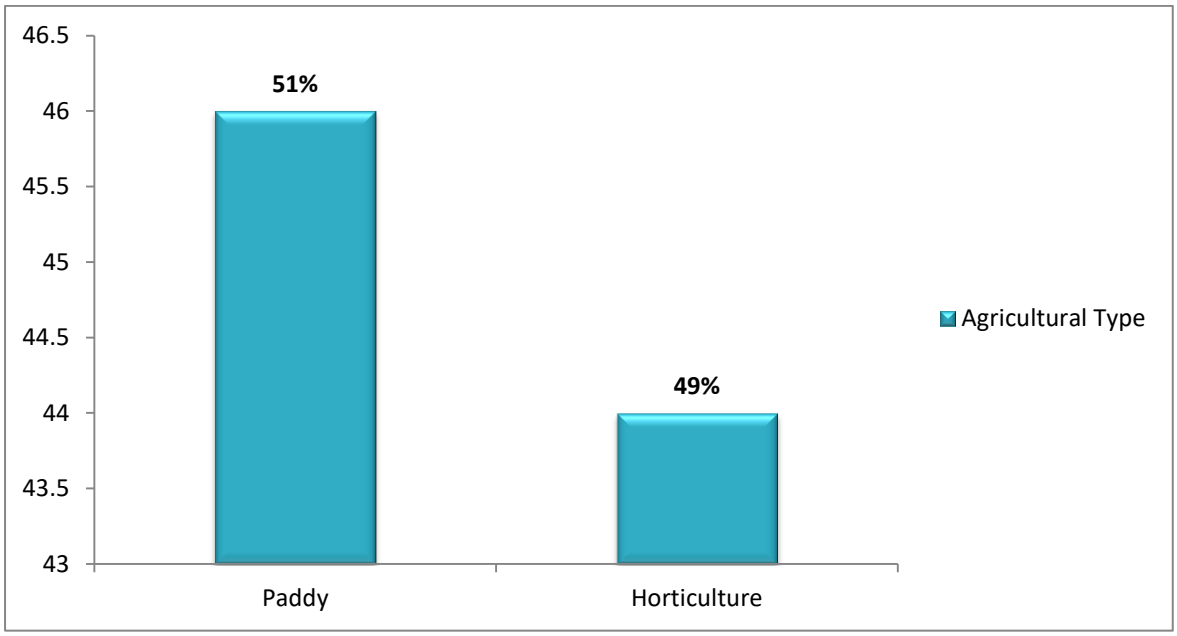


Source: Primary survey

Respondent's household income is very crucial as it helps to understand how conservation activities can affect different income groups. In the above figure no. 4.1.5 it can be seen that maximum numbers of respondents are from the income category of 30,000 to 60,000 with 35 per cent followed by 60,000 to 90,000 with 20 percent. Study also revealed that 17 percent of respondents were from the 120,000 to 150,000 income category and 15 percent were from 90,000 to 120,000. Very few respondents were from 150,000 and above, with 6 per cent and 7 per cent from 10,000 to 30,000.

4.1.6. Respondents engaged in different type of agriculture

Figure No. 4.1.6. Agricultural type

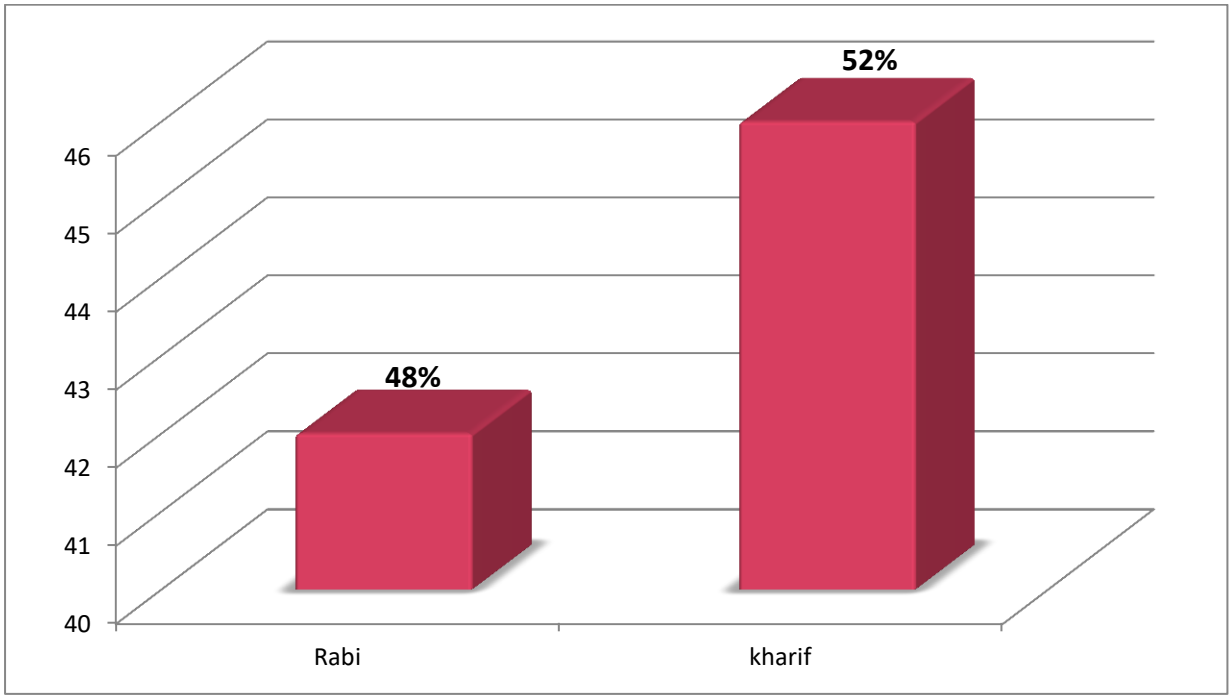


Source: Primary survey

In the above figure no. 4.1.6 it can be seen that farmers engaged in paddy cultivation are more than the horticulture vegetable farming with 71.9 percent respondents in paddy cultivation and 68.8 percent respondents in horticulture vegetables farming. This shows how many respondents are dependent on lake water for their farming activities.

4.1.7. Distribution of rice cultivation during Rabi and Kharif season

Figure No. 4.1.7. Rice cultivation during Rabi and Kharif season

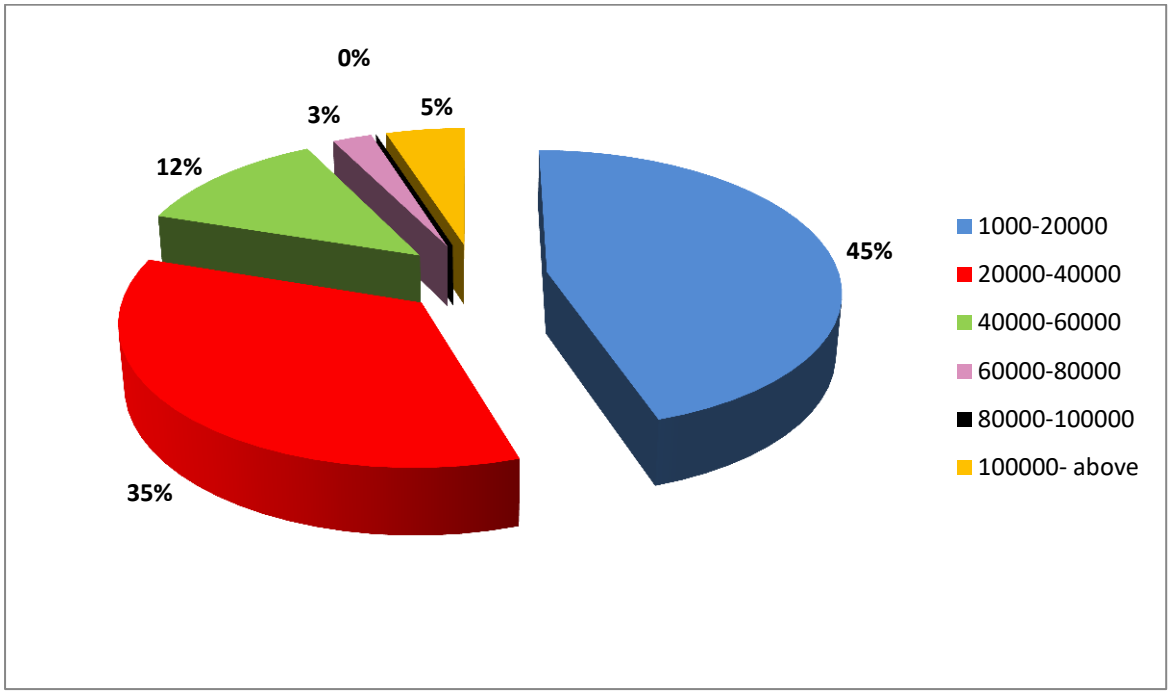


Source: Primary survey

As in Curtorim people cultivate paddy in “Rabi” as well as in “Kharif” season. The above figure no. 4.1.7 shows the distribution of total respondents who are engaged in crop cultivation in Rabi season and those who are engaged in Kharif crop cultivation. The maximum number of respondents are involved in Kharif crop cultivation with 52 per cent, whereas 48 per cent people are engaged in rabi crop cultivation.

4.1.8. Total revenue earned from the output

Figure No. 4.1.8. Total revenue earned from the output

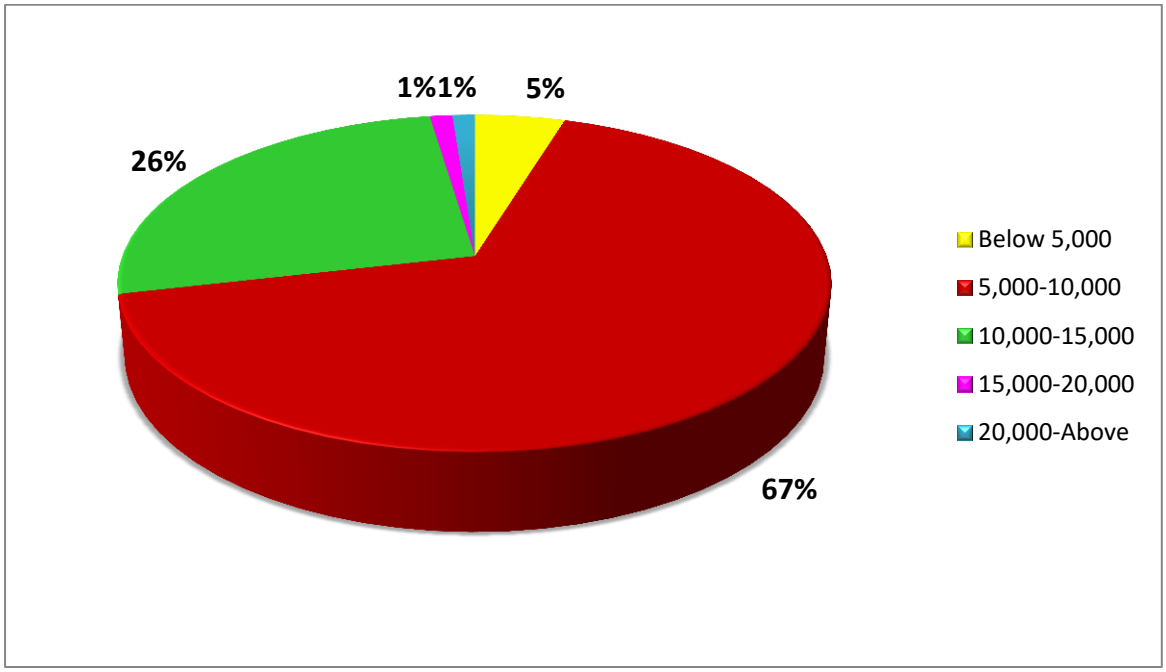


Source: Primary survey

Total production is important because it indicates economic activities related to the lake as well as how resources are being utilised. The above given figure no. 4.1.8 is showing the percentage of respondents falling in each category of total revenue earned from total production. The maximum number of respondents have only received between 1000 to 20000 which indicates 45 per cent, next is 20000 to 60000 which has 35 percent of people earning. Only 12 percent people got returns between 40000 to 60000. Whereas, 5 percent people earned between 100000 and above. And only 3 per cent people earned between 60000 to 80000. These result shows that maximum number of people incur less production which result in less revenue which indicate indicates there are more small land holdings.

4.1.9. Respondent's monthly household expenditure

Figure N0. 4.1.9. Respondent's monthly household expenditure

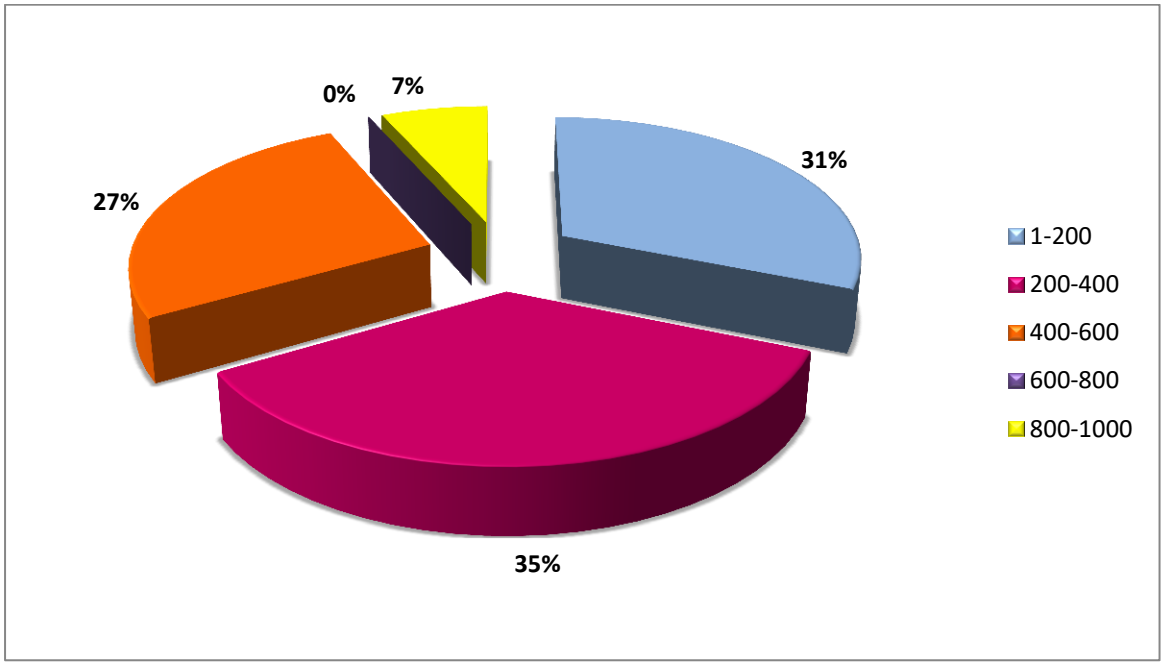


Source: Primary survey

The above figure no. 4.1.9 represents the distribution of respondent's monthly expenditure into five categories. Among these categories 5,000 to 10,000 has the maximum number of respondents with 67 percent. Next is 10,000 to 15,000 of monthly expenditure with 26 percent. 5 percent respondents fall into below 5,000 category, whereas 15,000 to 20,000 and 20,000 and above categories have 1 percent each.

4.1.10. Respondent's willingness to pay

Figure No. 4.1.10. Respondent's willingness to pay

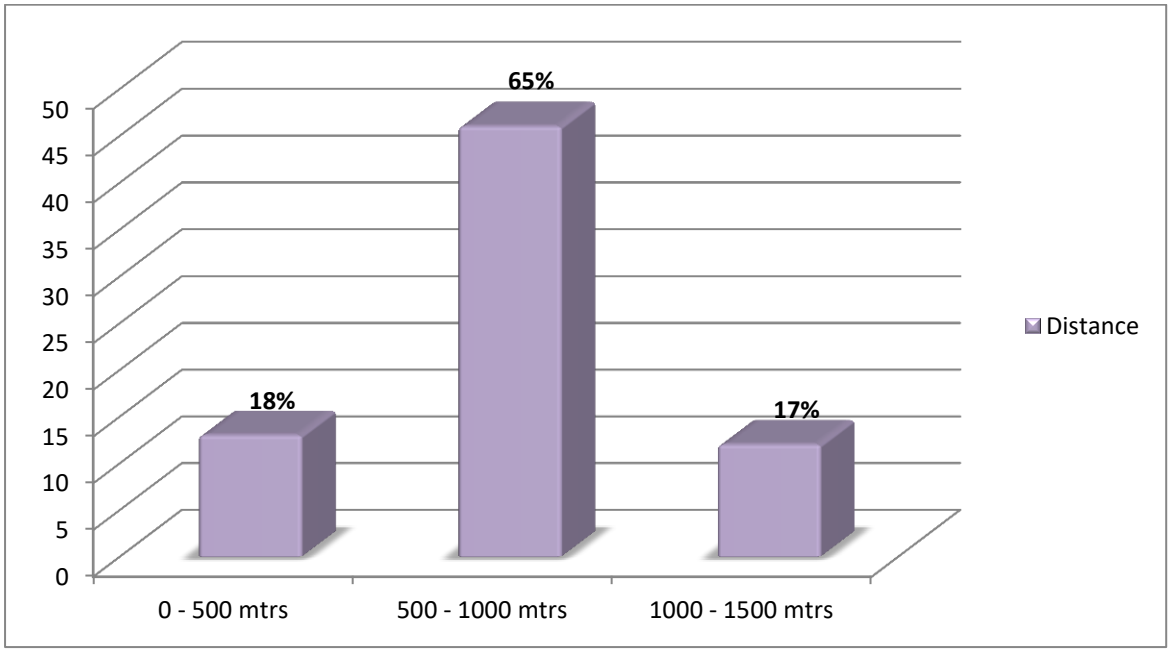


Source: Primary survey

Willingness to pay of respondents indicates how important certain goods or services are for them. From the above figure no. 4.1.10 we can understand how much people are willing to pay for the lake. The results show that only 7 percent of respondents are willing to pay an amount from 800 to 1000. However 35 per cent respondents are willing to pay from 200 to 400 and 31 per cent from 1 to 200. Whereas 27 per cent decided to pay between 400 to 600.

4.1.11. Distance from the lake

Figure No. 4.1.11. Distance from the lake



Source: Primary survey

Distance from the lake was taken to understand if it has any influence on respondent's willingness to pay. The figure no. 4.1.11 shows how many respondents were interviewed within 1500 meters distance. The maximum number of respondents were from 500 meters to 1000 meters with 65 per cent, followed by 0 to 500 meters with just 18 per cent. And last 17 per cent respondents were from 1000 meters to 1500 meters.

4.2. Rstudio results for correlation

4.2.1. Pearson correlation test results

Table No.4.2.1 Pearson correlation test results

Variables	Corr Coeff	Sign. level	Remark
Gender	0.2981	0.011	Significant
Age	-0.050	0.6778	Not significant
Education	0.0261	0.8287	Not significant
Occupation	-0.1790	0.1353	Not significant
Household income	-0.1867	0.119	Not significant
Lake benefits	-0.3789	0.0011	Significant
Farming type	0.3806	0.001	Significant
Production	0.2273	0.0565	Not significant
House expenditure	0.1439	0.2309	Not significant
Awareness	0.1085	0.3676	Not significant
Distance from lake	-0.0497	0.6804	Not significant
Lake importance	0.321	0.0062	Significant

The above table no. 4.2.1 presents the results of correlation test using Pearson method of correlation in Rstudio software. Along with correlation coefficients it also explains whether the variables significantly correlate or not. From the above table it can be understood if there is positive, negative or no correlation among the variables. As shown in the table the occupation and willingness to pay has negative correlation which indicates as individuals

move away from farming activities to other occupations their willingness to pay for the conservation of the lake decreases as they believe it does not provide them with any benefits. Next variable is farming type which shows positive correlation with willingness to pay, it discusses that as farming type changes which includes three categories paddy, horticulture, and both implies that as people are engaged in more farming activities or carry out both paddy and horticulture cultivation has more willingness to pay as compared to those who are engaged in single farming type.

The correlation between variable “production” and willingness to pay is positive which indicates that as production increases people are willing to pay more for the conservation of lake water. This also highlights the issue of small land holdings, as people have small land holdings they are not able to produce much which then influence their willingness to pay. The next variable which shows required correlation is “lake preservation” which means importance of preserving a lake, the correlation coefficient for this indicates positive correlation between importance of preserving lake and willingness to pay. This further shows that those who value lake preservation more are also likely to contribute a higher willingness to pay for projects or initiatives aimed at preserving the lake.

CHAPTER 5

CONCLUSION

Based on the study carried out in villages around Rai-tollem lake through a contingent valuation method it was found that maximum respondents involved in the study are from the above 50 age group. And maximum respondents had a qualification level of below SSC, which also indicated that people having below SSC as their qualification were involved in farming activities. From the surveyed people the highest number of respondents were farmers, which states higher dependence of people on lake water. The study also revealed that only 23 percent of respondents had an income level more than 1 lakh, and maximum respondents were having an income level of 30,000 to 60,000. The collected information also highlighted that more than 50 per cent of respondents were engaged in paddy cultivation and as Curtorim rice cultivation is very high, people cultivate rice during both the seasons in Rabi as well as in Kharif season. 45 per cent respondents earned only between 1,000 t0 20,000 from the output produced, and only 5 per cent people earned more than 1 lakh which states that more people are getting less produce this may be due to small land holdings which influences individuals earnings.

The 67 per cent respondents had monthly household expenditure of 5,000 to 10,000. For the willingness to pay only 7 percent people were ready to pay between 500 to 1000 and maximum respondents that is 35 per cent were willing to pay 200 to 400, and the respondents who decided to pay less claimed that the conservation and protecting lake from pollution is the government's responsibility and not theirs. Whereas, the average willingness to pay was calculated as INR 190.84. And from the total distance of 1500 meters, the highest number of respondents were from the distance of 500 to 1000 meters. In the correlation analyses it is found that occupation has negative correlation with willingness to pay which indicates as

people move from farming activities to other occupations their willingness to pay for the conservation of the lake decreases. Other variables, farming type, production, and importance of preserving lake have been found positively correlating with willingness to pay. Where farming type includes paddy, horticulture, and both which indicates as people are engaged in more farming activities their willingness to pay increases as compared to those who are participating in single activity.

ANNEXURE

Questionnaire for household survey

1. Name
2. Gender a) Male b) Female c) Prefer not to say
3. Age a) 18-25 b) 25-35 c) 35-50 d)50-above
4. Education qualification a) below SSC b) SSC c) Graduate
5. Occupation a) Farmer b) Fisher c) Government employee d) Others
6. What is the annual income of the household? a)Below 10,000 b)10,000 - 30,000 c)30,000 - 60,000 d)60,000 - 90,000 e)90,000 - 120,000 f)120,000 - 150,000 g)150,000 and above
7. Do you benefit directly from any of activities related to lake? a)Fishing b)Agriculture c)Recreation d)No benefit
8. If agriculture, what type of farming? a)Paddy b)Horticulture c) both
9. Varieties of the crops grown.
10. After harvest, total production of the grains.
11. If fishing, variety of fishes found in lake.
12. What is the total household expenditure? a)Below 5000 b)5000 - 10,000 c)10,000 - 15,000 d)15,000 - 20,000 e)20,000 and above
13. Are you aware of any benefits that are indirectly involved in lake related activities? (eg: nutrient retention, flood control, storm protection, groundwater recharge). a)Yes b)No c)Maybe
14. Do you agree that lake will provide economic benefits in the future through direct or indirect use? a)Yes b)No c)May be
15. If yes, specify potential benefits.

16. How important do you think the preservation of lake is for the local economy? a)1 b)2 c)3 d)4 e)5
17. If yes, if in a situation where your access to current level of lake benefits is threatened, would you be willing to contribute financially to protect these benefits? a)Yes b)No
18. If yes, what will be the maximum amount you would be willing to contribute?
19. Distance from the lake?
20. Any suggestions for measures to be taken to ensure the long-term economic sustainability of the lake.

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