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UNDERSTANDING THE VALUE OF WATER BY USING CONTINGENT VALUATION METHOD

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Abstract

A safe and healthy water supply is one of the significant Millennium Goals. Availability of safe and secure freshwater supply is becoming a major issue in Pakistan, particularly in the region of Punjab. Over-abstraction due to increasing urbanization coupled with un-regulated pumping and pressures of climate change is over stressing groundwater resources in Punjab. Groundwater near the city of Lahore is depleting at an alarming rate of one to two feet per annum. As a consequence, the region is now classified as 'water-stressed', verging towards becoming 'water-scarce' in the near future if no action is taken. [9]

This study quantified the community 'willingness to pay and the factors that influence when using contingent assessment techniques in Manak Village near Bahria Orchard, Raiwind road, Lahore. The consumers' willingness to pay for the safe drinking water using the contingent valuation method with different starting point offers was considered. Various data collection procedures, including focus group discussions, key informants' interviews, and field observations were taken. 76 questionnaires were completed and included in the water survey analysis.

The results showed that households with access to groundwater (Deep well) perceived this as of good quality. Consumers without access to groundwater used open-source, bottled water or distributed water for which they had to travel and spend time or to pay. Open-source water and standpipe water quality were seen as awful or satisfactory. Only 26% of the surveyed community were willing to pay for better water quality and a defined water supply source. The average willingness to pay was assessed to be around 1167 PKR.

Keywords: Groundwater, contingent valuation, willingness to pay, rural water supply, Manak

Introduction

Pakistan Council of Research in Water Resources stated that safe and pure drinking water is not in approach of 84 percent of the population. United Nations Children's Fund (2004) has detailed that in Pakistan 20 to 40 percent of patients in hospitals are experiencing the water related sicknesses.[1]

The Contingent Valuation is one of the regularly utilized strategies by financial specialists, policymakers, economists, and water associations to improve water supply [4]. It has been executed in a wide range of Water, Sanitation and Hygiene

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projects and especially in rural water supply scheme design, both in developed and developing countries [4–8].

The World Bank has been the superb client of Contingent Valuation in testing and promoting, the utilization of this technique to access the interest for Water, Sanitation and Hygiene services in both rural and urban settlements. [4].

The Contingent Valuation uses hypothetical data to evaluation the ex-ante Willingness to Pay. The strength of this technique is its flexibility [7]. It can be used to develop realistic policy scenarios for most new policies. Another strong point is the ability to measure non-use values. The main drawback of this method is its hypothetical nature.

One of the main challenges with most Contingent Valuation investigations led in developing countries is that the surveys themselves are poorly performed. This is often due to poorly trained enumerators and resulting enumerator bias [8].

Study Area

The village called Manak is located at a distance of 45 km from Lahore on Raiwind Road at 31°13'0" N 73°12'30" E.



Figure-1: Location Map Manak Village, Study Area

The village of Manak was established by Guru Nanak Dev ji (1469-1539), the First Sikh prophet on the mound. The Jatts of this village belong to the same grandfather. Many of them converted to Sikhism and to Islam while the rest Jatts remained Hindu.[2]

Manak village is located in the vicinity of Sundar Industrial Estate, Lahore. On the northern and eastern side of the village is Bahria Orchard, Lahore and on the southern west side lies Sundar Industrial Estate and Bhaikot Village.

Table 1: Key findings of the study area

<table>
<tr><td rowspan="3">No. of Buildings</td><td>Houses 1500 - 2000</td><td>Mosques - 3</td><td>Schools - 2</td><td>Church 0</td><td rowspan="3">Water borne Diseases found in most of the individuals</td><td>Hepatitis E & Hepatitis A</td><td>Due to the use of untreated water having biological contaiminants</td></tr>
<tr><td>Mostly, 5 – 10 Marla Houses</td><td rowspan="2">Jamia Mosques (150 – 200 Worshipers can pray)</td><td>1 (Boys Middle School)</td><td rowspan="2">-</td><td>Typhoid and paratyphoid fever</td><td>Bacteria entering the human body through contaminated water</td></tr>
<tr><td>18 Marla Houses are also available</td><td>1 (Girls Middle School)</td><td>Cholera</td><td>Causes severe diarrhea and vomiting which leads to dehydration due to the presence of toxins in water</td></tr>
<tr><td>Population</td><td colspan="4">8000</td><td>Average Storage Facility at homes</td><td colspan="2">250-300 Gallon Water Tanks</td></tr>
<tr><td>Source of Drinking Water</td><td colspan="4">Bore water
Filter Water from Bahria Orchard</td><td>Average no. of Family Members per Household</td><td colspan="2">4</td></tr>
<tr><td>Source of Household Water</td><td colspan="4">Groundwater Abstraction at 100 ft. – 150 ft. depth</td><td>Sewage Collection</td><td colspan="2">Depression Land around Village</td></tr>
<tr><td>No. of Public Hand Pumps</td><td colspan="4">10</td><td>Occupation</td><td colspan="2">Male member- Labour
Female Member- Housemaids</td></tr>
<tr><td>Age Group</td><td colspan="2">>10
10-20
21-60
<60</td><td colspan="2">20%
30%
35%
15%</td><td>Monthly Income</td><td colspan="2">16,000 - 20,000 PKR</td></tr>
<tr><td>Literacy Rate</td><td colspan="4">30%</td><td></td><td colspan="2"></td></tr>
</table>

Methodology

The survey was conducted in Manak Village between September 2020 and November 2020. In total, 76 questionnaires were completed and included in the survey analysis. each household was chosen randomly so that at least half of the respondents would live in four different directions outside of the center of the village.

Face-to-face interviews with the heads of households were conducted in the respondents' homes. Standardized questions regarding socio-economic and demographic characteristics, existing drinking water sources and their characteristics, trust to water management types, and direct open-ended and bids questions on Willingness to Pay were used.

The Contingent Valuation method was used where residents were directly asked about their Willingness to Pay for the safe drinking water. There were 25 questions asked to the local residents about household size, available water sources, drinking water source, water quality, water borne diseases, water treatment if any, their level of acceptance, and how much they willing to pay for better and safe drinking water. Moreover, water quality assessment was also performed.

Data Analysis

The collected data were used to calculate the mean Willingness to Pay according to the following:

$$E[WTP] = Pr(Zero) \cdot 0 + E(WTP, WTP > 0) \cdot Pr(Positive)$$

Where,

Pr (Zero) is probability that a respondent has zero Willingness to Pay;
Pr (Positive) = 1 – Pr (Zero) is probability that a respondent has a positive Willingness to Pay;
$E(WTP_{WTP} > 0)$ is mean Willingness to Pay

Water Quality Assessment

The purpose of water quality assessment study was to identify baseline of water quality levels in the project area and identify water quality contaminants of concern, levels and extent of contaminating to determine ambient conditions, trending and cause/effect relationships for each area.

Sampling Methodology

Three samples of freshwater (Groundwater) were collected. Groundwater samples of freshwater were collected from Hand pumps 100 – 150 ft. depth from different locations in the village. Sample no. 1, Hand Pump-1, was the nearest point from the ponds; Sample no. 2, Hand Pump 2, was almost 200 meters away from the pond and Sample no. 3, Hand Pump-3, was almost 100 meters away from the pond.

Water Analysis Conclusion

Sample 1

- Turbidity and Total Dissolved Solids were higher than the permissible limits
- High level of salinity was identified in the laboratory results.
- No Microbial contamination were found in the sample

Sample 2

- Total Dissolved Solids were higher than the permissible limits
- High level of salinity was identified in the laboratory results.
- Chemical Contamination of Chloride was found in the sample which were higher than the permissible limits.
- High value of Arsenic was also present in the sample.
- No Microbial contamination were found in the sample

Sample 3

- Microbial Contamination of Total Coliforms and Fecal Coliforms were found in samples
- No Physical and Chemical contamination were found in samples
- High level of salinity was identified in the laboratory results.

Major outcomes of the Survey

1. Community engagement in benefit sharing, transparency and awareness

creation were vital for the success of any project.
2. The community's main issue and concern was the non-availability of potable water and deteriorating groundwater quality.
3. The community was in immediate need of an intervention that helps improve their deteriorating groundwater quality.
4. Majority of the respondents were willing to have better water quality.
5. There is need to engage more community members as there should be willingness from the community to create time to engage in water sustainable activities.

Results and Discussion

There are numerous water sources available in the study area. Below table and figure shows these sources divided by the total users. The overall satisfaction with the water quality is almost 60% and the most reliable drinking water source is Bottled water or water from filtered water from nearby housing society, having satisfactory 95% and 100% respectively.

Table 2: Available sources of drinking water in Manak Village

Sources of Water	Total %Age	%Age Satisfied	%Age Unsatisfied
Bore Water	15	50	50
Filtered water from Bahria Orchard	55	95	5
Open Source	5	10	90
Hand Pump	15	40	60
Delivered Water (Bottled Water)	10	100	0

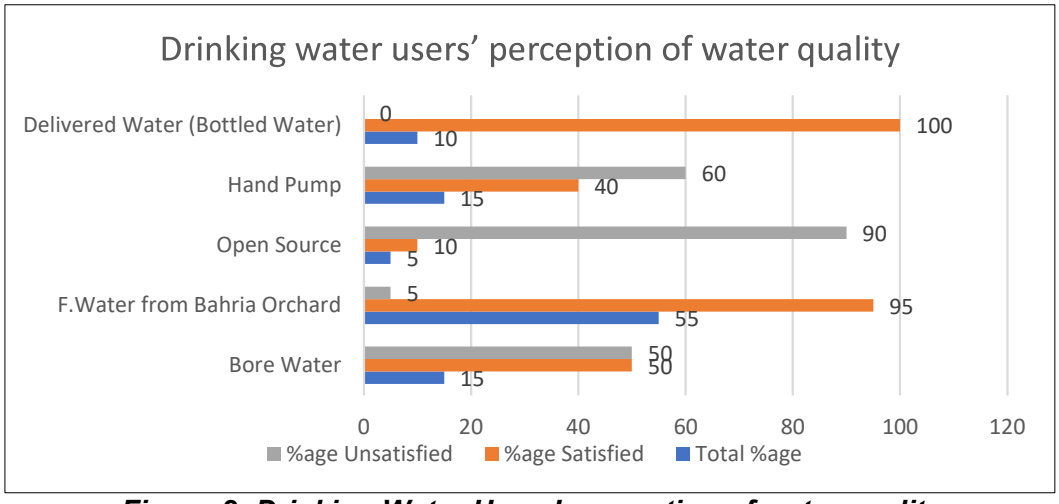

Figure-2: Drinking Water Users' perception of water quality

Willingness to pay System

The respondents were asked about their willingness to pay for the safe drinking water. The surveyed data showed that about 54% of household would not like to pay and only 26% of households would like to pay for safe drinking water facility.

Table 3: Willingness to pay ratio in Manak Village

Total	Won't Pay	Won't Pay %age	Will Pay	Will Pay %age	Don't Know	Don't Know %age
76	41	54	20	26	15	20

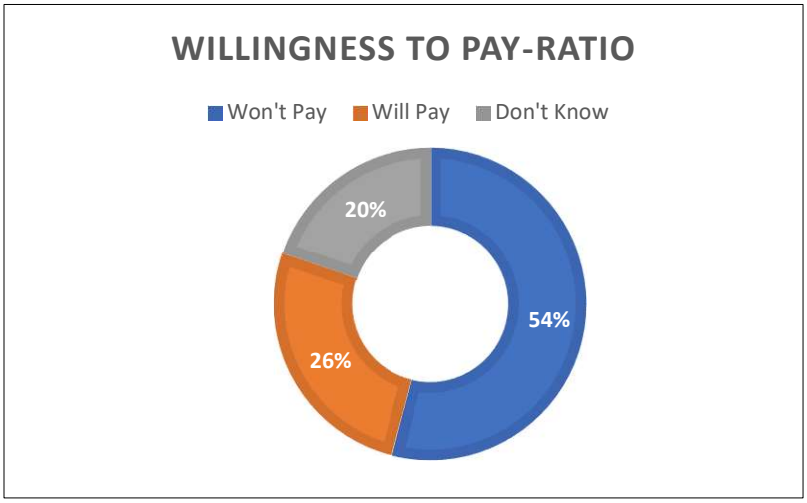

Figure-3: Willingness to Pay Ratio

Survey stats revealed that, out of the 26% population who are willing to pay, 35% would like to pay 1000 PKR, 40% would like to pay 1500 PKR and only 25% households would like to pay PKR 2000. The table below shows the willingness to pay against different Bid Values.

Table 4: Different Bid Values and Willingness to Pay

Will Pay (monthly)			
Bid Value (PKR)	**Bid/Pay %Age**	**Household %Age**	**Total Amount (PKR)**
1000	100	35	7000
1500	53	40	12000
2000	20	25	10000

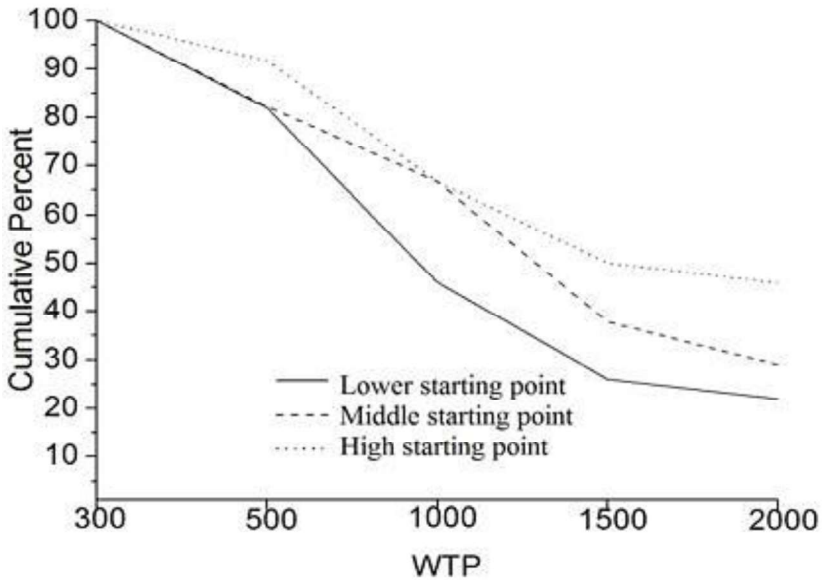

Figure-4: Cumulative distribution of maximum Willingness to pay- Comparison of Bids with Different Starting Points

Conclusion

This paper examined whether the contingent valuation method using bids with different starting values can be used to determine rural peoples' Willingness to Pay for better water services. In total, 95% of the rural respondents were willing to have safe drinking water but only 26% were willing to pay for that. The gained results can be used by water supply managers and engineers in order to better recognize the proper technological choice and the level of water service to be provided. Thus, it will make rural water projects both replicable and sustainable at a larger scale.

Our Work Philosophy

WWF Pakistan raises awareness on values of water, sanitation and hygiene and their importance among policy makers, industry and community leaders, journalists, writers, scientists, young professionals and teachers with special attention to vulnerable groups and youths.

We promote collaborative actions among key stakeholders such as national and local governments, industries and civil societies on valuing water in their domains, helping them identify their incentives to act (across risks and co-benefits) and finding opportunities to improve their water sustainable practices.

Through this Contingent Valuation survey, WWF-Pakistan determined the true need to conserve water resources in Manak Village and executed a landmark project titled "Replenishing the Groundwater Resources of Lahore"

- Installed a 1000 l/h capacity of Water Filtration Plant (Ultra-Filtration

Technology).

- 56 Rainwater Harvesting Units were installed to off-set 3360 cubic meter freshwater annually, benefiting local community.

WWF–Pakistan have also installed water Filtration plants in different remote areas of the Punjab to ensure the availability of safe drinking water for local rural communities.

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