Economic Affairs, Vol. 67, No. 05, pp. 787-795, December 2022
**DOI:** 10.46852/0424-2513.5.2022.12

Research Paper

# Households' Willingness to Pay for Improved Water Supply System in the Dryland areas of West Bengal – an estimation using Double-Bounded Dichotomous-Choice Model

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**Received:** 20-08-2022 **Revised:** 27-11-2022 **Accepted:** 05-12-2022

**ABSTRACT**

This study used double-bounded dichotomous-choice to estimate and analyze the factors affecting households' willingness to pay (WTP) for water supply in the dryland areas of West Bengal as well as improvement in the existing water bodies. This study notes that although the households living in the four districts of drylands of West Bengal are very poor financially, majority of them have willingness to accept the higher bid in the double-bounded bidding process. It shows the importance as well as necessity of good water system, as a whole, to them, which could solve manifold problems. Pilot survey as well as final survey were conducted in the three districts of dryland area of West Bengal on 450 households and bids were set in such a manner which could be bearable for the people of these areas. Over 65% were willing to participate in the improvement of the water supply system in the area. Those who were "protest bidders", showed socio-economic reasons for their decisions. We have followed the procedure suggested by NOAA (1993) panel for applying the CVM with full randomness being taken care of in the different stages of survey. What we have found is that apart from the amount of bid, several socio-economic variables play a part in people's decision on selection of a bid.

**HIGHLIGHTS**

- The paper makes application of Double Bounded Dichotomous Choice CVM in the Drylands of West Bengal, which is unique itself.
- The paper focuses on improvement of all forms of Water Supply System in the dryland areas of West Bengal.
- All three districts of dryland areas of West Bengal have been covered by this study through primary field survey.
- Households' Willingness to Pay for Improved Water Supply System in the Dryland areas of West Bengal – an estimation using Double-Bounded Dichotomous-Choice Model

**Keywords:** Double-Bounded Dichotomous-Choice, CVM, Water Supply System, Dryland areas

Due to unfavourable weather, harsh climatic conditions coupled with human pressure, World's drylands are recognised as having brittle eco-systems. But one also cannot deny that the drylands constitute a certain proportion of population as well as some of the world's largest land reserves which provide goods and services as the livelihoods for the people living here. Although there is no unanimously accepted definition of 'drylands', two definitions, provided by Food and Agriculture Organisation (FAO) and the United Nations Convention to Combat Desertification (UNCCD, 2000), are widely

**How to cite this article:** Chatterjee, N. (2022). Households' Willingness to Pay for Improved Water Supply System in the Dryland areas of West Bengal – an estimation using Double-Bounded Dichotomous-Choice Model. *Econ. Aff.*, **67**(05): 787-795.

**Source of Support:** None; **Conflict of Interest:** None

accepted[1]. World Atlas of Desertification (UNEP, 1992) defined 'drylands' as having a ratio of less than 0.65 of average annual precipitation (P) to potential evapo-transpiration (PET). FAO in 1993, categorised drylands into four forms according to both P/PET ratio as well as amount of rainfall. These classifications are – hyper arid zones, arid zones, semi-arid zones and dry sub-humid zones[2].

India is one of those few nations that has been suffering from this problem of Desertification from the very beginning. There are several indicators that decide the aridity of a region[3]. Average annual rainfall of drylands in India varies from 150 mm to 500 mm which is very erratic in nature along with a coefficient of variation of around 60% to 70% (Status Report on Hydrology, 2000 by National Institute of Hydrology). In India, we have around 16% area having over 12% of population in the 'dryland' areas which is unfurled over 13 districts[4].

Based on the State Agricultural Plan of West Bengal, the four districts, namely, Purulia; Bankura; West Midnapore (also known as Paschim Medinipur) and Birbhum have been recognised as 'drylands'[5]. Out of these four districts, Purulia is recognised as 'arid zone'. The magnitude of aridity is a bit moderate in rest of the three districts. Hence, these districts are recognised as 'semi-arid', in nature. Drylands of West Bengal not only suffer from poor quality of soil which makes crop productivity almost impossible but also suffer from lack of rainfall[6]. These four districts are a part of 'Chhotonagpur Plateau"; hence all the districts suffer from more or less similar sort of problems. Whole of Purulia, in the highly arid zone, suffers from severe water crisis. Dryland parts of Bankura and West Midnapore also suffer from severe water crisis. By this study, we shall examine how the people of drylands are valuing drinking water[7].

Lack of ground water coupled with lack of rainfall contribute together for scarcity of water supply in these areas. By the phrase 'water supply', we generally focus on the supply of drinking water because it is one of the basic amenities required for living[8]. People of drylands suffer severely from the scarcity of drinking water. The condition is really worse in Purulia and in larger parts of Bankura and West Midnapore. During our survey, we have witnessed people spend several hours per day (at least 2-4 hours per day) just to fetch drinking water from the nearby village tube wells, ponds, water bodies and that too not of the best quality. By this study we are willing to see how far as well as how much the people of drylands are willing to pay for getting good quality drinking water supplied in their houses by using Contingent Valuation Method.

The most preferred way to measure nonmarket values is through directly questioning individuals on their willingness-to-pay (WTP) for a good or service. Contingent Valuation Method (CVM) is a popular way of determining this WTP. It is a survey or questionnaire-based approach to the valuation of non-market goods and services. The values obtained for the good or service are said to be contingent upon the nature of the constructed (hypothetical or simulated) market and the good or service described in the survey scenario. The contingent valuation (CV) technique has great flexibility, allowing valuation of a wider variety of non-market goods and services than is possible with any of the indirect techniques. It is, in fact, the only method currently available for estimating non-use values (Chatterjee, 2017).

For dryland areas of West Bengal, the drinking water problem needs to be given more significance. Water supply as well as water bodies are needed to be given importance for proper 'conservation as well as use' because supply of drinking water directly to the households is absolutely absent in our study area. These areas, being backward and for several reasons is in the news headlines for a long period. Providing one of the basic amenities directly to the households demands significance. So, for proper valuation as well as conservation and use of this very scare resource has to be given utmost

*[1]According to UNCCD, around 40 percent of the world's total land area is considered to be drylands but the proportion of drylands in various regions varies from 20 percent to 90 percent.*

*[2]FAO, further, reported that proportion of arid and semi-arid are the highest among the whole range of drylands in the world.*

*[3]These indicators are low amount of amount of annual rainfall, high co-efficient of variability, strong wind region, high P/PET ratio, etc.*

*[4]Indian drylands constitute all the four forms of arid zones defined by the UNCCD but these forms vary across different states. Hence, drylands are of different forms in different parts of India.*

*[5]The Agricultural Plan is prepared by NABARD Consultancy.*

*[6]In these districts, soil is acidic in nature and poor nutrient quality limits the crop productivity.*

*[7]But in Birbhum, the problem of Drinking Water is not so severe.*

*[8]Whole of dryland suffers from scarcity of all forms of water, be it water for irrigation or other uses. Hence, our study covers the entire supply system of water in the dryland areas of West Bengal. due to extreme aridity of weather conditions.*

importance. CVM is highly useful in evaluating 'non-use values' of environmental goods, we have applied it for the improvement in the drinking water supply in the drylands of West Bengal. People of drylands depend upon 'common pools' for availability and supply of drinking water which is certainly not of the best quality. Hence, conservation of water bodies and arrangement for 'direct in-house supply of drinking water through pipeline' help to provide drinking water good quality directly to the households. Hence, improvement in the supply of drinking water combines not only proper conservation and use of water bodies but also proper supply of it directly to the households. Hence, development of the improved water supply can be considered having both 'use value' as well as 'non-use value'. This justifies the application and use of CVM for our study area[9].

The main motivation of this paper arises from the fact that there is almost no work, by applying CVM, in the drylands of West Bengal for valuing water supply system by emphasising on drinking water[10]. One can certainly say that there is no work on CVM by applying double-bounded dichotomous choice model for the drylands of West Bengal[11]. We have made an attempt to fill up this lacuna through this work. In the drylands of West Bengal supply of drinking water to the households through pipe-line is a dream foe the residents. People are very much ignorant about the uses of watersheds as well[12]. So, proper valuation of drinking water gets invaluable importance in these areas[13]. Hence, we have focused on valuation of supply of drinking water to the households through pipe line channels for the dryland areas. But for that to become a reality, existing water bodies, including watersheds, need to be conserved and used in a proper manner. Hence, valuation of drinking water supply incorporates the conservation of water bodies as well. This phenomenon was well explained to the respondents during survey. Rest of the paper is organised as follows. Section 2 briefly discusses about the existing literature followed by methodology of the study being discussed in section 3. The econometric outcomes of the study are discussed in section 4. Finally, concluding remarks are made in section 5.

## BRIEF REVIEW OF LITERATURE

There are several works that have applied CVM for valuation of environmental goods and services (Chatterjee, 2019), but there are few works on application of CVM on drinking water. Here we shall discuss few of the existing ones. Rodriguez *et al.* (2017) have used CVM on pricing or valuation of drinking water supply of improved quality in Mexico City by using censorship econometric technique. Apart from finding various socio-economic variables as significant, they observed that people are ready to spend around 0.22% of their average family incomes for enjoying the said benefits. Importantly, the willingness to pay for the poor segment of the respondents was found to be higher. Researchers have found positive willingness to pay for improvement in infrastructure of urban water supply system and for that purpose they are willing to pay a considerable amount of their family income (Wang, H. *et al.* 2015; Saz-Salazar *et al.* 2016). Gshwandtner *et al.* (2017) applied double-bounded binary choice model for estimation of willingness to pay for improved water system, they observed that 67% of the respondents accepted the initial bid where as 93% accepted the higher or second bid. Apart from income, several socio-economic variables were also significant in this study. Van song *et al.* (2019) used double-bounded referendum model to evaluate the improved water quality in Bac-ninh province. This study has found that people of higher income group who live near a polluted water source are willing to pay more an offered improvement. Apart from this they have suggested the government to follow various policies such as industrial pollution control, creating peoples' awareness, etc. for a reduction in the pollution level. A study on 10 OECD nations by Beaumais *et al.* (2014) found that people are willing to incur 7.5% of the average annual water bill for the sake of enjoying water quality. So, it is very obvious

*[9]See FAO (2000) Corporate Document Repository. Survey done by the Economics and Social Development Department on Applications of CVM justifies the use of CVM for drinking water.*

*[10]Except the work by Chatterjee (2017).*

*[11]Work by Chatterjee (2017, 2019) used single bounded referendum and open-ended referendum which is very much different from the Double-bounded DC model.*

*[12]Existing watersheds are not very widespread and recurrence of droughts every year limits the availability of water as well. The people of drylands of West Bengal primarily use watersheds for agricultural activities and that too for a certain period of the year when water is available. Hence, the concept of importance of watershed like other drylands gets nullified.*

*[13]Table 2 of our paper supports the fact that people of drylands are not very habituated in using watersheds, though there are few large watersheds in these parts, for example, Murguma of Purulia.*

that there is absence of work of CVM, by using double bounded referendum, in the drylands of West Bengal or even for India. From this angle, this work is going to fill that lacuna and contribute in the literature of environment and resource economics.

Double Bounded Dichotomous Choice or DBDC is one of the very popular procedures in estimating environmental goods. In this procedure, the responded is offered an amount and then asked to say "YES" or "NO" to that amount. Then, again the respondent is asked to say "YES" or "NO" to a higher or lower bid for stating his or her preference. This DBDC is certainly more efficient than the Single-Bounded Dichotomous Choice (SBDC) model since it (DBDC) is able to generate a lot of information about the respondent. The study by Habb and McConnell (2002) reveals that there are at least three ways for which DBDC is certainly more preferable compared to SBDC[14]. This result is established by the works of Jinsoo and Jihyo (2005), Nasreen *et al.* (2014)[15]. Bateman *et al.* (2001) feel that DBDC generates a kind of social responsibility in the respondent. They feel that by applying DBDC, one can generate an effect that contains indignation as well as guilt. When the respondent answers to the first bid offered in DBDC, he or she feels a deal is done with the surveyor and again when asked about a higher bid for the second choice, the respondent feels that the surveyor has gone back to the deal. In this way, when a respondent is offered a lower bid on the second choice, as he or she answers "No" for the first bid, it creates a feeling of social responsibility which also can be referred as 'guilt' in his or her mind (Watson and Ryan, 2004).

## Methodology of the study

In this section we are going to discuss about the methodology as well as the survey design of this study. Here our focus is on valuation of supply of drinking water to the households along with conservation of the water bodies in the drylands of West Bengal. We have conducted pilot survey in the three districts of drylands in West Bengal, Purulia, Bankura and West Midnapore, and consulted with the villagers, panchayat members about possible areas of survey, possible bids to be offered, etc. For selection of the survey areas, we have followed stratified random sampling technique in which the stratification has been done to conduct the survey in those villages which are severely affected by the problem of drinking water[16]. We have mainly conducted our survey in the hilly areas of Purulia and Bankura and in the non-hilly areas of West Midnapore. From each of the three districts, we have selected 150 households. Hence, our sample size is 450 which good enough for conducting a CVM by using DBDC. Entire dryland area suffers from the problem of good water supply. Lack of ground water availability due to scarcity of rainfall and poor characteristics of the soil makes all forms of water availability suffer badly. It can be water for irrigation, it can be water for regular use or it can be even supply of drinking water – every form of water supply and water availability suffers badly in the drylands. Under such circumstance, taking measures not only to hold the available water but also to make it available to the households for various purposes is immensely important. Special attention needs to be given to the supply of drinking water because it is one of the basic amenities. Areas which suffer the most were suggested by the villagers to be chosen as our survey area. In each area, we have tried to survey at least one-third of the total households in the village, *not more*. The households in the villages were selected randomly by simple chit-method of sampling. Following table describes about our survey area.

**Table 1:** Survey Area

| District | Village | Area | No. of Households used for sample survey |
|---|---|---|---|
| Bankura | Susunia | Hilly | 150 |
| Purulia | Murguma | Hilly | 75 |
| | Baghmundi | Hilly | 75 |
| West Medinipur | Salboni | Non-Hilly | 75 |
| | Bishnupur | Non-Hilly | 75 |

***Source:*** *Primary Survey in November-December, 2021*

We have conducted our survey in November and December of 2021. Apart from asking various questions about drinking water crisis in the area

[14]*But, the limitations of SBDC still apply on DBDC as well such as anchoring bias, accepting an abnormally "higher" bid, etc.*

[15]*First, a vivid bound of Willingness to Pay is found from the "Yes-No", "No-Yes" choices. Second, efficiency gains are observed by a "No-No", "Yes-Yes" response and last, for larger samples, number of responses increases, that is, protest bidders decrease.*

[16]*The whole area suffers from the problem of drinking water, the absence of water supply directly to the households.*

**Table 2:** Profile of Scarcity of Drinking water in the Survey Area

| District | Village | Area | No. of Households used for sample survey | Source of Drinking Water | Average Hour Spent per day for getting Drinking Water |
|---|---|---|---|---|---|
| Bankura | Susunia | Hilly | 150 | Tube well | 2-3 Hrs |
| Purulia | Murguma | Hilly | 75 | Tube well | 3.5 Hrs |
| | Baghmundi | Hilly | 75 | Tube well | 3.5 Hrs |
| West Medinipur | Salboni | Non-Hilly | 75 | Tube well & Pond | 2-3 Hrs |
| | Bishnupur | Non-Hilly | 75 | Tube well & Pond | 2-3 Hrs. |

***Source:** Primary Survey.*

**Table 3:** The Probability of "Yes-No" responses of the households for the first bid under DC1 model

| Respondents | 1st Bid | Yes | | No | |
|---|---|---|---|---|---|
| | | Number | Percentage | Number | Percentage |
| 450 | ₹ 100 | 347 | 77.11% | 103 | 22.88% |

***Source:** Primary Survey.*

**Table 4:** Responses received from the households from the two offered bids under DC2 model

| Respondents | 1st Bid | 2nd Bid (Higher) | 2nd Bid (Lower) | Y/Y | Y/N | N/Y | N/N |
|---|---|---|---|---|---|---|---|
| 450 | ₹ 100 | ₹ 150 | ₹ 50 | 274 | 73 | 55 | 48 |
| | | | | 60.88% | 16.23% | 12.22% | 10.67% |

***Source:** Primary Survey.*

and its availability, we have used several variables out of which income is the dominant one. We have also used sex, education, family size, age, distance from household to the source of drinking water, caste, etc as our variables. In our study area, the severity of the problem of drinking water scarcity cam be easily understood from the following table 2.

First, let us see the bidding procedure in DBDC (Fig. 1).

Here, we have used the random sampling technique in selection of households. As it is vivid from the above diagram, every respondent was asked two questions. First one with a lower bid and the second one with another higher or lower bid, depending upon the acceptance or rejection of the first bid by the respondent. A respondent who did not want to participate in the bidding game or did not accept any of the offered bids, can be recognised as a protest bidder[17]. Since, we have followed the guidelines suggested by NOAA panel in conducting our survey, we have received 100% responses from our respondents. By discussing with the panchayat bodies and villagers, we have offered the first bid as ₹ 100. On acceptance of the first bid, our second higher bid was ₹ 150. On rejection of the first bid, we offered a lower bid, which was ₹ 50. The outcomes of the offered bids under the first bid, based on the replies of the households, are given below in the tables 3&4.

From the above two tables, it becomes certain that only around 10.67% people do not want to participate in the offered development by paying from pocket. These respondents can be referred as the "protest Bidders". Again, from the percentage of respondents accepting the bids, it can be suggested that as the value of bid amount goes up, the probability to accept it falls which is quite normal. But the significant thing is over 89% of the respondents have agreed to participate in the improvement of drinking water supply by paying and above 60% are ready to accept the higher bid which is a great phenomenon for a poverty-stricken

*[17]We cannot keep these responses out of the econometric analysis because they will also enjoy the benefits of the proposed change in the supply of drinking water. They just do not want to take part in the bidding process or do not want to accept any of the bids. There could be various reasons for not accepting any of the bids.*

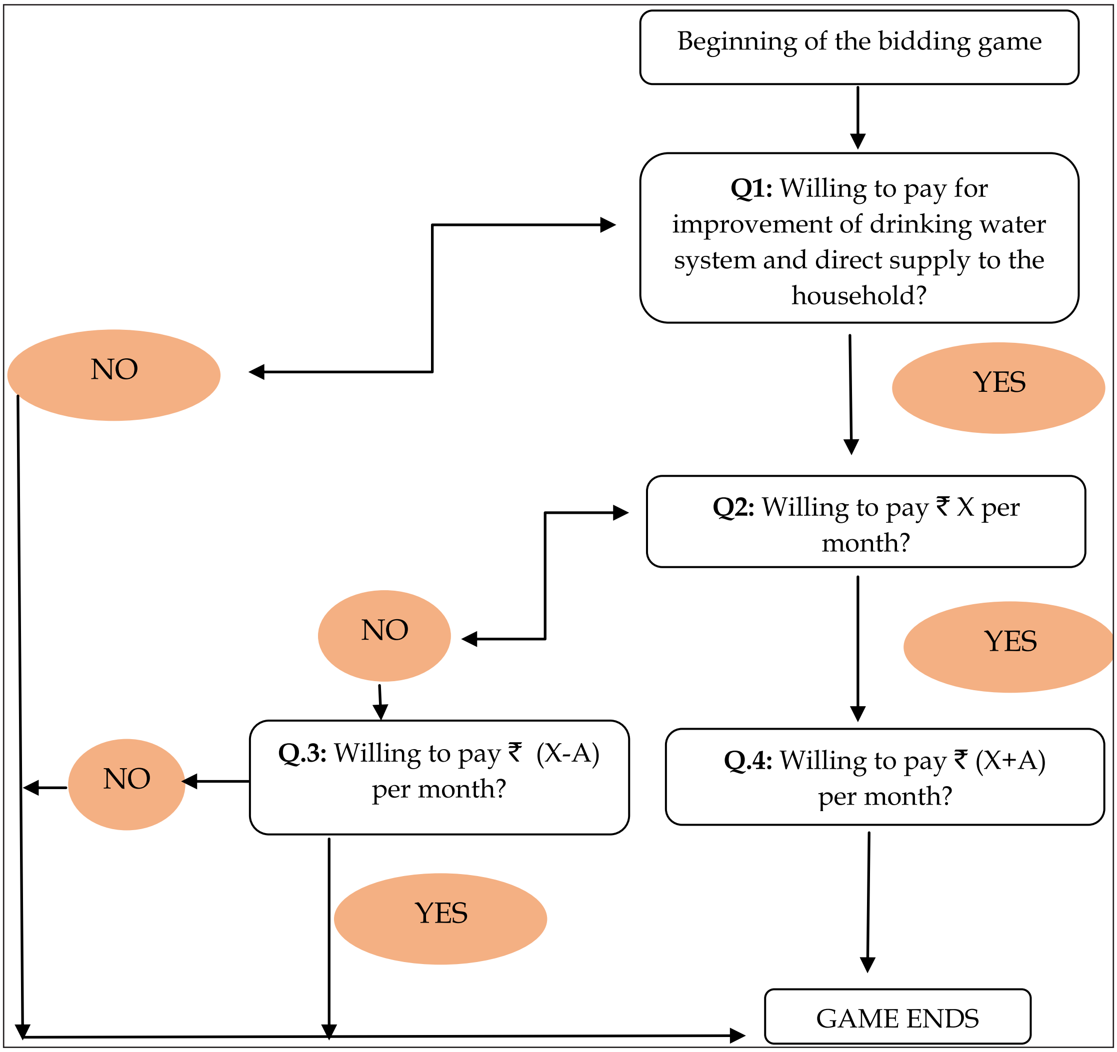


**Fig. 1**

area like drylands of West Bengal. It also signifies the scarcity of safe drinking water system in these areas and the necessity as well as importance of having such a facility in their lives. During survey, we were surprised to see how people of a poor area were eager to contribute for the sake of the proposed change.

Let us now see the factors that influence the decision of an individual.

When an individual is offered a bid, his or her probability for accepting that bid can be written as-

$$P = f(X) = 1/\left(1 + e^{-\Delta v}\right) \qquad \ldots(1)$$

Here, $f(X)$ refers to the probability of agreeing to pay at least ₹ X[18]. Again, $\Delta v$ refers to the change in the utility caused by the proposed change in the improvement in the drinking water supply system in the dryland areas of West Bengal, if the individual pays ₹ X. Hence, one can express Δ v as ___

$$\Delta v = \beta_0 + \beta_1 \, Bid + \beta_2 \theta_i \qquad \ldots(2)$$

Here, θ is the vector of all the socio-economic variables that influence the willingness to pay for the improvement in the drinking water system of the dryland area.

We can re-write the logistic function in equation (1) as__

$$L_n \,[P/(1 - P)] = \beta_0 + \beta_1 \, Bid + \beta_2 \theta_i \qquad \ldots(3)$$

Where, $L_n$ $[P/(1–P)]$ is the 'log-odds' ratio.[19]

[18]*This is also known as the 'survivor' function.*

[19]*It is the ratio of probability of willingness to pay ($P_i$) and non-willingness to pay (1- $P_i$). One can say that as $P_i$ increases, the log-odds ratio increases.*

Since we are using logistic regression analysis[20], the estimation of the coefficients needs two models which can be expressed as__

$$Y_1 = \beta_{01} + \beta_{11}\, Bid_1 + \beta_{21}\theta_i \qquad \ldots(4)$$

$$Y_2 = \beta_{02} + \beta_{12}\, Bid_2 + \beta_{22}\theta_i \qquad \ldots(5)$$

In the above two equations, $Y_1$ and $Y_2$ represent the set of binary responses for the question regarding Willingness to pay. The two bids, $Bid_1$ and $Bid_2$ represent the two bids in the double bounded dichotomous choice (DC) model. $\theta_i$ is the set of socio-economic-demographic factors that influence the individual's decision on accepting or rejecting the bids. $\beta_{01}$, $\beta_{11}$, $\beta_{21}$, $\beta_{02}$, $\beta_{12}$, $\beta_{22}$ are the estimated coefficients.

## Double Bounded DC Model analysis

In this section we are going to discuss about the econometric findings of our double bounded dichotomous choice analysis. First, let us consider the independent variables that we have used in our analysis. This is shown in table 5.

**Table 5:** Description of independent variables of the model

| | |
|---|---|
| *dc bid*$_1$ & *dc bid*$_2$ | Bids vector of initial bid of ₹ 100, higher bid of ₹ 150, lower bid of ₹ 50 following double bounded referendum DC model |
| Income | Total monthly income from all sources |
| Family size | Household Size/ No. of family members |
| Age | Age of the respondent |
| Edu yrs | Total years of education of the respondent |
| Sex | Dummy Variable. 0 for Males and 1 for Females. |
| Caste | Dummy Variable. 0 for General Caste, 1 for OBC, 2 for SC and 3 for ST |
| Distance | Distance from Household to the nearby drinking water source |

Let us see the outcome of the binary logistic regression of double bounded regression under DC1 and DC2 are given in table 6.

The results for both the models are very much similar. Value of bid has a negative impact on the willingness to accept it – which is quite natural. As the value of bid goes up, the probability of its acceptance falls. Income bears a positive impact, signifying the fact that people with higher income

**Table 6:** Factors affecting Willingness to Pay of the Logit Models

| Independent Variables | DC1 | | | | DC2 | | | |
|---|---|---|---|---|---|---|---|---|
| | **Coefficient** | **t- value** | **Marginal Values** | **t- value** | **Coefficient** | **t- value** | **Marginal Values** | **t- value** |
| Bid 1 | -0.0084*** | -11.39 | -0.0007*** | -9.18 | | | | |
| Bid 2 | | | | | -0.0077*** | -9.24 | -0.0005*** | -4.88 |
| Income | 0.387*** | 7.27 | 0.483*** | 5.21 | 0.252*** | 5.25 | 0.318*** | 4.26 |
| Family Size | 0.011** | 1.91 | 0.0002* | 1.81 | 0.025** | 2.01 | 0.0001** | 1.93 |
| Age | 0.004 | 0.57 | 0.0005 | 0.28 | 0.005 | 0.61 | 0.0001 | 0.17 |
| Edu Years | 0.018*** | 2.98 | 0.002*** | 2.51 | 0.057*** | 3.54 | 0.005*** | 2.62 |
| Sex | 0.001 | 1.01 | 0.0002 | 0.88 | 0.002 | 0.97 | 0.0006 | 0.53 |
| Caste | - 0.047*** | - 3.01 | -0.008*** | -2.24 | - 0.058*** | - 4.12 | -0.0005** | -3.44 |
| Distance | 0.002** | 2.04 | 0.0004** | 1.98 | 0.004** | 1.97 | 0.0007* | 1.80 |
| Constant | 3.214*** | 11.07 | | | 2.127 | 7.07 | | |
| N | 450 | | | | 450 | | | |
| Log-likelihood | 1014.35 | | | | 1107.27 | | | |
| LR chi-square | 292.77 | | | | 275.25 | | | |
| Prob > chi-quare | 0.000 | | | | 0.000 | | | |
| Pseudo $R^2$ | 0.574 | | | | 0.530 | | | |

****, ** denote significant at 1% and 5% probability levels, respectively*

[20] *Since our dependent variable is binary in nature.*

would love to accept the bid for the sake of improvement. Family size is significant for both the bids which establishes the fact that people having more family members value the importance of direct delivery of water supply to their households, as they need more water per day. Age and sex are insignificant which prove the fact that the need for improvement in the drinking water supply facilities is felt by everyone – people of all ages and genders. Higher levels of education certainly create awareness for the improvement in the existing condition of such an important basic amenity and it gets reflected in the significance of educational years. Caste, as a variable, is significant but the negative sign implies that as we move from people of 'general' caste to that of 'SCs, STs and OBCs', the willingness of accepting an offered bid falls which could be because of the fact that people of these castes (SC, ST, OBC) are financially not well off, hence, they do not prefer to accept the offered bid. Finally, we can see that distance of one's house to the nearest drinking water source bears a positive impact on the acceptance of the bid which is very much expected because people who live quite far from the water bodies do spend a lot of hours, per day, for fetching drinking water. For these people, such a proposed change in the drinking water supply system is revolutionary, indeed. Values of R-square for both the models are quite good, 54.7% and 53%, respectively which gives the impression that for cross-sectional data sets, both of our models are well-fitted. We have also expressed the marginal values of both the models which show the change in the willingness to accept the offered bid due to change in the independent variable. For example, one can see that as income changes, holding other variables unchanged, probability of accepting the bid or willingness to contribute goes up. We have also performed the test for multicollinearity among the explanatory variables of the estimated logit model. The variance inflation factor (VIF) for both the models have been estimated and the reported results or Mean VIF are 2.25 and 2.89, respectively for the first and the second model which show that the model do not suffer from severe multicollinearity problem[21]. One can use the following formula for finding out the exact amount of fund that can be raised from the villagers for the sake of improvement in the drinking water supply facilities directly to the households along with an improvement of the existing water bodies.

Expected Funding = Average Willingness to pay × total willing number of Households

In our case, for the first model, average willingness to pay stands out to be ₹ 133 per household per month and for the second model it is ₹ 72 per household per month[22]. Given the backwardness of the study area, one can consider this value to be really good as well as high for the sake of improvement of drinking water supply scenario. It also shows how high people value drinking water supply in this region, despite their poverty.

## CONCLUDING REMARKS

The century long history of deprivation coupled with backwardness of drylands of West Bengal is well known to one and all. Their agitations for the sake of acquiring even the basic amenities have been of national interest for the last two decades. An area suffering from even the availability of drinking water is really painful and deserves significance. People of these regions suffering from the availability as well as supply of drinking water grabbed our attention and we wanted to see how the stakeholders of these areas value the importance of improvement in the drinking water supply system directly to the households which inherently considers proper conservation of the water bodies as well. A proposed change which is not only absent in this region but also expected to bring a visible change in the lives of the people by saving valuable time, energy and bringing improvement in the standard of living. We have conducted pilot survey as well as final survey in those areas that severely suffer from scarcity of drinking water. We have applied Contingent Valuation Method (CVM) with double bounded dichotomous choice model in which an individual was offered two bids to express his or her preference for the proposed change. We have applied the suggested procedure of the NOAA panel for conducting CVM and as a result of which we have got satisfying participation. For a

[21]*As long as the value of VIF lies between 1 and 5, the problem of multicollinearity is not considered as a serious problem but value of VIF between 5 and 10 is considered to be serious.*

[22]*One can use this formula for finding the average Willingness to pay for a logit model __ Average Willingness to pay is* $\frac{\beta_0 + \beta_i \bar{X}_i}{\beta_1}$*, here the original logit model is –* $Y = \beta_0 + \beta_1\, bid + \beta_i X_i$.

poverty-stricken area like the three dryland districts of West Bengal we have got unbelievably satisfying outcomes. For the group of the higher bids (Y/Y) we have found the average willingness to pay is ₹ 133 and for the group with lower bid (N/Y) it is ₹ 72 per month – both of these values can be considered high enough for areas like these where people suffer badly to earn their livelihoods. It also establishes the necessity of improvement in the drinking water supply system felt by the people of these regions. From the aspect of policy prescription, one can say that Government and its regional bodies such as panchayats should really think about bringing this revolutionary change for the sake of well-being of the dryland area. A proposed change that has the potential to solve manifold problems – not only direct delivery of drinking water to the households but also improvement of the water bodies as well as in the standard of living of the people of these regions.

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