

## **Willingness to Pay for Participation in Community-Based Programme: A Case of Seed Self-Help Group in Uttar Pradesh**

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### **ABSTRACT**

Collective action is seen as an institutional tool for increasing the access of small and marginal farmers to technologies, inputs and service provisions in agriculture. Though the benefit of such community driven programmes is well documented in the literature, sustainability remains an unsolved puzzle; most of the community-based programmes are established and run by programmes supported by donors. In this line, the present study has attempted to estimate the willingness to pay of the farmers to participate in the community driven seed production programme run by an NGO, which in turn could indicate the sustainability of the programme in the long run. In the present form, the programme provides the required quantity of the foundation seed which is given to the farmer and he has to pay-back 'X' times the quantity of seed received, as a payment. The study, using double bounded contingent valuation, estimated that farmers are willing to payback 11 times the quantity of seed that they receive, as against the existing norm of 3 times. The study clearly indicates that the farmers are ready to pay higher amounts to participate in the seed production programme.

**Keywords:** Community-based programme, NGO, seed, SHG, Sustainability, Willingness to pay

**JEL:** O13, P32, Q13, L31

### **I**

### **INTRODUCTION**

Community-based seed producer groups are emerging as an alternative informal institutional innovation for improving the accessibility of small and marginal farmers to seeds (Coomes *et al.*, 2015). Globally, studies (Badstue *et al.*, 2006; Audi *et al.*, 2008; Alemu, 2011; Rajendrana *et al.*, 2016) have discussed the role of informal institutions such as community-based seed producers (CBSP) groups in providing improved seeds. Though, such CBSP models are diverse in terms of the organisational structure and programmes, the base model is the same, i.e., community driven seed production initiative, where seeds are produced and distributed among the communities (Subash *et al.*, 2016). In spite of the documented benefits, most of the community based initiatives are established by the programmes supported by donors and not established by the community themselves based on their needs. This raises the question of sustainability of such institutes when the external support is withdrawn. One way to assess the sustainability of the programme is to elicit how much the members of the community based seed organisers are willing to pay to

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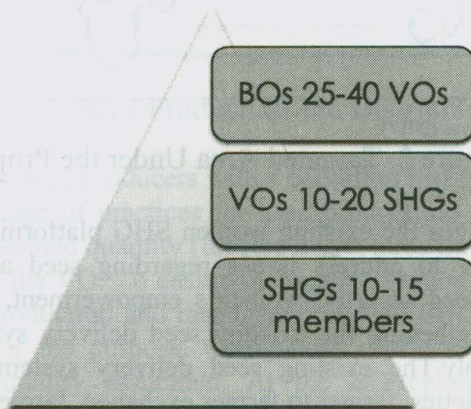
\*ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi, ICAR-Indian Agricultural Research Institute (IARI), New Delhi and ICAR-National Academy of Agricultural Research Management (NAARM), Hyderabad, respectively.

participate in the programme. This estimation could help in calculating the viability of the programme. The present study looks into willingness to pay to participate in the women SHG led community based seed production, management and dissemination model facilitated by Rajiv Gandhi MahilaVikasPariyojana (RGMVP).

### 1.1 RGMVP

RGMVP is right based organisation working in backward regions of Uttar Pradesh (UP). Their work mainly focuses on alleviating poverty through collective action of women by Self Help Groups (SHG). The SHG platform is leveraged for layering of various development interventions such as maternal and child health, nutrition, and sanitation. Through collectivisation, women can access opportunities and challenge the social and cultural hierarchies, which they are not able to do as individuals. SHG members are able to obtain loans, start income generating activities, and access information on health, education, sanitation, agriculture and rights/entitlements.

At an operational level, RGMVP organises women in a three-tier structure. The lowest level is the Self-Help Group (SHG), above that is the Village Organisation (VO), followed by the Block Organisation (BO) (Figure 1). The SHG comprises 10-15 members, the VOs comprised of women representatives from 10-20 SHGs, and the BO is a federation structure of 25-40 VOs. These federations help in bridging the gap between government delivery systems and poor people. RGMVP has also set up Community Resource Development Centres (CRDC) at a regional level to build a robust training and management system to scale up the model using the local resources and leadership. These structures act as regional management units, which manage BOs falling under their administrative area.

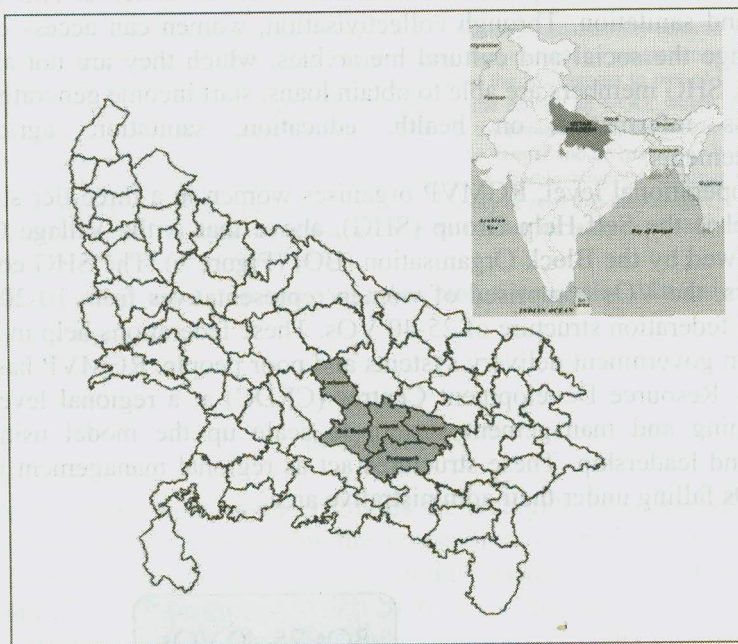


Source: Subash and Srinivas (2017)

Figure 1. Three-Tier Structure of RGMVP.

### 1.2 Informal Seed Systems Project through Women SHGs

Strengthening Informal Seed Systems through Women Self-Help Groups in Uttar Pradesh, is a project funded by Bill and Melinda Gates Foundation (BMGF). The seed production programme was layered on the existing SHG initiatives of RGMVP. The project was first carried out in a pre-pilot phase in 2014 in two districts (Amethi and Rae Bareli) covering six blocks in these districts. The programme was launched later in 2015 as a full fledged project with one year of baseline and pilot phase, and scale up phase in five districts (Amethi, Lucknow, Pratapgarh, and Rae Bareli and Sultanpur) covering 12 blocks in these districts in Uttar Pradesh (Figure 2).



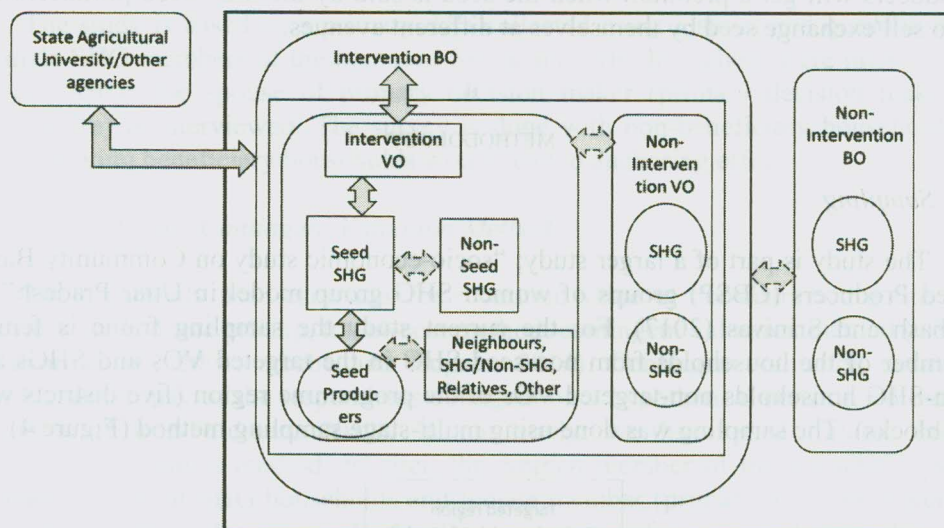
Source: Subash and Srinivas (2017)

Figure 2. Targeted Area Under the Project.

The project leverages the existing women SHG platform to strengthen informal seed systems in order to address issues regarding seed availability, access and utilisation to ensure seed security, women's empowerment, and nutrition security. This is done by strengthening the existing seed delivery system and creating new sources of seed supply. The existing seed delivery systems include public seed sources for certain varieties, farmer to farmer exchange, farmers saving her own seed, and informal market mechanisms. New sources of seed supply include, but are not limited to, linkages with universities and research (for both foundation and certified seed of existing and new varieties), SHG seed and producers.

### 1.3 RGMVP Model

The key objective of the project is to strengthen the informal seed systems (access to quality seed) leveraging the existing SHGs and to empower women in agriculture. For this, purchase of varieties is done by SHGs and their federations (VO) who get the seed produced through CBSPs. The programme is layered on the existing SHG platforms (roughly 10 per cent of the SHGs have been targeted for the programme). Women members of SHG households are targeted to become seed producers (CBSPs) for the VO. In this model foundation seed of farmer preferred improved varietal seeds has been purchased by SHG/VO and they provide seeds to members of the SHG for multiplication after estimating the requirement of seed for next season (Figure 3).



Source: Subash and Srinivas (2017)

Figure 3. Seed Production and Distribution.

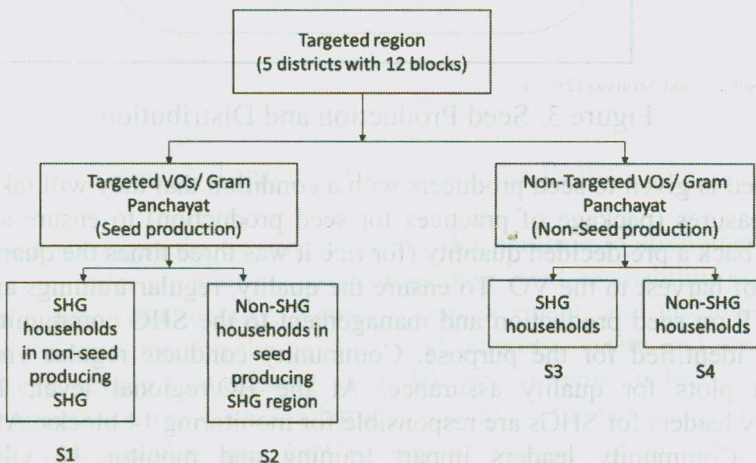
The seed is given to seed producers with a condition that they will take up all the needed measures (package of practices for seed production) to ensure seed quality and return back a pre-decided quantity (for rice it was three times the quantity of seed provided) of harvest to the VO. To ensure the quality, regular trainings are imparted by RGMVP on seed production and management to the SHG community members who were identified for the purpose. Community conducts regular visits to seed production plots for quality assurance. At the BO/regional level, 10 selected Community leaders for SHGs are responsible for monitoring 14 blocks. At the village level two Community leaders impart training and monitor 12 villages. One Community leader looks after one village, nearly 8 to 15 SHGs per person. RGMVP experts provide handholding support at every level.

Also few other members (*Ajeevika Sakhi's*) from the SHGs are selected and trained who in turn train the seed producer members. They were trained to follow Good Agriculture Practices (GAP) such as raising nursery and transplanting the crop and System of Rice Intensification. They also level the land before going for seed production. The seed production is carried out using the own inputs of the seed producers. After harvest, the seed producers give back a pre-decided quantity to the VO (three times of procured seed in case of paddy and two times for wheat). Thus there is seed at two levels- at VO and with seed producer. Seed at VO (referred to as "Seed Bank") will primarily be disseminated amongst remaining VO members. Meanwhile, VO communicates about the varietal availability of paddy and wheat seeds to other VOs and BOs. Then as per the demand received from them, remaining seed with VO and also seed producer is sold off to them. During the process, seed producers will get a premium when the seed is sold by the VO. Seed producers can also sell/exchange seed by themselves at different avenues.

## II METHODOLOGY

### 2.1 Sampling

The study is part of a larger study; "socio-economic study on Community Based Seed Producers (CBSP) groups of women SHG group model in Uttar Pradesh" by Subash and Srinivas (2017). For the current study the sampling frame is female member of the households from non-seed SHG in the targeted VOs and SHGs and non-SHG households non-targeted VOs of the programme region (five districts with 12 blocks). The sampling was done using multi-stage sampling method (Figure 4).



Note: Gram Panchayats are village unit which consists of a cluster of hamlets. S1, S2, S3, S4 are the strata.

Figure 4. Sampling Frame.

At stage one, targeted and non-targeted VOs (Gram Panchayats) were randomly chosen from 12 blocks. At stage two, from the sampled VOs (targeted and non-targeted) the population was divided into four strata; non-seed producer SHG in targeted VO (S1), non-SHG members in targeted VO (S2), non-seed producer SHG in non-targeted VOs (S3) and non-SHG members in non-targeted VOs (S4). In each stratum a total of 140 households totalling 560 households were surveyed. A census was done for SHG members in the sampled VOs to check whether the SHG and SHG member exists. The non-SHG households in targeted and non-targeted VOs was randomly selected from households after doing census of non-SHG households in the sampled VOs in treatment and control region.

## 2.2 Data

The study is based on a primary data collected using a structured questionnaire. Female SHG members of the non-seed SHGs and SHG household were interviewed. In non-SHGs the spouse of primary decision maker (primary decision maker in agriculture) is interviewed. The survey is done with non-beneficiary households as the surveying beneficiary households would lead to anchoring effect.

## 2.3 Double Bound Contingent Valuation Method

The commonly used estimates for economic value of non-marketed goods and services are hedonic pricing, travel-cost method, contingent valuation method (CVM) (Carson *et al.*, 2001; Abebe and Bogale, 2014). Contingent valuation estimates willingness to pay of the respondents contingent on a hypothetical constructed market situation (López-Feldman, 2012). In our study, we have used 'double bound contingent valuation method' to elicit the women member of the household [SHG women in case of SHG households and female member (primary decision maker) or spouse of primary decision maker] willingness to pay for participation in the seed. Creating hypothetical market as close to reality is the most important step in any contingent valuation process (Tinch *et al.*, 2015; Carson *et al.*, 2001; Shashi Kiran and Umesh, 2012; Hanley *et al.*, 2001). During the survey, the enumerators explained the women members of the family about the seed production programme, and the pay back condition in case if the individual is participating in the seed production programme.

In the existing RGVMP model, the participant has to pay for the seed not in cash but in kind. As explained earlier, each participating household will be given certain quantity of foundation seed and after the harvest the household has to return three times the quantity of seed given to them. Similarly, in the CVM study, each respondent was provided with a random bid "X" (ranging from 1 to 10) which indicates how many times the initial amount of seed they are willing to pay-back after the harvest. For instance, if "X" offered to respondent is 5, the question would be

'After the harvest, are you willing to payback 5 times the seed that you received for seed production?' The response of the individual is captured using a dichotomous variable (1=Yes, 0=No). If the response was "Yes", the bid was increased by one unit ( $X+1$ ), and a second question is asked whether they are ready to pay ( $X+1$ ) times of seed they received initially. If the answer to the first question is "No", a new bid is offered by reduced by one unit ( $X-1$ ) and asked whether they are ready to accept it. Depending on the answer for the above said questions the bids gets an upper bound and lower bound which increases the efficiency of the WTP estimates (Hanemann *et al.*, 1991; Hanemann and Kanninen, 2001; Gao *et al.*, 2010) and could be used to estimate Willingness to Pay (WTP) econometrically.

#### 22.4 Econometric Estimation of WTP

Let us assume that  $b_1$  and  $b_2$  are two bid amounts and  $Y_{1i}$  and  $Y_{2i}$  be two variables which capture these responses respectively. The response from the women member could be grouped into following four categories.

- (1) (Yes, No): Women member is ready to pay initial bid amount but refuses for second bid amount. 1) In this case  $Y_{1i} = 1$  and  $Y_{2i} = 0$ . Probability of getting this response is given by

$$\Pr(Y, N) = \Pr(t_1 \leq \text{WTP} < t_2) \quad \dots(1)$$

If WTP depends on set of explanatory variables, i.e.,  $\text{WTP}(Z_i, u_i) = Z_i\beta + u_i$ , where  $Z_i$  is the vector of explanatory variables and  $\beta$  represents corresponding coefficients. With assumption that error term is normally distributed with zero mean and standard deviation of  $\sigma$ , we can rewrite expression 1 as

$$\Pr(Y, N) = \Phi\left(\frac{t_2 - Z_i\beta}{\sigma}\right) - \Phi\left(\frac{t_1 - Z_i\beta}{\sigma}\right) \quad \dots(2)$$

- 2) (Yes, Yes): Here, both  $Y_{1i}$  and  $Y_{2i} = 1$  and probability can be written as

$$\Pr(Y, Y) = \Pr(t_1 < \text{WTP} < t_2) \quad \dots(3)$$

Applying Bayes rule of probability and rearranging,

$$\Pr(Y, Y) = 1 - \Phi\left(\frac{t_2 - Z_i\beta}{\sigma}\right) \quad \dots(4)$$

- 3) (No, Yes): In this case,  $Y_{1i} = 0$  and  $Y_{2i} = 1$

$$\Pr(N, Y) = \Pr(t_1 > \text{WTP} \leq t_2) \quad \dots(5)$$

$$\Pr(N, Y) = \Phi\left(\frac{Z_i\beta}{\sigma} - \frac{t_2}{\sigma}\right) - \Phi\left(\frac{Z_i\beta}{\sigma} - \frac{t_1}{\sigma}\right) \quad \dots(6)$$

4) (No, No): Case where both  $y_{1i}$  and  $y_{2i} = 0$

$$\Pr(N, N) = \Pr( t_1 < WTP < t_2) \dots(7)$$

$$\Pr(N, N) = 1 - \phi \left( Z_i \frac{\beta}{\sigma} - \frac{t_1}{\sigma} \right) \dots(8)$$

Equations 2, 4, 6 and 8 can be expressed in a likelihood functions as

$$\sum_{i=1}^n \left( d_i^{yn} \ln \left( \phi \left( \frac{t_2 - Z_i \beta}{\sigma} \right) - \left( \frac{t_1 - Z_i \beta}{\sigma} \right) \right) \right) + d_i^{yy} \ln \left( 1 - \phi \left( Z_i \frac{\beta}{\sigma} - \frac{t_1}{\sigma} \right) \right) + d_i^{ny} \ln \left( \phi \left( \left( Z_i \frac{\beta}{\sigma} - \frac{t_2}{\sigma} \right) - \left( Z_i \frac{\beta}{\sigma} - \frac{t_1}{\sigma} \right) \right) \right) + d_i^{nn} \left( 1 - \phi \left( Z_i \frac{\beta}{\sigma} - \frac{t_2}{\sigma} \right) \right)$$

where  $d_i^{yn}$ ,  $d_i^{yy}$ ,  $d_i^{ny}$  and  $d_i^{nn}$  are indicator variables which takes value zero or one depending on the respective response. From the estimates, we can compute WTP.

$$\text{WTP on mean} = \beta_0 * \text{Constant} + \sum_{j=1}^k (\text{Mean value } j * \beta_j)$$

where  $j=1-k$  represents the control variables used in the analysis (López-Feldman, 2012).

Estimated willingness to pay is based on the mean value of explanatory variables or control variables. The coefficient of model used to estimate can only indicate the probability of saying yes to a bid presented and cannot be used to quantify the effect of variable on willingness to pay. However, using the coefficients of the likelihood estimation can be used to predict WTP for each of the respondent, which can later be regressed on set of independent variables. Such analysis will indicate the effect of independent variables on WTP.

III  
RESULTS AND DISCUSSION

3.1 Socio-Economic Profile of Households

A summary of key socio-economic variables used in the study is given in the session (Table 1). The variables are tabulated based on strata (refer methodology). A detailed summary of different variables used for different objectives of the study would be given under different chapters.



TABLE 1. SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLDS

(1)	Strata1 (2)	Strata2 (3)	Strata3 (4)	Strata4 (5)
Caste				
General	10.69	10.29	12.88	21.74
OBC	51.91	50.00	53.03	52.90
ST	14.50	9.56	12.12	5.80
SC	22.90	30.15	21.97	19.57
Household type				
Nuclear	68.18	58.70	61.36	63.04
Joint	31.82	41.30	38.64	36.96
Household members*	5.86	5.60	5.55	5.69
House type				
Kuccha	45.80	40.15	33.08	37.23
Semi kuccha	32.06	41.61	49.23	40.88
Pucca	22.14	18.25	17.69	21.90
Livestock units*	1.79	1.31	1.39	1.56
Agricultural asset* value	13,617.65	9,680.93	10,056.64	14,038.65
Non-agricultural asset value*	29,194.60	16,050.27	16,031.63	29,643.10
Migrant	18.94	10.14	13.64	20.29
Land owned	0.45	0.54	0.31	0.57

Note: Variables \* are average values, others are in percentages.

Majority of the households belong to OBC category. The share of disadvantaged groups (SC/ST) is higher among SHG households (both seed and non-seed). About 63 per cent of the households are nuclear family but the share was higher among SHG households in treatment region. But the average number of household members showed pattern in reverse direction to that of family type. The average members were higher in non-seed member SHG households, SHG households and non-SHG households. Households across different strata possessed mainly semi-pucca houses. SHG households have better housing than non-SHG group in targeted region. Seed producers of SHG households had better housing than the non-seed producers of the same group. The livestock asset holding of the households were calculated by converting different types of households into Livestock Units (LSU). Average LSU was higher among SHG households compared to non-SHG households in non-targeted region. While it was vice versa in targeted region. The SHG households are well-off compared to non-SHG households in both agricultural and non-agricultural assets in target region and vice-versa in non-targeted region. The average value of agricultural assets was higher in seed producer of seed-SHG households compared to non-seed SHG in targeted region, while the average value of non-agricultural assets was higher in non-seed SHG compared to seed-SHG households. Higher share of migrant members was found in SHG households in targeted regions and vice versa in non-targeted region. The average land holding was higher in non-SHG members in treatment and control regions.

### 3.2 Willingness to Participate

The women SHG members and women spouse of the primary decision maker (non-SHG households) when questioned whether they are willing to participate in such a programme, about 48 per cent of the participants said they are willing to participate.

### 3.3 Willingness to Pay

Among the respondents who expressed their willingness to participate in such a programme, we estimated the extent to which they are willing to pay. In the existing programme the payment is done as 'X' times the quantity of seed given to them. We used Double Bound Contingency Evaluation Method to estimate the WTP.

TABLE 2. DESCRIPTION OF THE CONTROL VARIABLES USED IN THE ANALYSIS

Variables (1)	Type (2)	Description (3)
Age	Continuous	Age in number of years
Age square	Continuous	Square of ages to capture the exponential effect
Education	Dummy	1 if illiterate, 0=otherwise
Agriculture as primary occupation	Dummy	1 if primary occupation is agriculture, 0=otherwise
Primary decision maker in Agriculture	Dummy	1 if individual is primary decision maker in agriculture
Land owned by household	Continuous	Total land owned by the household
Extension contacts	Continuous	Total of contacts with agricultural extension members

One of the important bias arising in CVM studies is 'initial bid bias'. The initial bid offered has a profound influence on the estimate of willingness to pay. In contingent valuation format, it is suggested to have range of bid values and to randomise them to select the initial bid for each respondent. In our case, we had 10 values for initial bid 'X' (X is the quantity which the farmer is willing to pay back after the seed cultivation). In the present system, for rice they are paying '3X' quantity of seed and for wheat '2X'. So, to avoid an anchoring effect we increase the bids to a range till 10. The bids were drawn randomly in front of the SHG women or women member of the family (non-SHG households). Based on economic theory, as the bid quantity increases, the probability of getting 'No' responses increases. In CVM literature it is called 'The price test' (Carson *et al.*, 2001). Our study also shows a similar pattern with an exception for the bid at '10X' (Figure 5).

The willingness to pay was estimated using MLE and the estimated WTP was 11X (Table 3). The estimate was also statistically significant. As a reality check, we have also asked farmers an open ended question about how much they are willing to pay. The average value was 8.85, which is lower than the estimated value. This estimation could be used to understand the trade-off between the programme cost and benefits and assessing whether it is sustainable in the long run.

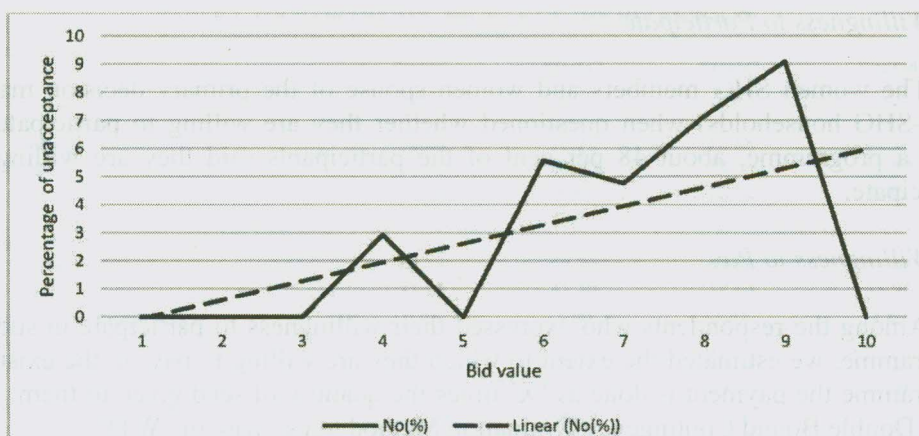


Figure 5. Distribution of Initial Bid and Corresponding Answer.

TABLE 3. ESTIMATED WILLINGNESS TO PAY FOR SEED

(1)	Coef.	Std. Err.	z	P>z	[95 per cent conf. interval]	
	(2)	(3)	(4)	(5)	(6)	(7)
WTP	11.093	1.300	8.530	0.000	8.545	13.640

The factors affecting farmers' willingness to pay was estimated using a simple linear regression model. The results are shown in Table 4. Age has shown a positive relationship while age square had shown a negative relationship. The coefficients of both the variables are very close to zero. Illiterate members had shown a negative relationship with WTP, while members who are engaged in agriculture as primary occupation had shown positive relationship. Members who are primary decision makers are showing negative relationship. Contact of members with extension agents was found to be a key variable and had shown positive relationship with WTP.

TABLE 4. FACTORS AFFECTING WTP FOR SEED

Variables	Coef.	Std. Err.	t	P>t	[95 per cent conf. interval]	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	0.005	0.002	2.090	0.038	0.000	0.009
Age square	-0.000	0.000	-2.020	0.045	0.000	0.000
Education	-0.064	0.010	-6.630	0.000	-0.083	-0.045
Agriculture as primary occupation	0.065	0.009	7.030	0.000	0.047	0.084
Primary decision maker in agriculture	-0.072	0.009	-7.760	0.000	-0.090	-0.053
Land owned by household	0.022	0.007	3.310	0.001	0.009	0.035
Extension contacts	0.112	0.006	18.130	0.000	0.100	0.125
Constant	0.408	0.049	8.320	0.000	0.311	0.505

Note: Number of observations=185, Prob> F=0.0000, R-squared = 0.7288, Adj R-squared=0.7180.

## IV

## CONCLUSION

The willingness to pay for participating in community-based seed production programme was found to be higher than the existing rate. Farmers were willing to payback 11 times the amount of foundation seed they received as payment, which is higher than existing structure of 3X. Due to unavoidable strategic bias inherent in the CVM, the willingness to pay can be higher than the actual amount participants are willing to pay. Even after taking a conservative stand on the estimates, we could draw two main inferences from the study. First, the seed production programme is benefitting the farmers in its present form. Then only the willingness to pay can be higher than the existing rate. Second, the payment for foundation seed can be increased moderately after due consideration is given to the cost of running the programme. This will reduce the subsidy burden on the donor and also make the programme self-sustaining in the long run.

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