Analysis of Farmers’ Willingness to Pay and the Feasibility of Household Irrigation Technologies

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ILSSI Stakeholder Consultation - International Livestock Research Institute, Addis Ababa - 24th May 2018

Photo: Desalegne Tadesse/IWMI
Background

- 4 type of irrigation technologies field tested in 4 sites

**Pulley**
- Cost: 1350 Birr/unit including tanker and hose
- Vegetable and fodder

**Rope & Washer**
- Cost: 4000 Birr/unit
- Vegetable, fruit and fodder

**Solar pump**
- Cost: 8000 Birr/unit
- Water application: Drip, hose, furrow
- Vegetable and fodder

**Petrol Pump**
- Cost 13000 Birr/unit
- Shared by 4 farmers
- Vegetable for market
Research objectives

To answer the following research questions.

1. What is the average amount that farmers are willing to pay for household level water lifting irrigation technologies?

2. Whether the feasibility/profitability of the technology has a relationship with the average willingness to pay? if not,

3. What other factors affect farmers’ willingness to pay?
Methodology

Data and data source

- Survey data from 400 farmers drawn from four research sites in Ethiopia.

- 143 households (48 female headed) are project target households.

- 184 of the sample households have adopted at least one or a mix of household-level water lifting irrigation technologies, including
Methodology

- A **contingent valuation** method (CVM) was used
- Two price bids
- The **second bid is contingent** upon the response to the first bid.

- The respondent is engaged in **two rounds of bidding** where she/he is asked to respond **yes** or **no** to a stated sum of initial bid and then the second bid will **increase** or **decrease**, respectively

- So, the price elicitation format is **double-bounded dichotomous choice method**
Methodology

- If the agent responds "yes" to the first bid ($\beta_i$), the second bid ($\beta_i^u$) is greater than the first bid:

  \[(\beta_i < \beta_i^u)\]

- On the other hand, if the agent responds "no" to the first bid ($\beta_i$), the second bid ($\beta_i^d$) is smaller than the first bid:

  \[(\beta_i^d < \beta_i)\]

- Accordingly, there are four possible outcomes:
Initial bids are price/cost of the technology (example, R&W costs 4000 Birr)

- Initial bid
  - Yes
    - Initial bid accepted
      - Follow up bid
        - Yes
          - AWTP
            - >=4500
        - No
          - Follow up bid accepted
            - 4500 Birr
              - Yes
                - AWTP
                  - 4000-4500
              - No
                - Follow up bid accepted
                  - 3500 Birr
                    - Yes
                      - AWTP
                        - 3500-4000
                    - No
                      - Follow up bid accepted
                        - 0-3500
Results - Proportion of sample households willing to pay a bids price

- Not willing to pay the minimum bid price (0-3500)
- Willing to pay between the minimum and initial bid prices (3500-4000)
- Willing to pay between initial and higher bid prices (4000-4500)
- Willing to pay greater higher bid price (>4500)
**Results** - Farmers’ average willingness to pay and cost of technologies

- **AWTP** ranges between 69 to 90 percent of the actual cost.
Feasibility/profitability of technologies depend on crop type, water application and location.

No relationship between farmers AWTP and feasibility/profitability of the technology.

![Graph showing NPVs for different technologies and crop types](image-url)
Farmers’ WTP is influenced by a host of factors ranging from demographic to socioeconomic and farm specific factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>R&amp;W</th>
<th>Pulley</th>
<th>Petrol pump</th>
<th>Solar pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-11</td>
<td>-0</td>
<td>-84***</td>
<td>-15</td>
</tr>
<tr>
<td>Literacy/numerical skills</td>
<td>607</td>
<td>135</td>
<td>1069</td>
<td>2329***</td>
</tr>
<tr>
<td>Distance to microfinance</td>
<td>-6***</td>
<td>-2***</td>
<td>-36****</td>
<td>3</td>
</tr>
<tr>
<td>Applied for credit</td>
<td>459**</td>
<td>161***</td>
<td>1377*</td>
<td>1364***</td>
</tr>
<tr>
<td>Distance to market</td>
<td>-10***</td>
<td>-4***</td>
<td>-44***</td>
<td>-41***</td>
</tr>
<tr>
<td>Irr. experience (1=yes)</td>
<td>-681**</td>
<td>-169*</td>
<td>3363***</td>
<td>2189***</td>
</tr>
<tr>
<td>Land holding (ha.)</td>
<td>-2333***</td>
<td>-380</td>
<td>-3150</td>
<td>1066</td>
</tr>
<tr>
<td>Agricultural income</td>
<td>0.174***</td>
<td>0.043***</td>
<td>0.364**</td>
<td>0.306**</td>
</tr>
<tr>
<td>Groundwater (1=yes)</td>
<td>857***</td>
<td>168*</td>
<td>2753**</td>
<td>1250*</td>
</tr>
</tbody>
</table>
Key Messages

1. Farmers are willing to pay for household irrigation technologies
   - But, support/subsidize/tariff is important for successful adoption and scaling-up

2. An income based differential approach of support/subsidize is advisable
   - Income based differential approach can:
     - Ensure most households have the ability to pay.

   - Uniform support mechanism could be:
     - Discouraging and creates income inequality as the poor cannot afford
3. Investment need to be **resource and objective** based

**Manual pumps**
- Often used for multiple uses
- Used for homestead irrigation
- Too small to produce surplus for the market,
- Improve household consumption
- Women tend to control income from

**Motorized pumps**
- More market-oriented
- Surplus production for the market
- 0.25 ha. is the minimum threshold for financially viable investment in motor pump
## Production and consumption by technology

<table>
<thead>
<tr>
<th>Variables</th>
<th>Petrol pump</th>
<th>Manual pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of income from irrigated agriculture (Birr/ha)</td>
<td>11142</td>
<td>4760</td>
</tr>
<tr>
<td>Value of per adult annual food consumption (Birr)</td>
<td>4094</td>
<td>6708</td>
</tr>
</tbody>
</table>
Key Messages

4. Investment in education and training of farmers can accelerate the adoption/scaling up of technology,
   - It increases their ability to access, analyze and efficiently use information.

5. Improve access to credit, extension services and markets
THANK YOU!