**Farmers’ heterogeneous preferences for traits of improved varieties: Informing demand-oriented crop breeding in Tanzania**

**Supplementary material**

**Instruction for the choice experiment** (Please read the following aloud to the respondent)

We are going to ask you a few questions about whether you would choice to purchase a number of groundnut seed varieties with different seed attributes at a particular price level. The groundnut seeds are arranged in 6 different decision sets. This purchase is hypothetical, that is, you do not actually pay money when you indicate a particular purchase preference. But we would like you to make a choice in each decision scenario as if you were facing them in real life seed markets. In each scenario, there are two groundnut seed varieties and you may choose any or none of them. When making your choice, assume that all the unstated attributes of groundnut varieties are the same for the two presented varieties.

**Consequentiality clause**

Because the purchase decision is hypothetical, it might be possible that people would respond in one way but act differently. A common observation is that one states a higher willingness to pay than what he/she is willing to pay for the seed in the market. In order to avoid this situation, we ask you to respond to each of the following choice questions just exactly as you would if you were really in a seed market and were going to face the consequences of your decision—which is to pay money if you decide to buy the seed variety within your budget constraint. There are no right or wrong answers, and your honest responses will be useful for policymakers, breeders and seed companies and businesses in Tanzania to develop and produce new groundnut varieties that can satisfy farmer preferences at reasonable prices.

**Description of the attributes of the groundnut seed**

**Yield:** The output of the seed that is measured in tons per hectare and takes three levels.

* 0.5 tons: A variety that has a potential to produce 0.5 t/ha
* 1.5 tons: A variety that has a potential to produce 1.5 t/ha
* 2.5 tons: A variety that has a potential to produce 2.5 t/ha

**Maturity:** This refers to the number of days a variety takes to mature**.** It assumes three levels.

* 95 days: 95 days to maturity
* 115 days: 115 days to maturity
* 125 days: 125 days to maturity

**Grain price**: This refers to the groundnut grain market price per kilogram. It takes three levels

* Grain price 1000: Grain market price of 1000 Tsh/kg
* Grain price 2500: Grain market price of 2500 Tsh/kg
* Grain price 4000: Grain market price of 4000 Tsh/kg

**Color:** The color of the groundnut seed and assumes two levels

* Tan color: Groundnut seeds that are tan in color
* Red color: Groundnut seeds that are red in color

**Tolerance**: Tolerance of groundnut seed to drought, pest and diseases. It takes two levels

* Tolerant: Seed varieties that are tolerant to drought, pest and diseases
* Not tolerant: Seed varieties that are susceptible to drought, pest and diseases

**Seed price.** The seed market price per kilogram. It takes four levels:

* Seed price 2500: Seed market price of 2500 Tsh/kg
* Seed price 3500: Seed market price of 3500 Tsh/kg
* Seed price 4500: Seed market price of 4500 Tsh/kg
* Seed price 6000: Seed market price of 6000 Tsh/kg

Table A1. Example of choice task presented to respondents

|  |  |  |  |
| --- | --- | --- | --- |
| **Attributes** | **Variety 1** | **Variety 2** | **Neither 1 or 2** |
| Yield | 0.5 | 1.5 |  None of the alternatives |
| Maturity | 95 | 115 |
| Grain price | 2500 | 1000 |
| Colour | Red | Tan |
| Tolerance | Tolerant | Tolerant |
| Seed price | 2500 | 3500 |
| **Which one would you choose?** |  |  |  |

*Source*: Constructed by authors.

Table A2. Regression results of the LCA with four classes and without class membership

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **Class 1** | **Class 2** | **Class 3** | **Class 4** |
| **Mean of estimates** | **Coefficient** | **SE** | **Coefficient** | **SE** | **Coefficient** | **SE** | **Coefficient** | **SE** |
| Color of groundnut grain is red, yes=1 | 0.085 | 0.072 | -0.113 | 0.169 | -0.326 | 0.217 | 1.784\*\*\* | 0.232 |
| Variety is tolerant, yes=1 | 1.088\*\*\* | 0.074 | -0.368 | 0.259 | 0.922\*\*\* | 0.218 | 2.317\*\*\* | 0.248 |
| Yield in tons per hectare (ref: 0.5) |  |  |  |  |  |  |  |  |
| Yield is 1.5  | 0.869\*\*\* | 0.068 | 0.151 | 0.227 | 1.123\*\*\* | 0.270 | 0.175 | 0.154 |
| Yield is 2.5  | 0.973\*\*\* | 0.076 | 0.324 | 0.288 | 1.554\*\*\* | 0.272 | 2.578\*\*\* | 0.272 |
| Grain price (Tsh/kg) (ref: 1000)  |  |  |  |  |  |  |  |  |
| Grain price is 2500 | 0.083 | 0.086 | 1.869\*\*\* | 0.283 | -0.476\* | 0.276 | 1.050\*\*\* | 0.179 |
| Grain price is 4000 | 0.087 | 0.097 | 2.711\*\*\* | 0.305 | -0.345 | 0.242 | 0.272\* | 0.156 |
| Number of days to maturity (ref:125) |  |  |  |  |  |  |  |  |
| Maturity is 115 | -0.044 | 0.075 | 0.665\*\*\* | 0.228 | -0.226 | 0.224 | 2.217\*\*\* | 0.314 |
| Maturity is 95 | -0.116 | 0.073 | 0.232 | 0.200 | -0.988\*\*\* | 0.272 | 1.538\*\*\* | 0.253 |
| Seed price (Tsh/kg) (ref: 2500) |  |  |  |  |  |  |  |  |
| Seed price is 3500 | 1.081\*\*\* | 0.096 | 0.819\*\*\* | 0.150 | -1.355\*\*\* | 0.292 | -1.960\*\*\* | 0.289 |
| Seed price is 4500 | 0.788\*\*\* | 0.089 | 1.194\*\*\* | 0.252 | -2.264\*\*\* | 0.324 | -1.764\*\*\* | 0.366 |
| Seed price is 6000 | 0.736\*\*\* | 0.082 | 0.429\*\* | 0.187 | -1.964\*\*\* | 0.316 | 0.147 | 0.181 |
| Number of respondents  | 1,299 |  |  |  |  |  |  |  |
| Number of observation | 23,382 |  |  |  |  |  |  |  |
| Log-likelihood  | -5,950 |   |   |   |   |   |   |   |

*Note*: \*\*\*, \*\*, and \* represent statistical significance at 1%, 5%, and 10% level, respectively. SE represents standard errors.

Table A3. Characterization of the classes by their socioeconomic characteristics

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Socioeconomic characteristics | Class 1 | Class 2 | Class 3 | Class 4 | Pooled significance |
| Household head is female  | 0.47a | 0.48a | 0.42b | 0.49ac | 0.47\*\*\* |
| Age of household head | 46.4a | 42.9b | 45.3c | 43.7d | 45.10\*\*\* |
| Years of formal education in years  | 5.96a | 6.10b | 6.40c | 6.32c | 6.08\*\*\* |
| Total land owned | 7.32a | 7.40a | 9.00b | 6.93ab | 7.34\*\*\* |
| Household size in adult equivalent | 3.38a | 3.52b | 3.24c | 3.56bd | 3.43\*\*\* |
| Total Livestock Unit (TLU) | 2.31a | 0.53b | 1.29ab | 1.17bc | 1.69\*\*\* |
| Access to extension services | 0.51a | 0.67b | 0.82c | 0.52a | 0.56\*\*\* |
| Access to credit | 0.11a | 0.12a | 0.02b | 0.11a | 0.11\*\*\* |
| Membership to farmer groups | 0.28a | 0.32b | 0.15c | 0.22d | 0.28\*\*\* |
| Access to market | 0.74a | 0.88b | 0.73a | 0.80c | 0.79\*\*\* |
| Household is poor category | 0.41a | 0.40a | 0.58b | 0.34c | 0.40\*\*\* |
| Household is poorest category | 0.20a | 0.20a | 0.37b | 0.16c | 0.20\*\*\* |
| Aggregate class size (%) | 0.55 | 0.20 | 0.05 | 0.20 |  |

Note: \*\*\* represents statistical significance at 1% level. Averages with similar superscriptsimply no statistically significant difference between the classes (e.g., total land owned between class 1 and class 4; household size between class 1 and class 3). On the other hand, averages with different superscripts imply significant statistical difference between the classes (e.g., total land owned between class 1 and class 2; household size between class 1 and class 4).