KNOW WHAT YOU SOW:
THE COST OF SEED TYPE MISIDENTIFICATION IN TANZANIA

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Introduction

> Agricultural productivity in Sub-Saharan Africa (SSA) remains far below other developing regions (ERS, 2019, World Bank, 2019).

> Increases in output and total factor productivity (TFP).

> Use of improved seeds in Eastern Africa is still low (Smale et al, 2013).

> Farmers misidentify seed (Wossen et al., 2018, Wineman et al., 2018).

> Inputs allocations related to perceived adoption status.

> Purpose of this work is to estimate the cost of misidentification.
Model

- Estimation of a semi-translog maize yield production function (TL):

\[ y_i = a_0 + \sum_{j=1}^{4} b_j x_{ij} + \frac{1}{2} \sum_{j=1}^{4} c_{jj} x_{jj}^2 + \sum_{j=1}^{4} \sum_{k>j}^{4} c_{jk} x_{ij} x_{ik} + \sum_{j=1}^{4} d_j x_{ij} + e w_i + \sum_{j=1}^{2} f_j s_{ij} + v_i - u_i \]

- Stochastic Frontier Approach (SFA).

- Battese and Coelli (1995) specification for Technical Efficiency (TE)

- Cost of seed misidentification (CSM):

\[ CSM_i = \frac{y_i}{TE_i} \cdot (\overline{TE}^{id} - \overline{TE}^{mis}) \cdot p_{maize} \]

Potential Yield  Efficiency Differential  Price of Maize

\[ CSM_i = \frac{1,375}{.47} \cdot (.55 - .45) \cdot .25 = .73 \]
Data

> Our sample consists of 803 observations on maize yield, inputs used, reported and actual type of seed, and farmer’s characteristics.

> 2016 Varietal Monitoring for Realized Productivity and Value in Tanzania Baseline Survey (Tegemeo).

> DNA fingerprinting tests were performed on sampled seeds (DArT & MARI).
Data (cont.)

> Seed type misidentification:

<table>
<thead>
<tr>
<th>DNA test</th>
<th>Reported</th>
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<tbody>
<tr>
<td></td>
<td>Local</td>
<td>Improved</td>
</tr>
<tr>
<td>DNA test</td>
<td>Local</td>
<td></td>
</tr>
<tr>
<td></td>
<td>True negative 14.11%</td>
<td>False positive 15.22%</td>
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<tr>
<td></td>
<td>False negative 12.75%</td>
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<tr>
<td></td>
<td>True positive 57.92%</td>
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> Efficiency variables: education, age and gender of primary decision maker, household has accessed to extension services or has cell phone, farm size and proportion of crop value sold.
Results

> On average, farmers are producing 50.6% of the potential output.

> Farmers that misidentified the type of seed planted are less efficient than those that correctly identified it.

<table>
<thead>
<tr>
<th>Average technical efficiency</th>
<th>Reported</th>
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<tbody>
<tr>
<td>DNA test</td>
<td></td>
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<tr>
<td>Local</td>
<td></td>
</tr>
<tr>
<td>True negative 0.505</td>
<td>False positive 0.461</td>
</tr>
<tr>
<td>Improved</td>
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<tr>
<td>False negative 0.474</td>
<td>True positive 0.530</td>
</tr>
</tbody>
</table>
Results

> False negative farmers are, on average, .038 points less efficient than true negative farmers.
  > This represents a loss of $26.2 per hectare (~8% of its income).

> False positive farmers are, on average, .063 points less efficient than true positive farmers.
  > This represents a loss of $51.2 per hectare (~13% of its income).

> Education of the Primary DM and share of the crop sold are positively related with efficiency.

> Size of the farm is negatively related with efficiency.
Conclusions

> We quantify the loss in yield and revenue related to the technical inefficiency that arises from seed type misidentification.

> Farmers that fail to identify the type of seed they use have a revenue loss per hectare of $26 - $51, or between 8% and 13% of their income.

> Education of the Primary DM and share of crop sold have positive effect on efficiency, while size of the farm has a negative effect.

> These estimates give us a lower bound measure of the potential gains of policies that promote correct identification.
Thank you

Please direct comments or questions about this research to Federico Trindade at Federico.epar@gmail.com.

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