Socio-economic factors influencing productivity of cassava farmers in E. Africa

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Socio-economic factors influencing productivity of cassava farmers in E. Africa

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Introduction

- World production of cassava is about 250 million tonnes (FAO, 2015)
- Africa contributes 55% of global supply
- Major staple crop contributing greatly to food security in Africa
  - About 200 million people in East/Central Africa depend on cassava
- Cassava yields in Africa are the lowest in the world (10 t/ha compared to 26 t/ha in India)
Cassava production in East Africa

Source: FAOSTAT (2015)
The problem being addressed?

• The whitefly (*Bemisia tabaci*)
• Vector of significant viruses
• Cassava brown streak disease (CBSD)
• Cassava mosaic disease (CMD)
  • Production losses in East and Central Africa estimated as high as 47%, equivalent to more than US$ 1.25 Billion per year (Legg et al., 2009)
Research questions

• What is the present status of cassava production/productivity in Uganda, Tanzania and Malawi?
• What is the current adoption rate of improved cassava production technologies?
• What is the economic impact of the whitefly on smallholder farmers?
Methods

• Literature review
• Questionnaire development
  • Pre-survey workshops
  • Pilot surveys
• Farmer surveys using multi-stage random sampling procedures
  • A total of 800 farmers interviewed in Uganda and Malawi

• Economic models
  • Gross margin analysis
  • Stochastic production frontier
  • Tobit adoption model
Stochastic production frontier model

\[ Y_j = f(X_j, \beta) \exp(v_j - u_j) \]  \hspace{1cm} (1)

\[ \ln y_j = \beta_0 + \sum_i \beta_i \ln x_{j,i} + \frac{1}{2} \sum_i \sum_k \beta_{i,k} \ln x_{j,i} \ln x_{j,k} + v_j - u_j \]  \hspace{1cm} (2)

\[ u = z\delta + w \]  \hspace{1cm} (3)

Where: \( Y_j \) is the cassava output produced by farmer \( j \),
\( X_j \) is a vector of inputs,
\( V_j \) is the stochastic error term, \( N(0, \sigma^2_v) \);
\( U_j \) represents technical inefficiency of the farmer \( j \). \( Z \) is a vector of farmer-specific variables which influence the farmers efficiency and \( \omega \) is a matrix of random error terms, \( N(0, \sigma^2_w) \)
Preliminary results from Malawi

• What are the main constraints you face in producing cassava?

- Pests & diseases
- Lack of good quality planting materials
- High labour costs
- Drought
- Lack of capital
- Low produce prices
- Inferior/low yielding variety
- Deteriorating land & soil conditions
- Lack of market information
- Other
- Lack of credit facilities
- Bulkiness to transport to market/perishability
- Lack of technologies for processing
- Poor transport infrastructure
What pests of cassava do you **actively** manage for?

- None: 29%
- Whitefly: 18%
- Mealy Bug: 18%
- Goats: 13%
- Grasshopper: 12%
- Pigs: 12%
- Termites: 2%
- Green mite: 1%
- Cows: 1%
- Donkey: 1%
- Sheep: 1%
- Snails: 0%
- None: 29%
What diseases do you **actively** manage for?

- **None**: 59%
- **CBSD**: 15%
- **CMD**: 20%
- **Other**: 6%
Farmers perception of whitefly impacts

- Do you think you could estimate the impact of the whitefly on your household?
  - Yes: 43%
  - No: 57%

- What is the impact of the whitefly on cassava yields?
Farmers perception of CMD impacts

• Do you have CMD in your fields?
  • Yes: 67%
  • No: 33%
• What is the average reduction in income from CMD?
Farmers perception of CBSD

• Do you have CBSD in your cassava fields?
  • Yes: 57%
  • No: 43%

• What is the average reduction in income that you get from CBSD?
## Cost and returns from improved cassava (Malawi)

<table>
<thead>
<tr>
<th></th>
<th>1 hectare, US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue (TR)</td>
<td>$2,234</td>
</tr>
<tr>
<td>Variable costs</td>
<td></td>
</tr>
<tr>
<td>Cassava cuttings</td>
<td>$56</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>$30</td>
</tr>
<tr>
<td>Labour</td>
<td>$492</td>
</tr>
<tr>
<td>Transportation</td>
<td>$42</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$40</td>
</tr>
<tr>
<td>Total variable cost (TVC)</td>
<td>$661</td>
</tr>
</tbody>
</table>

Source: Field surveys, Malawi, 2015
Cost and returns from cassava (cont.)

<table>
<thead>
<tr>
<th>Description</th>
<th>1 hectare, US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed costs</td>
<td></td>
</tr>
<tr>
<td>Depreciation on farm tools @10%</td>
<td>$10</td>
</tr>
<tr>
<td>Depreciation on land@5%</td>
<td>$20</td>
</tr>
<tr>
<td>Total fixed cost (TFC)</td>
<td>$30</td>
</tr>
<tr>
<td>Total cost (TVC+TFC)</td>
<td>$690</td>
</tr>
<tr>
<td>Gross margin</td>
<td>$1,574</td>
</tr>
<tr>
<td>Net farm income (TR-TC)</td>
<td>$1,549</td>
</tr>
<tr>
<td>Benefit: cost ratio (TR/TC)</td>
<td>3:1</td>
</tr>
</tbody>
</table>

Source: Field surveys, Malawi, 2015
## Stochastic production frontier (Malawi)

<table>
<thead>
<tr>
<th></th>
<th>Coefficients/s.e.</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9.98 (0.58)***</td>
<td>7.02</td>
</tr>
<tr>
<td>Area planted</td>
<td>0.61 (0.12)***</td>
<td>8.73</td>
</tr>
<tr>
<td>Labour</td>
<td>0.47 (0.11)***</td>
<td>4.33</td>
</tr>
<tr>
<td>Cassava cuttings</td>
<td>0.32 (0.06)***</td>
<td>5.11</td>
</tr>
<tr>
<td>Fertilizer and other agrochemicals</td>
<td>0.42 (0.19)***</td>
<td>2.11</td>
</tr>
<tr>
<td>Sigma-squared</td>
<td>2.96 (0.47)</td>
<td></td>
</tr>
<tr>
<td>Gamma (γ)</td>
<td>0.89 (0.20)***</td>
<td></td>
</tr>
<tr>
<td>Log-likelihood function</td>
<td>-345</td>
<td></td>
</tr>
<tr>
<td>LR Statistic</td>
<td>82.11</td>
<td></td>
</tr>
</tbody>
</table>
Mean technical efficiency

• Mean technical efficiency is low at 0.4
• Cassava farmers in Malawi not making the best use of inputs
• Results suggest significant room for improvement
Summary

- Productivity of smallholder cassava farmers is undermined by the whitefly and associated diseases
- Improved cassava varieties generate a good rate of return
- Mean technical efficiency is low and farmers are not making best use of inputs
- Our results are consistent with other studies (e.g. Alene et al., 2013)
- Field trials?
Acknowledgement

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Thank you

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