Can Bt Technology Reduce Poverty Among African Cotton Growers? An Ex Ante Analysis of the Private and Social Profitability of Bt Cotton Seed in Mozambique

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Presentation Outline

• Introduction
  – Objectives

• Data Sources

• Methods

• Results

• Conclusions, Policy Implications, and Suggestions for Further Research

• Limitations of the Study
Introduction

• Cotton in Africa
  – Produced by low-income smallholders;
  – Can play a strategic role in rural poverty reduction strategies;

• Bt cotton
  – Widespread introduction of Bt technology has led to rapid growth in average world cotton yields;
  – Notably China and India have participated in the boom;
  – But, African countries have so far passed up the opportunity;
  – Several ex ante studies have predicted significant yield improvement and income gains if African farmers were to adopt Bt;
  – But, the lack of effective bio-safety and legal frameworks is the main barrier

Objective

• Ex ante analysis of the financial and economic profitability of Bt cotton

  – Hypothesis:
    • The introduction of Bt cotton would improve farm-level profitability of cotton, and

    • Contribute to Government’s poverty reduction objectives
Data Sources

- A data set of 316 cotton-growing households collected by Strasberg in the mid-1990s from two outgrower schemes:
  - Monapo District, Nampula Province, and
  - Montepuez District, Cabo Delgado Province
  - Farmers were visited five times during the growing season,
  - Detailed information on the cost of production,

- Information on farmers’ pest management practices was collected in 2003:
  - Entomologists and other crop specialists

Methods

1. Explaining the Variation in Yield with a Simple Multivariate Model

- Yield is posited to be a function of:
  - crop management,
  - plot characteristics,
  - perceived weather,
  - perceived pest infestation, and
  - village effects.

- Cobb-Douglas specification in terms of logarithms of the dependent and continuous independent variable
2. Estimating on-farm profitability With Partial Budget (1/2)

2.1 Financial Analysis:

- Increased yield evaluated at $0.21/kg,
- A reduction of 1.5 sprays,
- Total technology costs assigned at $50.00,
- Savings in sprays is evaluated at a subsidized cost of $3.31/application,
- A 5% unsprayed embedded refuge (at equivalent production loss)
2. Estimating on-farm profitability With Partial Budget (2/2)

2.2 Economic Analysis:

- All costs and benefits and use undistorted international prices to reflect scarcity value,

- increase the price of seed cotton to US$0.29 per kg (fully liberalized output market in the region),

- value pesticide at international market prices (subsidies in Mozambique),

- pesticide savings generate a health benefit, equivalent to 50% of the value of cost savings on insecticides.

Bt Cotton Profitability

<table>
<thead>
<tr>
<th>Item</th>
<th>Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Financial</td>
</tr>
<tr>
<td>Additional benefits</td>
<td></td>
</tr>
<tr>
<td>Yield ($/ha)</td>
<td>42.00</td>
</tr>
<tr>
<td>Increased production (kg/ha)</td>
<td>200</td>
</tr>
<tr>
<td>Seed cotton price ($/kg)</td>
<td>0.21</td>
</tr>
<tr>
<td>Savings in insecticide cost ($/ha)</td>
<td>5.00</td>
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<tr>
<td>Health ($/ha)</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>47.00</strong></td>
</tr>
<tr>
<td>Additional costs</td>
<td></td>
</tr>
<tr>
<td>Seed ($/ha)</td>
<td>50.00</td>
</tr>
<tr>
<td>Refuge ($/ha)</td>
<td>2.50</td>
</tr>
<tr>
<td>Harvesting ($/ha)</td>
<td>5.00</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>57.50</strong></td>
</tr>
<tr>
<td><strong>Net benefit ($/ha)</strong></td>
<td><strong>-10.50</strong></td>
</tr>
</tbody>
</table>

Source: Authors' computations
Key findings

Financial viewpoint of the farmer:
- Bt cotton does not generate enough revenue to cover the technology fee of $50.00/ha
- The yield advantage to Bt cotton would have to approach 70% at a base yield level of 800 kgs/ha

• Causes:
  - Low output prices, and
  - The relatively high technology fee (poor cotton farmers).

The viewpoint of society:
- The value of Bt cotton is considerably higher.

Conclusions, Policy Implications, and Further Research (2/2)

• Mozambique should **NOT** ‘go slow’ on bio-safety regulations,

• Social profitability of Bt higher than its private profitability,

• Field testing is a first necessary measure.

• Expected profitability is particularly sensitive to assumptions about the technology fee
Limitations

Findings are based on several strong assumptions:

• uncertainty concerns the yield advantage of Bt cotton
  – farmers who did not spray > who sprayed once

• Assumptions:
  – low levels of infestation were partially responsible for the absence of
    pesticide application, and
  – infestation levels from bollworm species could be lower than in more
    conventional contiguous cultivation

• More research on the spatial and temporal incidence of bollworm
  infestation

Thank You

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