

# **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

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# 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

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## 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

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# 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

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# 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

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# Bt cotton Yield

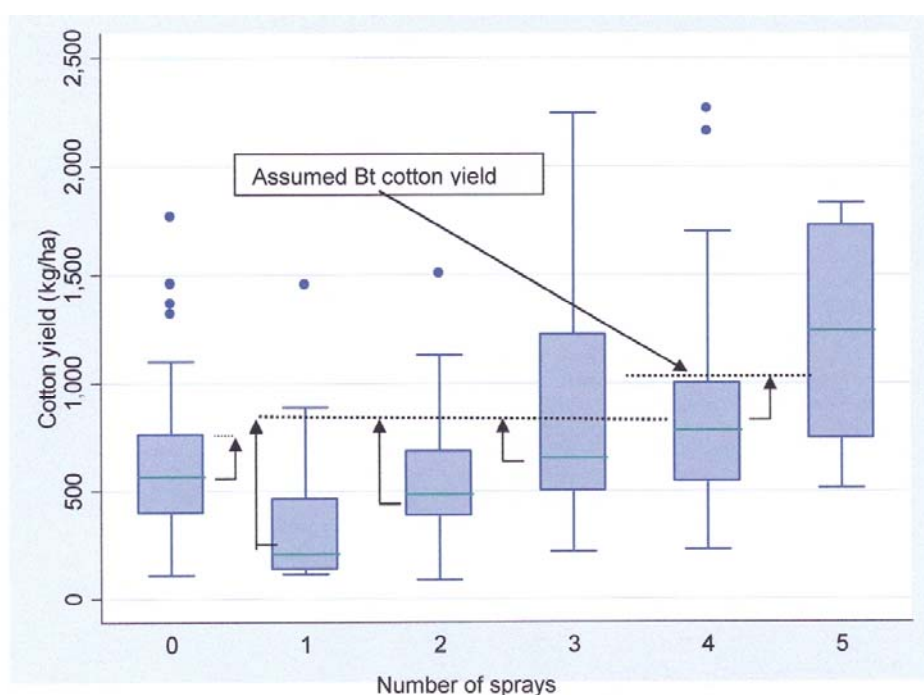


Figure 1. The distribution of predicted seed cotton yields by spray group targeted at chewing pests and assumed levels of Bt Cotton yield.

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## 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)

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## 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.

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## Bt Cotton Profitability

Item	Profitability	
	Financial	Economic
Additional benefits		
Yield (\$/ha)	42.00	58.00
Increased production (Kg/ha)	200	200
Seed cotton price (\$/Kg)	0.21	0.29
Savings in insecticide cost (\$/ha)	5.00	14.00
Health (\$/ha)	0.00	7.00
<b>Total</b>	<b>47.00</b>	<b>79.00</b>
Additional costs		
Seed (\$/ha)	50.00	50.00
Refuge (\$/ha)	2.50	2.50
Harvesting (\$/ha)	5.00	5.00
<b>Total</b>	<b>57.50</b>	<b>57.50</b>
<b>Net benefit (\$/ha)</b>	<b>-10.50</b>	<b>22.50</b>

Source: Authors' computations

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# 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.

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## 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

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# 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

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***Thank You***

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