Burkina Faso’s Bt cotton Reversal

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GM Crops – Needed to help poor farmers

“Europe’s attitude to GM is interpreted as a sign that the technology is dangerous. And this can generate unwarranted resistance to the technology in the parts of the world that most need access to agricultural innovations.”

– Owen Patterson, June 20th, 2013

"In a continent that is hungry, the GM debate should be very different. The technology provides one of the best ways to substantially increase agricultural productivity and thus ensure food security to the people...”

Blaise Compaore,
Ex-President of Burkina Faso
Outline

• **Bt cotton in Burkina Faso**

• **Burkina Faso’s reversal**
  - Lint quality
  - Farmer choice / labor / yields

• **Take-aways from Burkina Faso and Bt cotton**
  - Institutions matter
  - Private imperative
  - Concentration of power

• **Issues with GM crop evaluations**
  - Embeddedness
  - (Double) counterfactual
  - Silver bullet paradox
Bt Cotton in Africa

South Africa, 1998
• Mostly commercial farmers
• 600 small-scale Bt cotton farmers

Burkina Faso, 2008
• Primarily small-scale farmers
• ~100,000 Bt cotton farmers; 70% of total cotton production (2013)

Sudan, 2013
• Large-scale commercial farmers
Bt Cotton Timeline in Burkina Faso

- Bt cotton field trials

|------|------|------|------|------|------|

Sources: Sofitex, Ecobank Research.
Bt Cotton Timeline in Burkina Faso

- Bt cotton field trials
- Backcross to local varietals
Bt Cotton Timeline in Burkina Faso

- 2003: Bt cotton field trials
- 2006: Backcross to local varietals
- 2008: Bt cotton released to farmers
- 2013 - 2016: Additional years with Bt cotton production data

Sources: Sofitex, Ecobank Research.
Bt Cotton Timeline in Burkina Faso

2003: Bt cotton field trials
2006: Backcross to local varietals
2008: Bt cotton released to farmers
2013: 70% of total production is Bt cotton
2015: 
2016: 

Sources: Sofitex, Ecobank Research.
Bt Cotton Timeline in Burkina Faso

- **2003**: Bt cotton field trials
- **2006**: Backcross to local varietals
- **2008**: Bt cotton released to farmers
- **2013**: Begin phase-out of Bt cotton
- **2015**: 70% of total production is Bt cotton
- **2016**:
Bt Cotton Timeline in Burkina Faso

- **2003**: Bt cotton field trials
- **2006**: Backcross to local varietals
- **2008**: Bt cotton released to farmers
- **2013**: Begin phase-out of Bt cotton
- **2015**: 70% of total production is Bt cotton
- **2016**: 100% of cotton conventional

Sources: Sofitex, Ecobank Research.
Quality = Burkina Faso’s comparative advantage

- Long fibers
- High fiber efficiency (ginning ratio)

Product of intentional breeding program

- French colonial origins; led to publicly funded, state-led efforts
- Multiple desired outcomes

Problems with quality

Burkinabè officials noticed declines in both staple length during the first years of commercial release. ̊ Monsanto skeptical, suggesting that these initial declines in staple ratios were due to exceptional water stress and other variations. ̊ But this deterioration in ginning ratios and staple length persisted over time. Reports from Burkinabè officials, which were corroborated by Figure 1. Ginning ratios in three African countries, 1980–2007 (Source: David L. Tschirley, Colin Poulton, and Patrick Labaste, ‘Organization and performance of cotton sectors in Africa: Learning from reform experience’ (World Bank, Washington, DC, 2009), pp. 180–1.

32. The Burkinabè cultivars in use were known to exhibit variance in ginning ratios due to environmental considerations. Dominique Dessauw and Bernard J. French-speaking Africa: Milestones and prospects, paper presented at the World Cotton Research Conference 4 (Omnipress, Lubbock, TX, 2008).
Bt Cotton and Poor Lint Quality

Shorter fibres
- 1/32 inch shorter
- In 2013, only 33% of total cotton fibre was classed as high quality;
  - Down from 80% in 2005

Lower cotton fiber efficiency
- Conventional varietals = 42%
- Bt varietals = approximately 40%

The new Bt varietals retained the lint quality characteristics of its Bt parent, NOT its Burkinabe parent
Burkina Faso’s cotton companies phase-out Bt cotton (2015)

- Sue Monsanto for $84 million USD
- BUT, many farmers wish to continue growing Bt cotton

Burkina Faso’s cotton sector

- Companies operate regional monopolies
- Control all seed distribution, input provisioning, cotton purchase and ginning
- Allows for stable credit; facilitates Bt cotton adoption
- Improvement from South Africa

BUT: Farmers lack choice of seed varietal
Burkina Faso, Bt Cotton, Yields and Labor

Some research points to yield and profit benefits of Bt cotton

- Higher seed costs
- Reduced pesticide usage
- Less pest damage
- Less labor
- Hectare-based pricing

Farmer Prices to Grow Cotton (per Hectare in US Dollars)

<table>
<thead>
<tr>
<th>Cotton type</th>
<th>Seed</th>
<th>Insecticide</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bt cotton</td>
<td>$60</td>
<td>$20</td>
<td>$80</td>
</tr>
<tr>
<td>Conventional cotton</td>
<td>$2</td>
<td>$60</td>
<td>$62</td>
</tr>
</tbody>
</table>

22 % increase in yields and 51% increase in profits for an ‘average’ farming household with 3 hectares

- BUT: derived from comparisons with ‘refugia’ (Glenn Stone)

Farmers principally desire Bt cotton due to labor savings; unclear yield or profit advantage
Burkina Faso, Bt Cotton, Conclusions

Private financing played large role in Bt cotton failure
• Rush to market
• Altered broad public breeding effort to singular focus – pest resistance

Institutions matter: Vertical integration attracted GM crop investment
• Credit facilitated adoption
• Concentrated power = abrupt phase-out

Reveals lack of farmer power in cotton sector
• No farmer input in GM crop approval, reversal or breeding program

Limited scope of GM crop analyses
• Little is know about the suite of impacts of GM crops
• Pattern: Quick judgment of success; use of narrow metrics
Issues with GM Crop Evaluations

Embeddedness: GM crops are part of larger social and ecological contexts profoundly affecting outcomes

Social contexts mediate outcomes: E.g., vertically integrated sectors
- Facilitate credit and adoption
- Forestalled farmer input and desires

Narrow indicators
- Average yield and profits
- Neglect differential impacts

Lack of longer time horizons
- Secondary pest and pest resistance
- Unintended consequences

High politicization and private investment impedes the study of GM crops
Issues with GM Crop Evaluations

Counterfactual: How to isolate the effects of the GM crop?

Selection bias
• GM crops adopters = more ‘productive’ farmers
• Leads to ‘productive’ bias of GM crop analyses

Cultivation bias
• Extra care given to GM crops

Double Counterfactual
• GM crop interventions are not compared with other interventions to boost yields and profits
  • E.g. Integrated pest and plant management techniques
Issues with GM Crop Evaluations

Silver Bullet - GM crops?
• Proponents and Opponents agree no silver bullet

Silver Bullet Paradox
• BUT: implemented in isolation, as if they were a silver bullet

Concentration of human resources and both public and private funds on GM crop interventions
Conclusions

Highly particular outcomes of GM crops depending on specific social and agro-ecological contexts

• Requires multi-year, multi-metric, integrative, multi-disciplinary studies
• Need greater focus on differentiated outcomes

Private investment in GM crops has significant downside

• Desire for quick return
• Limits farmer input
• Concentrates public resources to detriment of other efforts
• Concentrates power in the hands of fewer decision-makers
Not possible without the support of many colleagues, foremost among them:

- Hamadou Diallo
- Ousmane Ouedraeogo
- Andre Domboue
• Vitale J., and J. Greenplate, ‘The Role of Biotechnology in sustainable agriculture of the twenty-first century: The commercial introduction of Bollgard II in Burkina Faso’. In David D. Songstad, Jerry L. Hatfield, Dwight T. Tomes (eds.) Convergence of food Security, energy security and sustainable agriculture, pp. 239-293.