#### Burkina Faso's Bt cotton Reversal



**Brian Dowd-Uribe** University of San Francisco December 2, 2016



### 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 20<sup>th</sup>, 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

Chart 1: Seed cotton production, 000s MT



Sources: Sofitex, Ecobank Research.



Chart 1: Seed cotton production, 000s MT



Sources: Sofitex, Ecobank Research.



Chart 1: Seed cotton production, 000s MT







Chart 1: Seed cotton production, 000s MT



Sources: Sofitex, Ecobank Research.

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

Chart 1: Seed cotton production, 000s MT



Bt cotton field trials		Bt cotton released to farmers		Begin phase-out of Bt cotton	
2003	2006	2008	2013	2015	2016
	Backcross to local varietals		70% of to production Bt cotton	tal 1 is	

Chart 1: Seed cotton production, 000s MT



Bt cotton field trials		Bt cotton released to farmers	Begin of Bt	phase-out cotton
2003	2006	2008	2013 20	15 2016
	Backcross to local varietals		70% of total production is Bt cotton	100% of cotton conventional

## Lint Quality

*Figure 1.* Ginning ratios in three African countries, 198 *Source:* David L. Tschirley, Colin Poulton, and Patrick Lab performance of cotton sectors in Africa: Learning from reform e: Washington, DC, 2009), pp. 180–1.

#### Problems with quality

Burkinabè officials noticed declines in both staple lengt during the first years of commercial release.<sup>31</sup> Monsant tical, suggesting that these initial declines in staple ratios were due to exceptional water stress and other tions.<sup>32</sup> But this deterioration in ginning ratios and st over time. Reports from Burkinabè officials, which w

31. Brian Dowd-Uribe, *Engineered outcomes: The state and agricultu* (University of California, PhD thesis, 2011); Interview, cotton compa 32. The Burkinabè cultivars in use were known to exhibit variance environmental considerations. Dominique Dessauw and Bernard H French-speaking Africa: Milestones and prospects', paper present Research Conference 4 (Omnipress, Lubbock, TX, 2008).

#### 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

## 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, Bt Cotton, Farmer Choice

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)				
Cotton type	Seed	Insecticide	Total	
Bt cotton	\$60	\$20	\$80	
Conventional cotton	\$2	\$60	\$62	

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 Social and Agro-ecological Dimensions

-Mediate Outcomes -Differential Impacts

> Farm-Gate -Average Yield -Average Profit

### 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, multidisciplinary 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

### Acknowledgements

**Questions?** Comments:

Brian Dowd-Uribe University of San Francisco bdowduribe@usfca.edu Not possible without the support of many colleagues, foremost among them:

- Hamadou Diallo
- Ousmane Ouedraeogo
- Andre Domboue



### References

- Bassett, T. (2001). A peasant cotton revolution. Oxford University Press.
- Bingen, J. 'Cotton in West Africa, a question of quality', in Jim Bingen and Lawrence Busch (eds), Agricultural standards: The shape of the global food and fibre system (Springer, Dordrecht, 2006), pp. 7–8.
- Dowd-Uribe, B. (2016): GMOs and poverty: definitions, methods and the silver bullet paradox, Canadian Journal of Development Studies / Revue canadienne d'études du développement
- Dowd-Uribe, B., (2014). 'Engineering yields and inequality? How institutions and agro- ecology shape Bt cotton outcomes in Burkina Faso', Geoforum 53 (2014), pp. 161–71.
- Dowd-Uribe B. and Schnurr M, (2016), Briefing: Burkina Faso's Reversal on Genetically Modified Cotton and the Implication for Africa, African Affairs 115(458): 162-172.
- Ecobank (2015), 'Middle Africa briefing note, soft commodities, cotton, 12 June 2015.
- Estur, G., (2008). 'Quality and marketing of cotton lint in Africa.' Africa Working Paper Series #121.
- Schwartz, A. 'L'évolution de l'agriculture en zone cotonnière dans l'Ouest du Burkina Faso'. In Jean-Claude Devèze (ed), Défis Agricoles Africains (Karthala, Paris, 2008), pp. 153–172.
- Traoré O., Denys S., Vitale J., Traoré K., and K. Bazoumana, 'Testing the efficacy and economic potential of Bollgard II under Burkina Faso cropping conditions', Journal of Cotton Science 12: 87–98.
- Vitale J., Glick, H., Greenplate, J., Abdennadher, M., and O Traoré (2008), 'Second-generation Bt cotton field trials in Burkina Faso: Analyzing the potential benefits to West African farmers', Crop Science 48(5): 1958–1966.
- 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.