A Black (White) Hole in the Global Spread of GM Cotton

Saule Burkitbayeva\textsuperscript{1}, Matin Qaim\textsuperscript{2} and Johan Swinnen\textsuperscript{1}

1. LICOS Center for Institutions and Economic Performance & Department of Economics
University of Leuven (KU Leuven)
2. Georg-August-University of Goettingen, Germany
GM COTTON – ONE OF THE MOST SUCCESSFUL GM STORIES

- Especially from the perspective of smallholder farmers

- Two thirds of global cotton area is GM

- It has been successful in reducing pest damage, improving yields and incomes in developing countries (Qaim and Zilberman, 2003; Klümper and Qaim, 2014)

Puzzling that some important producers did not adopt!
OUTLINE OF THE PRESENTATION

1. Spread of GM cotton
2. Importance of cotton in Central Asia
3. Why no GM cotton in Central Asia?
   Seeking for an answer in the literature of political economy of GM.
4. Alternative/Trivial Explanation
5. Conclusion/Implication
GM COTTON – ONE OF THE MOST SUCCESSFUL GM STORIES

- Invention of Bt cotton in late 1980s

- Commercialized in 1996 and spread around the globe rapidly

- More than 15 million small and poor farmers are using the technology

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GM COTTON TRAITS

- Insect resistance
- Herbicide resistance
- Stacked technology

Insect resistant variety (Bt cotton) is the most popular
## GM Cotton Adoption Among the Main Producers

<table>
<thead>
<tr>
<th>Rank</th>
<th>Area</th>
<th>Production (000) 480-pound bales</th>
<th>Total Area of Cotton Mln ha</th>
<th>Adoption rate % of Gm cotton of total area</th>
<th>Bt cotton area in Mln ha</th>
<th>Exports (000) 480-pound bales</th>
<th>Imports (000) 480-pound bales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China, mainland</td>
<td>35,000</td>
<td>5.0</td>
<td>80</td>
<td>4.0</td>
<td>47</td>
<td>12000</td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td>28,500</td>
<td>11.6</td>
<td>93</td>
<td>10.8</td>
<td>7750</td>
<td>1200</td>
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<tr>
<td>3</td>
<td>United States of America</td>
<td>17,315</td>
<td>5.0</td>
<td>94</td>
<td>4.7</td>
<td>13026</td>
<td>10</td>
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<tr>
<td>4</td>
<td>Pakistan</td>
<td>9,300</td>
<td>3.4</td>
<td>82</td>
<td>2.8</td>
<td>450</td>
<td>2200</td>
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<tr>
<td>5</td>
<td>Brazil</td>
<td>6,000</td>
<td>1.1</td>
<td>50.1</td>
<td>0.5</td>
<td>4307</td>
<td>65</td>
</tr>
<tr>
<td>6</td>
<td>Uzbekistan</td>
<td>4,500</td>
<td>1.3</td>
<td>0</td>
<td>0.0</td>
<td>3200</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Australia</td>
<td>4,600</td>
<td>0.5</td>
<td>99.5</td>
<td>0.5</td>
<td>6174</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Turkey</td>
<td>2,650</td>
<td>0.5</td>
<td>0</td>
<td>0.0</td>
<td>218</td>
<td>3692</td>
</tr>
<tr>
<td>9</td>
<td>Greece</td>
<td>1,200</td>
<td>0.3</td>
<td>0</td>
<td>0.0</td>
<td>1200</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>Mexico</td>
<td>1,090</td>
<td>0.2</td>
<td>97</td>
<td>0.2</td>
<td>225</td>
<td>950</td>
</tr>
<tr>
<td>11</td>
<td>Argentina</td>
<td>750</td>
<td>0.4</td>
<td>99</td>
<td>0.4</td>
<td>251</td>
<td>28</td>
</tr>
<tr>
<td>12</td>
<td>Burkina Faso</td>
<td>1,175</td>
<td>0.6</td>
<td>51</td>
<td>0.3</td>
<td>1150</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>Turkmenistan</td>
<td>1,600</td>
<td>0.6</td>
<td>0</td>
<td>0.0</td>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>Mali</td>
<td>880</td>
<td>0.5</td>
<td>na</td>
<td>na</td>
<td>875</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>Myanmar</td>
<td>270</td>
<td>0.4</td>
<td>84</td>
<td>0.3</td>
<td>65</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>Kazakhstan</td>
<td>415</td>
<td>0.1</td>
<td>0</td>
<td>0.0</td>
<td>350</td>
<td>5</td>
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<tr>
<td>17</td>
<td>Tajikistan</td>
<td>550</td>
<td>0.2</td>
<td>0</td>
<td>0.0</td>
<td>650</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: James (2012), ICAC
NON ADOPTERS ARE

- Greece (in EU)
  belonging to EU with strict GM regulations

- Turkey
  with strong trade relations with the EU

- Central Asian countries
  including Uzbekistan, Turkmenistan, Kazakhstan and Tajikistan
IMPORTANCE OF COTTON IN CENTRAL ASIA

- Cotton industry took off during the Tsarist and Soviet Eras

Cotton production in USSR (1000 tonnes)

Source: USSR statistical books

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WORLD COTTON PRODUCTION IN 2013

Source: FAOSTAT

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TOP COTTON EXPORTERS IN 2012

Source: FAOSTAT

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The salient difference is the degree of state regulation

Cotton markets in Kazakhstan, Kyrgyzstan and Tajikistan are essentially market driven

In Uzbekistan and Turkmenistan cotton industry is state controlled

Despite these different economic policies, GM cotton is not commercialized in any of these countries
SO WHY NO GM COTTON IN CENTRAL ASIA?

The most often mentioned factors to explain the absence of GM crops in the EU and several other countries are:

- Consumer aversion
- Fear of losing export markets
- Issues related to government regulations

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Consumer Aversion?

This is observed in western countries, partly influenced by negative media reports (Curtis et al. 2008)

Consumer aversion is the least likely explanation in the context of Central Asia:
- CA regimes are to a large degree authoritative
- Media remains under state control
Fear of Losing Export Markets?

A negative relationship between developing countries’ GM activities and the trade with the EU (Vigani, 2010)

It is not a key reason in CA because:

- Exports of cotton to EU are small. 90 percent of exports goes to Asia
- Trade standards do not necessarily lead to changes in local production
  For example: “Cotton campaign against forced labor”
Most of the criticism is targeted to Uzbekistan

In response, CA shifted exports to Asia

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Organic Cotton in CA?

- Turkey is one of the non-adopters and a large organic cotton producer
- Only small scale organic farming in Kyrgyzstan and Tajikistan
- Uzbekistan and Turkmenistan are not involved in organic cotton farming
Absence of GM Regulatory Systems?

- But lack of legislative framework for GMO’s did not discourage the cultivation of GM crops in other regions.

  - In Pakistan, Bt cotton approved in 2010, adopted in 2002
  - Same happened in India and China

If there was a real demand by farmers, most likely GM varieties would have been smuggled from abroad.

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Is there Demand for GM cotton in Central Asia?

Insect control is a major concern for cotton producers in general.

Benefits of Bt cotton adoption in China, India and Pakistan come from reductions in the use of chemical pesticides, lower crop damage and thus higher revenue and profits.

However, pest infestation levels vary geographically!
## Pest Infestation Levels and GM Cotton Adoption

<table>
<thead>
<tr>
<th>Pest infestation level</th>
<th>Bt cotton adoption status</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Adopted</td>
</tr>
<tr>
<td>High</td>
<td>China</td>
</tr>
<tr>
<td></td>
<td>India</td>
</tr>
<tr>
<td></td>
<td>Pakistan</td>
</tr>
<tr>
<td></td>
<td>Australia</td>
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<tr>
<td></td>
<td>Mexico</td>
</tr>
<tr>
<td></td>
<td>Argentina</td>
</tr>
<tr>
<td>High to Medium</td>
<td>Burkina Faso</td>
</tr>
<tr>
<td>Medium</td>
<td>US</td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
</tr>
<tr>
<td>Low</td>
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</tbody>
</table>

Adopted from Clive James 2002
Pest infestation is not a major issue in the region

Agri-climatic environment is close to perfect for cotton cultivation in CA

Bio-control systems and harsh winters help to break down insect lifecycle (Bobojonov, 2009, ICAC 2008)
This is also reflected in an international comparison of cotton yields

Cotton yields among major cotton producers in 2014 (kg per ha)

Note: Countries that did not adopt GM cotton are colored in grey

Source: USDA
- Yields in CA are not systematically lower than in other countries, in spite of relatively low levels of chemical pesticide use

- CA countries spend much less on chemical pest control than other major producers (ICAC 2008)

- Cotton breeding is focused much more on issues of water stress
SUMMARY/IMPLICATIONS

Hole in the spread of GM cotton.

CA did not adopt GM. Why?

- Consumer aversion is irrelevant
- Fear of loosing export markets is no a threat
- No organic production
- Absence of regulatory system might play role

Most likely, because there is limited demand for the types of GM traits available
Pest Infestation is low in Turkey and Greece as well.

This implies that Bt cotton adoption rates may already be near to 100%.

This could change if other GM traits are commercialized/developed.

Climate change and its impact on pest infestation levels.

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Thank you!