



*One in five workers in Burkina Faso is employed by the cotton industry. For years, high quality was the cotton's main selling point. (photo: Luc Gnago/Reuters)*

## How Monsanto's GM Cotton Sowed Trouble in Africa

By Joe Bavier, Reuters, 10 December 17

***When America's biotech giant tried to export its know-how to small cotton farmers in Burkina Faso, there was a problem: The quality sank.***

In 2000, farmers in Burkina Faso, Africa's top cotton grower, were desperate. Their cotton fetched top prices because its high-quality fibre lent a luxurious sheen to clothing and bedsheets. But pests – bollworms – were threatening the crop.

Even when you dropped the bollworm larvae into a bucket of poison, farmers said, they kept swimming.

U.S. seeds and pesticide company Monsanto proposed an answer: a genetically modified strain of cotton called Bollgard II, which it had already introduced in America and was marketing worldwide. GM was established in large-scale farming in South Africa, but not among the smallholders who produce most African cotton. The Burkina farmers agreed to a trial and the country introduced seeds with the gene in 2008.

The resulting cotton was pest-free, and the harvest more abundant. By 2015, three-quarters of all Burkina Faso's production was GM, and it became a

showcase for the technology among smallholders in Africa. From 2007 to 2015, delegations from at least 17 different African nations visited Burkina to see it.

But there was a problem. While the bug-resistant genes produced more volume, the quality fell. Last season, the cotton farmers of Burkina Faso abandoned the GM varieties.

"Genetically modified cotton, it's not good today. It's not good tomorrow," said farmer Paul Badoun, picking apart a lumpy handful of raw cotton in his field near Kongolekan, a village of small mud brick houses in the southwestern cotton heartland.

The country's GM experience, told by more than three dozen Monsanto insiders, farmers, scientists and cotton company officials as well as in confidential documents reviewed by Reuters, highlights a little-known quandary faced by genetic engineering. For Burkina Faso's cotton growers, GM ended up as a trade-off between quantity and quality. For Monsanto, whose \$13.5 billion in revenues in

2016 were more than Burkina Faso's GDP, it proved uneconomical to tailor the product closely to a market niche.

The Burkinabes knew from the start that American cotton varieties containing Monsanto's gene could not deliver the quality of their home-grown crop, cotton company officials and researchers told Reuters. But they pressed on because Monsanto agreed to breed its pest-resistant genes into their native plants, which they hoped would protect the cotton and keep its premium value. That, they say, was a failure.

In July 2015 Monsanto wrote to the Burkina growers saying the quality problems had been offset by other benefits. Asked by Reuters about the quality problems and whether it promised to fix them, the company did not respond. Instead, it pointed to a dispute that erupted with Burkina Faso over payments for seed-licensing fees.

"We exited our cotton business in Burkina Faso due to the increasing challenge in collecting license fees that had remained due for a significant period, despite Monsanto's efforts to explore pragmatic solutions," the company said in an emailed response to Reuters' queries.

"Monsanto takes any complaint it receives seriously and endeavours to get to the root of any issues, whether they are caused by Monsanto products or not," the company said. The Bt venture was a collaborative effort with Burkinabe authorities and local stakeholders, and Monsanto communicated with all stakeholders to better understand the alleged issue, it said: The alleged decline in cotton quality "can be attributed to various factors such as the environment."

The company, which has agreed to a \$66 billion takeover by Germany's Bayer, told Reuters its genetic traits transformed Burkina Faso's cotton sector, improving the lives of 350,000 farmers and the roughly 4 million Burkinabes who depend on them, by increasing production and reducing pesticide use.

Roger Zangre, a Burkinabe agricultural scientist who helped bring Monsanto to Burkina Faso, said Burkina's technical shortcomings were partly to blame for the problems with the GM crops. "Before the introduction, our capacities should have been reinforced. But all of that fell by the wayside, and that's on us ... We can't blame Monsanto alone," said

Zangre, who was employed by the state and said he had never been paid by Monsanto.

But Brian Dowd-Urbe, an assistant professor at the University of San Francisco who has studied the case, said the Burkinabe experience has undermined confidence in Monsanto. He and five other international and Burkinabe researchers and cotton sector officials believe Burkina's quality problem boiled down to poor breeding processes.

"Here is an issue that was established early on in the breeding process and trial stage that over almost 10 years they were unable to resolve," he said. "What does that mean in terms of Monsanto's ability to successfully steward breeding

Monsanto declined to comment on this. It said its Bollgard II technology remains under consideration in several countries in sub-Saharan Africa and is showing good results in trials in Malawi. Authorities in Malawi did not respond to requests for comment.

Africa's annual cotton exports are worth nearly \$1.2 billion, according to statistics compiled by the Swiss-based International Trade Centre. South Africa and Sudan are the only other African nations apart from Burkina Faso to introduce GM cotton so far. Sudan opted to introduce foreign varieties that it knew would produce lower quality cotton, calculating that the increased output would offset the drop in value, a cotton expert at Sudan's agriculture ministry said. For now, he added, that bet has paid off.

In Ghana, Uganda and Nigeria, growers have also been testing Bollgard II, but they say Burkina Faso's experience has made them more cautious. "We are being very sceptical now," said James Wiyor, executive secretary of Ghana's Cotton Development Authority.

Mali, Africa's number two producer and Burkina Faso's main local rival, says it stuck with conventional, high-quality strains; it says this decision gave it an edge over its GM rivals.

"It's a shame," said Jane Dever, a professor and cotton breeder at Texas A&M University, discussing Burkina Faso's experience, "because (Burkina Faso) really was (Monsanto's) guinea pig for introducing transgenic cotton into West Africa."

## “EVERYTHING WAS GOOD”

Burkina Faso is big in African cotton, but small in global terms. India, the world leader, grows over 20 times more cotton each year. Even so, Burkina depends heavily on cotton exports. Around a fifth of its workforce participates in the sector, according to the World Bank.

Unable to go head-to-head against big producers, Burkina Faso instead cultivated quality.

“Burkina cotton was one of the most preferred cottons,” said Ashwin Subramanian, head of Singapore-based commodities trader Olam International’s West African cotton business. “The importing countries in the Far East always preferred Burkina cotton. The quality was good. The consistency was good. Everything was good.”

The country’s major pest problems began in the 1990s - first whiteflies, then bollworms which feed on flower buds, withering them and damaging fruits.

Farmers were spending around \$60 million every year to protect their cotton, and even then losing 20 percent to 65 percent of their crops, Monsanto told Reuters. Losses could rise to 90 percent in fields that had not been treated with pesticides.

In 1995, the Burkina government asked Zangre, the local agricultural scientist, to look into biotech solutions. He met Monsanto officials at a conference in Cameroon in 1999 and the following year helped introduce the company’s representatives to officials from Burkina’s cotton companies and the farmers’ union. Together with government officials, they decide policy for the cotton sector.

In 2003, Burkinabe researchers began testing Bollgard II cotton that was being grown in the United States. Right away, they confirmed it was effective against pests. It contains a bacterium called *Bacillus thuringiensis*, or Bt, that wards off insect larvae.

But the quality problems were equally obvious.

Cotton quality is most commonly determined by the length of the fibre, or staple, that emerges when a tuft is pulled out of a cotton boll. The longer the fibre or staple, the higher the quality. Monsanto’s American Bt cotton produced short fibres, the kind typically used to make fabric for everyday use such as jeans and t-shirts.

“When we started using it, we knew that the American variety wouldn’t interest us, because it didn’t have the quality we required,” said Bazoumana Koulibaly, research head for the cotton programme at Burkina Faso’s agricultural research institute, INERA.

The Burkinabes said they asked Monsanto to breed the Bt gene into their native cotton, so they could marry its pest resistance with their long fibres. However, tests conducted by INERA in 2006 and 2008 found that the new Burkinabe Bt fibres were between 0.88 mm and 2.41 mm shorter than the country’s conventional cotton.

In 2008, Burkina Faso’s government tried to introduce new liability provisions to the deal, according to a U.S. diplomatic cable published by WikiLeaks. Then U.S. Ambassador Jeanine Jackson intervened on behalf of Monsanto.

“Upon hearing the news of a possible halt to the planned commercialisation of the Bt cotton in Burkina Faso, Ambassador discussed the issues with both Prime Minister Tertius Zongo and Monsanto reps,” the cable said. “The PM then interceded and instructed that the administrative order be changed to meet Monsanto’s terms.”

The Burkinabes initially wanted to commit Monsanto to compensating the cotton company and its associates if there were problems, according to a memo the cotton industry sent to Monsanto which was reviewed by Reuters. The revised administrative order said instead disputes should be handled through legal and regulatory channels and resolved in good faith.

Zongo declined to comment on why he interceded. Jackson, who has now retired from diplomatic service, said she did not recall the details but noted that advocacy of U.S. businesses and investments is usually the “number one task” for ambassadors. Monsanto declined to comment on this point.

Burkina introduced the new GM cotton for seed production in the 2008-2009 season. A full-scale commercial launch was scheduled for the following season.

Wilfried Yameogo, the director of Sofitex, Burkina Faso’s biggest cotton company, said the decision to go ahead was based on a pledge from Monsanto that

it would fix the quality problems ahead of the commercial launch.

“Monsanto made promises, and we continued to produce it. They said, ‘No, no, no. It will be okay.’” Yameogo said. Reuters could not confirm whether such a promise was made and Monsanto did not respond to a request for comment on this.

#### SHORT FIBRES

The growers moved fast. By 2014, GM cotton had surged to almost three-quarters of all the cotton acreage planted in Burkina Faso.

In the three seasons before Burkina introduced Bt cotton, over 90 percent of its output was classed as high quality medium to long staple by the country's cotton companies. In 2010-2011, GM cotton made up over half of production, but only 21 percent of the crop reached the previous quality standard.

“There was a problem selling this cotton,” Agriculture Minister Jacob Ouedraogo told Reuters.

Monsanto paid nearly \$3 million in compensation to the Burkinabes in those first two seasons due to the quality problems, according to the memo reviewed by Reuters, which was sent in 2015 to complain about losses cotton companies had incurred. Monsanto declined to comment on this point.

Burkina Faso's cotton continued to suffer. In 2014-2015, average Bt cotton fibres from around the country were up to 2.29 mm shorter than the conventional strains. The cotton lost its premium pricing. The impact, according to the Burkinabes, was a drop in the value of its output of at least 3 cents per pound of cotton, or between 2 and 5 percent of the volatile global benchmark price.

Singapore trader Olam International had been among Burkina Faso's biggest customers. It had to seek out new buyers, eventually selling on the cheaper output to textile mills in Pakistan, said Olam's West Africa cotton chief Subramanian.

#### KNOW-HOW

Geneticists like Dever say the problem was the process, not the Bt gene. Retaining specific quality characteristics in new varieties is one of the hardest tasks facing cotton breeders, Dever said.

“It can be done,” she said. “You just have to make sure you do the appropriate number of backcrosses and you do the appropriate amount of testing.”

To introduce a gene, breeders cross a plant already containing it with a second parent possessing other desired traits - in this case, Burkina's long cotton fibres. They then breed the first hybrid with the second parent. The process, known as a backcross, continues: The more backcrosses, the more the new variety will resemble the second parent.

Zangre and INERA'S Koulibaly said Monsanto carried out just two backcrosses before introducing the new variety. “Evidently the two backcrosses were insufficient. It was necessary to go further. Breeders will go to six or seven backcrosses to really get over 99 percent purity,” Koulibaly said. Monsanto declined to comment on this.

Dever, who has developed cotton varieties for companies including Bayer, estimated that carrying out three more backcrosses would have pushed back the release date of Bt cotton by at least a year.

Zangre said that if the Burkinabes had possessed the proper tools and technical knowledge to introduce the Bt genes themselves, they could have avoided the mistake.

Yves Carrière, an entomology professor at the University of Arizona who studies Bt crops, arrived in Burkina Faso in 2009 planning to set up a programme to monitor the introduction. He was worried, he said: The Burkina authorities had plans to head off potential problems, but the universities and state agencies that in the developed world would typically support such a biotechnology launch appeared weak.

“It was rushed. That's for sure ... It was rushed and far from optimal,” he said. “It shows the shortcomings of even the largest corporations, which do not have the structure and the means to do everything that needs to be done in developing countries.”

For its part, Monsanto never based technical staff in the country, a former Monsanto employee who was involved in the process told Reuters. Instead, he said Monsanto developed the new Bt varieties in the United States, paid around \$350,000 annually to fund research institute INERA's work on the GM cotton, and flew in its own scientists when required.

Monsanto declined to say if it had based its own researchers in Burkina Faso, but said its activities resulted in significant investments in research and development.

“ARMED AND SEASONED”

By 2016, the Inter-Professional Cotton Association of Burkina (AICB), the cotton sector’s umbrella organisation, claimed the cotton companies’ losses had reached around \$85 million over the previous five seasons.

In the final settlement that ended the partnership last December, Yameogo said Monsanto ceded over \$19 million in royalties that the Burkinabes had been withholding. In exchange, the Burkinabes agreed to drop demands for compensation.

Monsanto said the settlement, which it called a “goodwill gesture,” was confidential.

For Burkina Faso’s farmers, Bt cotton’s benefits were “barely acceptable,” according to a 2016 study by the French government’s agricultural research agency, CIRAD. It found farmers made more money, but the new seeds also increased their financial risk.

Burkina Faso is now clawing back its reputation. In the 2016-2017 season, the first since it returned to conventional cotton seeds, 98.8 percent of its production was graded as medium to long staple. So far, the bollworms have not returned.

If they do, Burkinabe officials say they aren't turning their backs on GM, although the country does not use the technology at present. However, they say, any varieties must fit their unique needs.

“We still favour the use of biotechnologies,” said Yameogo, the cotton company boss. “We’ve been armed and seasoned by the experience we had with Monsanto.”