line, which continue to improve the biotechnology research capacity in these two countries. It is expected that Malawi will also be conducting its first Bt cotton trials at Bunda College of Agriculture this year. In subsequent years it is envisaged more trials will be conducted at 3 other locations in the country.

Program for biosafety systems, in collaboration with the Food Agriculture and Natural Resource Policy Analysis Network (FANRPAN), supported ex ante studies on potential benefits for cotton farmers if Bt cotton were adopted commercially in Malawi. Assuming a current 20% yield loss due to insect infestations, and taking into account chemical costs and labor, adopting Bt cotton would realize US$78 gross benefit/ha which translates into nearly double the income of US$40/ha that is obtained with conventional varieties (Manda et al., 2007; van der Walt, 2009).

Concluding Remarks

Globally, the distribution and adoption of biotech cotton continues to increase annually. Countries like China, India and South Africa continue to reap benefits, and with two new ones, Egypt and Burkina Faso, also getting on board. Another trend is the increase in the number of countries conducting confined field trials in Africa. Furthermore, these trials were conducted around specific products. This trend is likely to result in national biosafety frameworks that are much better focused and more streamlined than those developed in a vacuum. As activity increases across the continent, synergies could be built around harmonization efforts that could facilitate trade and the transboundary movement of biotech organisms.

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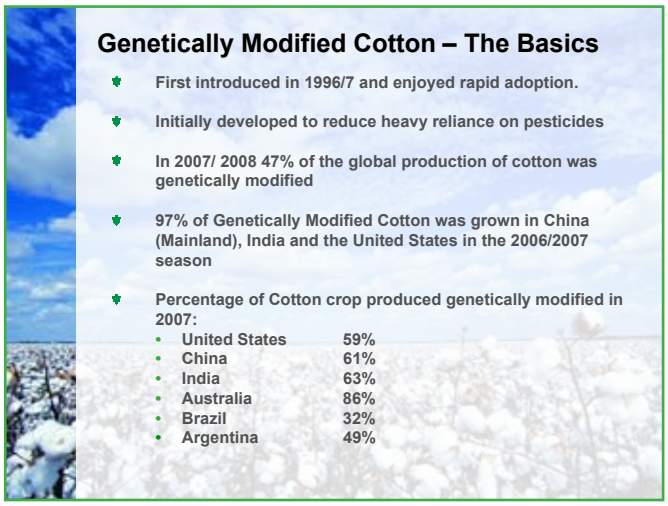
Biotech Cotton in International Trade.

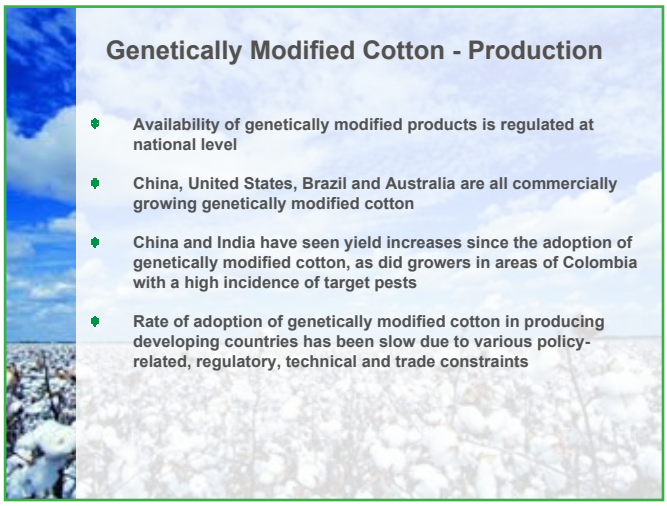
Richard Haire, Queensland Cotton Corp. Ltd., Australia

This paper briefly overviews the state of play with respect to the production of cotton that has been genetically modified, and then looks at each of the primary products that emerge from this activity, namely cotton planting seed, cotton lint, cottonseed oil and cottonseed meal. The paper concludes with some remarks about the contribution that GM cotton can make to development and food security in a capital-constrained world.

Genetically modified cotton was first released in commercial quantities in the late nineteen nineties following an exhaustive and at times exhausting testing and approval regime. The technology achieved instant adoption by growers. It's creation was to control the heliothis which had become so destructive to cotton as it was resistant to conventional chemistry and other crop protection practices. As with any new technology, the introduction of biotech cotton was not without challenges, as we came to understand that it alone was no silver bullet. However, after several iterations and enhancements, today almost 50 % of the worlds cotton production employs this technology.

Today, the big three of China (with 67 % of its production being GM), the United States (86 % of its production) and India (76 % of production) account for more than 90 % of the world's GM cotton. 95 % of Australia's cotton is GM and 10 % of Brazil's cotton is estimated to be GM. Modern traits include enhanced inbuilt insecticides and herbicide tolerance





allowing over-crop herbicide applications without causing crop damage.

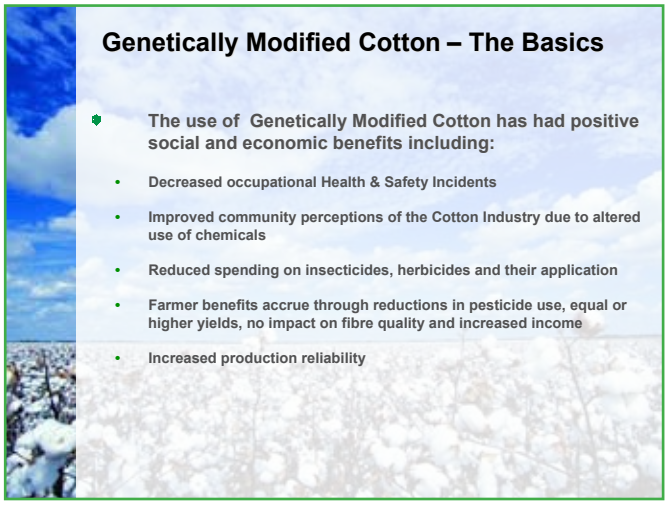
There have been numerous assessments done of biotech cotton economic, social and environmental merit and they all share common conclusions.

- Its introduction has clearly led to a material reduction in the usage of insecticides,
- It has had a very positive impact on community perceptions about our industry's efforts to promote sustainability in crop protection practices,
- It has reduced the occupational health and safety risks associated with the storage, handling and application of pesticides,
- and it has been credited with enhanced yields and improved production reliability of cotton.

The net economic, social and environmental benefits have been unambiguously positive.

Access to genetically modified products is controlled at the national level with varying degrees of success.

China, United States, India, Australia and Brazil have all legalized the production of Genetically Modified cotton. Other papers in this publication have described the impressive yield increases that have been achieved in India and China since their adoption of this technology, closing the gap between the yields achieved in those countries and other top performing countries. On the flip side, late, partial or zero adoption of the technology in many African countries has seen them fall behind in comparative yield tables.



Access to GM technology is governed by very strict licensing conditions that essentially seek to

- protect the technology developer's intellectual property,
- to eliminate the potential for a secondary market in the product through the retention of seed for future replantings,
- and to defend the technology from systematic failure.

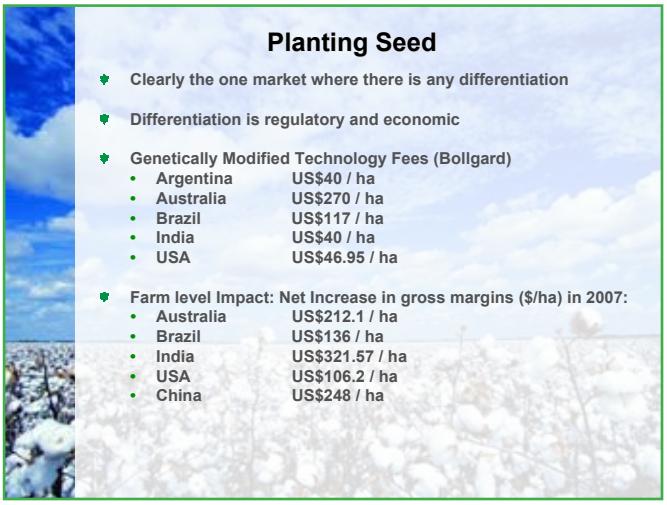
It is well known that the efficacy of the initial single gene version of the technology deteriorated over time as insects developed resistance. In some cases, this resistance was the result of poor discipline or mismanagement of the technology. Fortunately, largely as a result of gene stacking and through better crop hygiene and management, the current technology is proving to be very robust.

Market Based Issues

The primary products are cotton planting seed, cotton lint, cotton seed oil and cotton seed meal.

Planting seed

Planting seed is the most conspicuous example of differential pricing and regulatory arrangements between a genetically modified and a conventional product. Restrictions are explicit in the license attached to this technology. Pricing also represents a point of difference between the two alternatives and within this space we see wide disparity between countries and users. The pricing strategy seems to be based on the principal of "charge as much as the market will bear". As highlighted by the studies done on its impact on gross margins, while there is a relative consistency in the value of the technology, there is a wide disparity in the pricing with Australia, for example, paying six times the license fees paid by India and the United

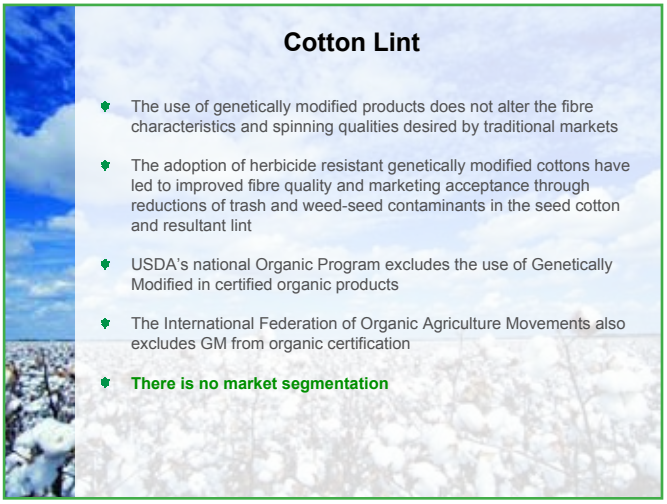


States but enjoying 84 % of the benefit of India and double the economic benefit of the US. Having said that, it should be noted to date, demand has always matched supply, perhaps the ultimate test of the efficiency of the market.

Cotton lint

There has been no observed difference between the fiber characteristics of GM cotton compared with conventional cotton, and spinnability does not appear to have been affected. On the contrary, there is evidence to suggest that the introduction of herbicide resistance has had a direct and positive impact on the leaf and vegetable matter content of cotton. It could also be argued that the use of GM cotton, particularly insofar as crop protection goes, has freed the farmer from one very onerous aspect of their crop management program and allowed them more time to focus on nutrition aspects to enhance fiber quality.

In relation to Organic cotton, both the USDA and the International Federation of Organic Agriculture Movement specifically exclude genetically modified crops from eligibility as "certified organic". However, based on international trade data on organic cotton, there is considerable doubt as to whether this prohibition is observed in all cases. Other than this restriction in relation to organic cotton, there is neither a regulatory nor market differentiation between GM cotton and conventional, and there is no material demand preference for one version over the other.

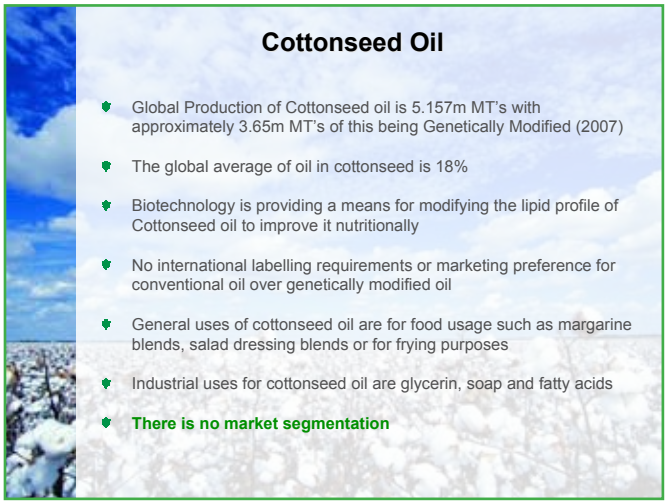


Cotton seed oil

Global production of cotton seed oil for the 2007 season was estimated at 5.2 million metric tons with approximately 3.6 million tons being genetically modified. The oil is sold in either its raw form or in end use product form without restriction across the world.

Cotton seed oil finds its way into the food chain through its use in table spreads (margarines) salad dressings and its use as cooking oil. Cottonseed oil is described by scientists as being "naturally hydrogenated" because the saturated fatty acids it contains are the natural oleic, palmitic, and stearic acids. These fatty acids make it a stable frying oil without the need for additional processing or the formation of trans fatty acids.

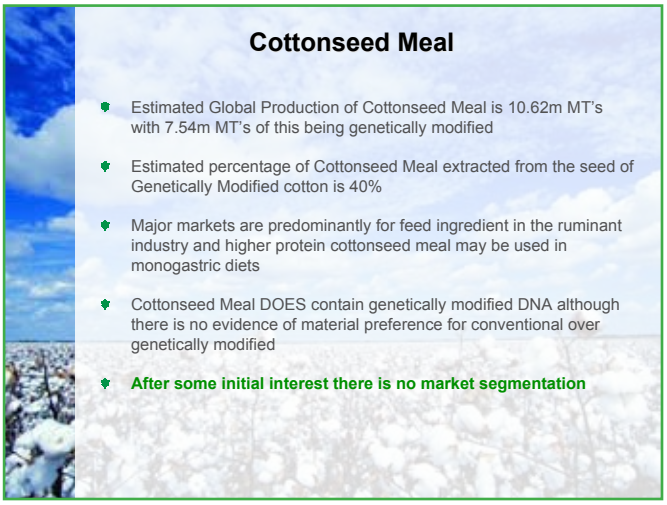
Using biotechnology is also finding a mechanism to modify the lipid profile of oil to enhance it nutritional value. In order to be removed from the cotton seed, the oil must first undergo substantial extractive and refining processes and it is these activities which disqualify it from any international labelling requirements. Industrial uses for cotton seed oil are glycerin, soap and fatty acids. There is currently no market segmentation for cottonseed oil derived from GM seed.



Cottonseed meal

Cottonseed meal accounts for approximately 40 % by weight of fuzzy cottonseed, depending on the particular extraction process used. It is a high protein stock feed. For the 2007 year, an estimated 10.6 million tons of cotton seed meal was produced globally with 7.5 million tons of this from genetically modified seed. Cottonseed meal is not traded internationally as much as its related product, cotton oil. Its primary use is as feed for ruminant animals such as dairy cows and beef cattle.

When GM cotton was introduced in both the United States and Australia, there was some market interest in segregating GM meal from conventional cottonseed meal. However, within 2 years, market demand became generic.



So it is fair to say that, with the exception of cotton planting seed, there is negligible market preference for either the conventional cotton based products or for products eminating from genetically modified cotton. The absence of any trade related bias for these products would seem to be a common sense response and further confirms the overall benefit that the introduction of GM cotton has had for our industry without apparent market disruption.

Labelling

The Food Standards Australia and New Zealand is the body charged with, amongst other things, the labelling and description requirements of food stuffs sold in the two countries. Under their standards, any food containing more than 1 % of material that has been geneticaly modified must bear a label with that information. In the United States we do not yet have compulsory labelling and there have not yet been base line percentages established for GM designation.

The EU allows up to 1% of any ingredient in food to be genetically modified before requiring specific labelling and packaging. The EU has also established, in relation to GM feedstock that

"where a GMO used in the production of food and/or feed has been authorized under this Regulation, foods and/or feed containing, consisting of or produced from that GMO will not need an authorization under this Regulation, but will be subject to the requirements referred to in the authorization granted in respect of the GMO."

In Japan, the threshold for labelling is 5 % content.

Summary

There can be no disputing that the introduction of Genetically Modified cotton varieties has promoted the economic sustainability objectives of its users. These benefits are not just economic, but have delivered benefits at a social, environmental and human level.

- That the industry has avoided much of the adverse publicity faced by other GM crops is testament to the universal recognition of these benefits.
- In the period since its introduction in 1996 to 2007, the global farm benefit from the introduction of GM crops has been estimated at 12.6 billion dollars.
- There is no evidence of material market bias against the products emanating from this technology.
- The regulatory regime confronting this technology has been far more onerous that the regime confronting conventional genetic selection and acceleration, for example.
- Access to this technology together with its disciplined adoption can be part of the solution to economic development and food security.

The main thing here is to promote greater productivity and sustainability of all cotton producers as a meaningful starting point to underpinning their development and food security ambitions. In a resource-constrained world, GM technology represents just one product that can make a contribution to achieving these goals. It is no silver bullet, and as we know productivity gains in of themselves are not the total solution- but the challenge of producing "more with less" will stay with us for generations to come.