
GM Cotton in Australia

A Resource Guide

The following is a reference guide providing information about genetically modified (GM) cotton in Australia, and some of the research in the pipeline. The guide provides information on the cotton industry, an overview of GM cotton varieties and the regulation surrounding them, the science behind the crops, how they perform, the use of cotton in human and animal foodstuffs, and further information resources.

1. INDUSTRY BACKGROUND

Australia's cotton industry is worth approximately \$1.7 billion annually, and there are around 1,500 growers in the cotton growing areas of NSW and Queensland.

Cotton has many uses, the most common being the production of clothing. It is also used for familiar products such as cotton buds, and less known products like bank notes, x-rays and upholstery. Cotton seed is pressed to extract the oil from it, and this oil is used for frying by the fast food and take away industries. The hull of the seed is then used as stock feed.

2. INSECT RESISTANT COTTON – BT OR INGARD

In 1996, insect-resistant GM cotton was grown commercially for the first time, after six years of field trials. Known as Bt or Ingard cotton, the GM cotton developed by CSIRO, using a gene owned by Monsanto, contains a gene from the soil bacteria *Bacillus thuringiensis* (Bt), which allows the plant to produce the Bt protein which kills cotton's major pest, heliothis or the cotton bollworm, when it eats the leaves.

Cotton growers spend approximately \$50 million annually on insecticides to control cotton pests. Insect resistant GM cotton has provided growers with the opportunity to implement more effective integrated pest management strategies into their farming systems, and reduce chemical use.

According to CSIRO, the use of Bt cotton has allowed the industry to reduce pesticide applications by 56 per cent

each season, with reductions of up to 80 per cent in some years. In 2001, approximately 130,000 hectares of Bt cotton were grown in NSW and Queensland. This dropped to 100,000 hectares in 2002 because of the drought.

The use of Bt cotton has been capped at 30 per cent by the cotton industry to maximise the life of the technology by minimising chances of the heliothis pest developing resistance to the protein.

The Bt cotton was approved for release by the Genetic Manipulation Advisory Committee (GMAC), which has since been replaced by the Office of the Gene Technology Regulator (OGTR).

In 2003, the licence for Bt cotton was renewed. It is envisaged that this GM cotton will be superseded by Bollgard II (see overpage), in the near future.

The regulatory details, including licence application information for Bt cotton can be found at www.ogtr.gov.au/ir/dir022.htm

For more information about the performance of Bt cotton, see the report titled **The performance of Ingard cotton in the 2001-2002 season** at www.crdc.com.au/Resources/Ingard01-02.pdf

3. HERBICIDE TOLERANT COTTON – ROUNDUP READY

Roundup Ready cotton and Roundup Ready/Bt cotton, were commercially available for the first time in Australia in 2001. The Roundup Ready characteristic makes the

cotton plant resistant to the herbicide glyphosate. Herbicide tolerant crops are not harmed by the herbicides applied to the weeds around them, providing growers with greater flexibility in weed control options.

Like Bt cotton, Roundup Ready cotton was approved under the previous gene technology regulatory system, and the commercial licence was issued by GMAC. The licence holder recently applied for a continuation of the licence through the OGTR.

Roundup Ready/Bt cotton was achieved through conventional breeding of the two GM varieties. Regulatory details and licence application information for Roundup Ready cotton can be found at: www.ogtr.gov.au/ir/dir023.htm

For more information about the performance of Roundup Ready cotton, see the report titled **The performance of Roundup Ready cotton in the 2001-2002 Australian cotton season** at www.crdc.com.au/Roundup_Report_Final_doc.pdf

A report titled the **Second Australian Cotton Industry Environmental Audit** available from www.crdc.com.au, outlines the positive impact Bt and Roundup Ready cotton have had on the industry.

In 2003, the Federal Department of Agriculture, Fisheries and Forestry has released a report titled **Agricultural Biotechnology: Herbicide Tolerant Crops in Australia**. The report examines herbicide tolerant crops, particularly GM herbicide tolerant crops, the reasons they are being developed and the rationale behind their use by farmers.

The benefits and risks from growing these crops are examined, along with the strategies used to manage the risks. The aim is to inform the public debate about the technology and its potential in Australian agriculture. To get a copy of the report visit: www.affa.gov.au/content/output.cfm?ObjectID=4BEECF75-993E-48F7-A26AA2BE5C964B80

4. INSECT RESISTANT COTTON – BOLLGARD II

Bollgard II is the second insect-resistant GM cotton to be approved for commercial release in Australia. Approved in 2003, it differs from Bt cotton in that it contains two, rather than one, genes from the soil bacteria *Bacillus thuringiensis* (Bt). The genes produce proteins in the leaves of the cotton plant and when cotton's major caterpillar pest eats the plant, it dies.

Bollgard II is going to be phased in over three years, as Bt cotton is being phased out. Bt cotton is capped at 30 per cent of the entire cotton crop for resistance management purposes. The introduction of Bollgard II should allow this cap to be increased to 80 per cent once Bt cotton is no longer grown.

CSIRO researchers believe that Bollgard II will reduce pesticide applications by up to 75 per cent. Field trials of Bollgard II have shown that the cotton performs as well as non-GM varieties in relation to yield and quality. This information can be found at www.csiro.au/index.asp?type=faq&id=Bollgard&stylesheet=divisionFaq

Licence application details regarding Bollgard II are available from www.ogtr.gov.au/ir/dir012.htm

A paper compiled by CSIRO and titled **Bollgard II agronomy issues – Some comments on current concerns**, is available for growers at www.csiro.au/index.asp?type=faq&id=Bollgard&stylesheet=divisionFaq. It briefly addresses issues such as sowing dates, nutrition, management actions and challenges.

5. MARKETS AND AGRONOMIC ISSUES

There have been various reports released recently in relation to the marketing and agronomic issues of GM canola, and one of these mentions cottonseed as part of the grain-livestock system in Australia. The report produced by ABARE, **Market access issues for GM products: implications for Australia**, outlines key market access conditions or restrictions that are affecting international trade in GM grains and assesses their impact on trade patterns, such as regulatory arrangements and labelling requirements.

The report states that Australia produces less than three per cent of the world share of cottonseed, but represents 37 per cent of the world export share, averaged out over the last five years. Copies of the report are available from: <http://abareonlineshop.com/product.asp?prodid=12559>

According to the Australian Bureau of Statistics (www.abs.gov.au), the major export markets of Australian cotton include Indonesia, Japan, Thailand, South Korea and Taiwan.

6. THE SCIENCE BEHIND GM COTTON

Although produced in 1992, long before the commercial introduction of the first GM cotton variety in Australia, this document produced by CSIRO scientists and titled **The Science Behind Transgenic Cotton** <http://cotton.crc.org.au/Publicat/Pest/transgen.htm> provides a good overall background to the science behind the technology, including diagrams, and background to the Monsanto/CSIRO research partnership, resistance management and the safety of any new varieties.

Released in 2002 by the OGTR, this document titled **The biology and ecology of cotton in Australia** www.ogtr.gov.au/rtf/ir/biologycotton.rtf focuses on issues relating to growth and distribution, pests and diseases, weediness, toxicity and gene transfer between cultivated and wild cottons.

7. GM COTTON AROUND THE WORLD

In 2002, 58.7 million hectares of GM crops were grown around the world, an area equivalent to two and-a-half times the area of the United Kingdom. Cotton is the third largest GM commodity worldwide, behind soybeans and corn, with 6.8 million hectares grown in 2002. It represents 12 per cent of the total GM crop area and 20 per cent of the total global cotton area.

The most dominant characteristics in GM crops are herbicide resistance (representing 75 per cent of all GM crops) and Bt insect resistance.

Genetically modified cotton varieties are grown in the USA, China, Australia, India and Mexico.

For more information: www.isaaa.org

8. FOOD

Many people are unaware that cottonseed oil is used extensively for frying by the fast food and take away industry. Cottonseed oil from commercially approved GM cotton varieties has been approved for use in the food chain.

The issue of food safety is often raised as one of the major concerns people have about GM foods. Food Standards Australia New Zealand (FSANZ), formerly ANZFA, have produced a booklet titled, **Safety Assessment process for genetically modified food**. The booklet explains FSANZ's role in assessing the

safety of GM foods – an assessment all GM foods must undergo before they are allowed to be sold in Australia and New Zealand and is available at www.foodstandards.gov.au/srcfiles/gm_and_consumer/pub02_00.pdf.

In December 2001 Australia adopted new labelling laws for GM foods and ingredients. Standard A18 (food produced using gene technology) ensures that all GM crops, animals and microorganisms must be assessed and approved by FSANZ as safe before they can be used for food or in food processing.

Food products from six GM commodities may be in Australian supermarkets. These are soybean, canola, corn, potato, sugar beet and cotton.

Food or ingredients labelled 'genetically modified' either contain new genetic material or protein as a result of genetic modification or have altered characteristics, for example improved nutritive values. The labelling rules focus on the end food product, and not the plant or process involved in its production. For example, oil from GM cotton does not require a label because refined oils contain no genetic material, and are identical to oils from a non-GM crop.

For more information:

www.anzfa.gov.au/srcfiles/Standard152_GM_%20v62.pdf

www.foodstandards.gov.au/assistanceforindustry/userguides/labellinggeneticallymodifiedfooduserguide/attachment3.cfm

9. ANIMAL FEED

By-products from cotton, including GM cotton are used as a high protein source of animal feed.

The use of GM crops as an animal feed source has been investigated extensively around the world and information on this topic produced by the Federation of Animal Science Societies can be found at www.animalbiotechnology.org/. The research has examined the effect of feeding GM crops to animals on the animals themselves, and also the effects of these crops on animal by-products – such as meat, eggs and milk. The conclusions from these studies were consistent, showing no detrimental effects in livestock fed GM crops or their by-products.

Agrifood Awareness Australia Limited has also produced a fact sheet on this topic which is available at www.affa.com.au/mfs.asp?C=nav2.htm&M=papers.asp&T=title

In 2003, the Bureau of Rural Sciences released a report titled **Tracking Potential GM Inputs to Feedlot Beef – A Scoping Study**, which tracks each crop source for feed used in feedlots, and the potential GM content of these crops, including cotton, field peas, lupins, canola, corn and soybean. It is available at www.affa.gov.au/content/output.cfm?ObjectID=E09243A-D-0F75-45BA-BF01D6D49B46345C and states that cotton stockfeed may include up to 40 per cent GM content.

10. GM COTTONS IN THE PIPELINE

In addition to the commercially released GM cotton varieties mentioned, a number of others are currently undergoing field trials in Australia.

OGTR Code	Organisation	Characteristic(s)
Cotton DIR040	Dow AgroSciences Australia	Insectresistance
Cotton DIR039	CSIRO	*High oleic acid content
Cotton DIR036 DIR038	CSIRO	Insect resistance Herbicide tolerance
Cotton DIR035	Monsanto	Herbicide tolerance Insect resistance
Cotton DIR034	Syngenta Seeds	Insect resistance

* Oil from conventional cotton requires extra processing (partial hydrogenation) to eliminate high levels of polyunsaturated fatty acids, however hydrogenation may increase human cholesterol levels. High oleic acid oils have a healthier fatty acid profile, and are expected to be more stable for frying purposes without the need for hydrogenation. Genetically modified high oleic acid cotton is the first large commodity GM crop with a consumer-orientated benefit, to undergo field trials.

Further information on all of the above can be found by looking up the relevant DIR code at the site below: www.ogtr.gov.au/ir/index.htm#43

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11. GENERAL AND OTHER REFERENCES:

More information can be obtained at the following: Agriculture, Fisheries and Forestry – Australia (AFFA): A comprehensive list of countries and their **regulatory schemes**.

www.affa.gov.au/content/output.cfm?ObjectID=3158AA5F-9953-45E0-A406CB0D0C244BBF

Agriculture, Fisheries and Forestry - Australia (AFFA): A detailed report reviewing the **testing of GM crops and food products**.

www.affa.gov.au/content/output.cfm?ObjectID=7DE2E28F-1913-40D5-BA711F313D07F17B

Agrifood Awareness Australia Limited: A daily updated website which includes an easy to read booklet providing an **overview of gene technology** in Australia.

www.affa.com.au/

Australian Cotton Cooperative Research Centre, established to enhance the development and growth of the cotton industry through collaborative **research** - www.cotton.crc.org.au

Biotechnology Australia: A series of **surveys outlining public perceptions** on gene technology in Australia.

www.biotechnology.gov.au/content/controlfiles/display_details.cfm?objectid=443164A1-7F7B-410C-BD068DA14499A560

Cotton Australia is the **peak industry body** for Australia's cotton growers - www.cottonaustralia.com.au

Cotton Research and Development Corporation is a **research and industry development partnership** between the Federal Government and the cotton industry - www.crdc.com.au.

The papers in this series aim to provide information and promote discussion about these issues.



PO Box E10, Kingston ACT 2604
 Telephone: (02) 6273 9535
 Fax: (02) 6273 3968
 Email: info@affa.com.au
 Website: www.affa.com.au
 ABN: 49 103 817 296