



16 September 2008

**TECHNICAL SUMMARY OF THE RISK ASSESSMENT AND RISK
MANAGEMENT PLAN
FOR
APPLICATION NO. DIR 081/2007
FROM
MONSANTO AUSTRALIA LIMITED**

Introduction

The Acting Gene Technology Regulator (the Acting Regulator) has made a decision to issue a licence (DIR 081/2007) to Monsanto Australia Ltd (Monsanto) for dealings involving the limited and controlled release of genetically modified (GM) cotton lines into the Australian environment.

The *Gene Technology Act 2000* (the Act), the Gene Technology Regulations 2001 and corresponding state and territory law govern the comprehensive and highly consultative process undertaken by the Regulator before making a decision whether to issue a licence to deal with a GMO. The decision is based upon a Risk Assessment and Risk Management Plan (RARMP) prepared by the Acting Regulator in accordance with the *Risk Analysis Framework* and finalised following consultation with a wide range of experts, agencies and authorities and the public¹.

The application

Monsanto applied for a licence for dealings involving the intentional release of up to 504 cotton (*Gossypium hirsutum* L.) lines² that have been genetically modified for enhanced water use efficiency (WUE) on a limited scale and under controlled conditions. The trial is authorised to take place at up to 20 sites of no more than 2 ha each, on a maximum total area of 40 ha per year between September 2008 and June 2010.

The proposed sites³ may be located in the New South Wales local government areas (LGAs) of Balranald, Bourke, Central Darling, Carathool, Coonamble, Gunnedah, Hay, Lachlan, Moree Plains, Narrabri, Narromine, Walgett, Warren and Lake Tandou (an unincorporated area); the Queensland LGAs of Paroo, Balonne, Dalby Regional, Goondiwindi Regional, Toowoomba Regional, Somerset Regional, Brisbane City and Lockyer Valley Regional; and the Western Australia LGA of Wyndham-East Kimberley. Glasshouses in the LGAs of

¹ More information on the process for assessment of licence applications to release a genetically modified organism (GMO) into the environment is available from the Office of the Gene Technology Regulator (Free call 1800 181 030 or at <<http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/process-1>>), and in the Regulator's *Risk Analysis Framework* (OGTR 2007) at <<http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/riskassessments-1>>.

² The term 'line' is used to denote plants derived from a single plant containing a specific genetic modification made by one transformation event.

³ The original application indicated that the sites may be located in up to 25 different LGAs. The applicant has requested the addition of Gunnedah (NSW) to the list of LGAs, but due to council amalgamation in Queensland, the number of proposed locations has decreased from 25 to 23.

Brisbane City and Toowoomba Regional would be producing the seed for planting at field sites.

The cotton lines were genetically modified using one of 56⁴ different gene constructs. All the constructs contain one gene for WUE, except for one construct which contains two different genes. The introduced genes have demonstrated the capacity to produce a water use efficient phenotype in cotton and other plants by regulating expression of endogenous genes, or modulating biochemical pathways in the cotton plants. Most of the introduced genes were derived from the plants *Arabidopsis thaliana* (thale cress), *Zea mays* (corn), *Glycine max* (soybean), *Oryza sativa* (rice), *Gossypium hirsutum* (cotton), *Beta vulgaris* (beetroot), *Cucurbita ficifolia* (figleaf gourd), *Triticum aestivum* (wheat) and the moss, *Physcomitrella patens*. The remainder of the introduced genes were derived from the bacteria *Agrobacterium tumefaciens*, *Bacillus haloduras*, *B. subtilis*, and *Escherichia coli*; or the fungus, *Saccharomyces cerevisiae*.

Additionally, the GM cotton lines contain the antibiotic resistance selectable marker gene, *nptII* or the herbicide tolerance selectable marker gene, *cp4 epsps*. The *nptII* gene, encoding a neomycin phosphotransferase type II enzyme, was originally derived from the common gut bacterium *Escherichia coli* and confers kanamycin or neomycin resistance on the GM plant. The *cp4 epsps* gene, which encodes the 5-enolpyruvylshikimate-3-phosphate synthase enzyme, is from the common soil bacterium *Agrobacterium* sp. strain CP4 and confers tolerance to the herbicide glyphosate. The *nptII* gene and *cp4 epsps* genes were used in the laboratory to select modified plant tissues during the initial development of the plants from which the GM lines are derived.

The purpose of the trial is to conduct proof of concept research involving experiments to evaluate agronomic characteristics including water use efficiency, yield and fibre quality of the GM cotton lines under optimal and water stress conditions. Seed will be collected for further studies, including possible future releases (subject to additional assessments and approvals). The GM cotton will not be used for human food or animal feed

Monsanto proposed a number of controls to restrict the dissemination or persistence of the GM cotton lines and the introduced genetic materials into the environment. These controls have been considered during the evaluation of the application.

Confidential Commercial Information

Some details, including the names of the introduced genes and their encoded proteins, and the gene constructs, including plasmid maps and certain regulatory sequences, have been declared Confidential Commercial Information (CCI) under section 185 of the Act. The confidential information was made available to the prescribed experts and agencies that were consulted on the RARMP for this application.

Risk assessment

The risk assessment considered information contained in the application, relevant previous approvals, current scientific knowledge, and issues relating to risks to human health and safety and the environment raised in submissions received from consultation with a wide range of prescribed experts, agencies and authorities on the application (summarised in

⁴ The original application was for 63 gene constructs containing 56 different genes. However, Monsanto withdrew 7 constructs leaving 56 constructs containing 50 different genes.

Appendix B of the RARMP). No new risks to people or the environment were identified from the advice received on the consultation RARMP.

Advice received from the public on the consultation RARMP (4 submissions) and how it was considered, is summarised in Appendix C.

A reference document on the parent organism, *The Biology of Gossypium hirsutum L.* and *Gossypium barbadense L. (cotton)*, was produced to inform the risk assessment process for licence applications involving GM cotton plants. The recently updated document is available from the OGTR or from the website <<http://www.ogtr.gov.au>>.

The risk assessment begins with a hazard identification process to consider what harm to the health and safety of people or the environment could arise during this release of GMOs due to gene technology, and how it could happen, in comparison to the non-GM parent organism and in the context of the proposed receiving environment.

Seven events were considered whereby the proposed dealings might give rise to harm to people or the environment. This included consideration of whether, or not, expression of the introduced genes could result in products that are toxic or allergenic to people or other organisms; alter characteristics that may impact on the spread and persistence of the GM plants; or produce unintended changes in their biochemistry or physiology. The opportunity for gene flow to other organisms and its effects if this occurred was also assessed.

A **risk** is only identified when a hazard is considered to have some chance of causing harm. Events that do not lead to an adverse outcome, or could not reasonably occur, do not represent an identified risk and do not advance any further in the risk assessment process.

The characterisation of the seven events in relation to both the magnitude and probability of harm, in the context of the control measures proposed by the applicant, did not give rise to any identified risks that required further assessment. The principle reasons for this include:

- ◆ limits on the size and duration of the release proposed by Monsanto;
- ◆ suitability of controls proposed by Monsanto to restrict the dissemination or persistence of the GM cotton plants and their genetic material;
- ◆ limited capacity of the GM cotton lines to spread and persist outside the areas proposed for release;
- ◆ limited ability and opportunity for the GM cotton lines to transfer the introduced genes to commercial cotton crops or other sexually related species;
- ◆ none of the GM plant materials or products will be used in human food or animal feed;
- ◆ widespread presence of the same or similar proteins encoded by, and end products produced as a result of the activity of, the introduced genes in the environment and lack of known toxicity or evidence of harm from them.

Therefore, any risks of harm to the health and safety of people, or the environment, from the proposed release of the GM cotton lines into the environment are considered to be **negligible**.

Hence, the Acting Regulator considers that the dealings involved in this proposed release **do not pose a significant risk** to either people or the environment⁵.

Risk management

The risk management process builds upon the risk assessment to determine whether measures are required in order to protect people and/or the environment. As none of the seven events characterised in the risk assessment are considered to give rise to an identified risk that requires further assessment, the level of risk is considered to be **negligible**.

The Regulator's *Risk Analysis Framework* defines negligible risks as insubstantial, with no present need to invoke actions for their mitigation in the risk management plan. However, a range of measures have been imposed to restrict the dissemination and persistence of the GMOs and their genetic material in the environment and to limit the proposed release to the size, location and duration requested by the applicant as these were important considerations in establishing the context for assessing the risks.

Licence conditions to manage this limited and controlled release

The Acting Regulator has imposed a number of licence conditions including requirements to:

- conduct the release on up to 20 sites of no more than 2 ha each on a total maximum area of 40 ha per year for two years between September 2008 and June 2010;
- locate the proposed trial sites at least 50 metres (m) away from natural waterways;
- limit pollen flow using one of the following measures:
 - surround the trial site with a 100 m monitoring zone and maintain a 3 kilometre (km) isolation distance between the site and intentionally planted cotton crops, **or**
 - surround the trial site by a 20 m pollen trap of non-GM (conventional) cotton or GM cotton that the Regulator has approved for commercial release.
- remove and/or destroy any cotton plants growing in the monitoring zone prior to flowering;
- ensure the pollen trap plants are grown in such a way as to ensure flowering at the same time and for the same period of time as the GM cotton;
- locate the glasshouses at least 20 km from the nearest cotton crop;
- implement an insect control program within the glasshouses;
- harvest and gin all cotton plant materials (GM and non-GM) separately from other commercial cotton crops;
- remove and/or destroy all cotton plant materials from the trial site and adjacent areas (eg pollen trap, equipment cleaning areas) after harvest, except for materials required for future research or release;

⁵ As none of the proposed dealings are considered to pose a significant risk to people or the environment, section 52(2)(d)(ii) of the *Gene Technology Act 2000* mandates a minimum period of 30 days for consultation on the RARMP. However, the Regulator has allowed up to 6 weeks for the receipt of submissions from prescribed experts, agencies and authorities and the public.

- store GM plant materials (required for further study or future release) in certified physical containment level 2 (PC2) facilities or facilities approved in writing by the Regulator;
- after harvest, apply measures to promote germination of any cotton seeds that may be present in the soil;
- monitor trial sites after harvest for a minimum of 12 months and destroy any cotton volunteers that may grow until no volunteers are detected for a continuous 6 month period;
- restrict personnel with access to the site to authorised personnel only; and
- not permit the use of GM plant material, including cotton seed, cotton seed oil and meal for human food or animal feed, or cotton lint for the production of fabrics and/or other cotton products.

The Regulator has issued guidelines and policies for the transport, supply and storage of GMOs (*Guidelines for the transport of GMOs; Policy on transport and supply of GMOs*). Licence conditions based on these guidelines and policies have also been proposed to control possession, use or disposal of the GMOs for the purposes of, or in the course of, the authorised dealings.

Other regulatory considerations

Australia's gene technology regulatory system operates as part of an integrated legislative framework. Dealings conducted under a licence issued by the Regulator may also be subject to regulation by other agencies that also regulate GMOs or GM products including Food Standard Australia New Zealand (FSANZ), Australian Pesticides and Veterinary Medicines Authority (APVMA), Therapeutic Goods Administration (TGA), National Industrial Chemicals Notification and Assessment Scheme (NICNAS) and Australian Quarantine Inspection Service (AQIS)⁶.

FSANZ is responsible for human food safety assessment, including GM food. As the trial involves proof of concept research, the applicant does not intend any material from the GM cotton lines proposed for release to be used in human food. Accordingly, the applicant has not applied to FSANZ to evaluate any of the GM cotton lines. FSANZ approval would need to be obtained before they could be used in human food in Australia.

Identification of issues to be addressed for future releases

Additional information has been identified that may be required to assess an application for a large scale or commercial release of any of these GM cotton lines that may be selected for further development, or to justify a reduction in containment conditions. This would include:

- ◆ characterisation of the genetic material inserted into the plants, including copy number and genotypic stability;
- ◆ additional data on the potential toxicity of plant materials from the GM cotton lines;

⁶ More information on Australia's integrated regulatory framework for gene technology is contained in the *Risk Analysis Framework* available from the Office of the Gene Technology Regulator (OGTR). Free call 1800 181 030 or at <<http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/riskassessments-1>>.

- ♦ additional data on the allergenicity of proteins encoded by the introduced genes for water use efficiency; and
- ♦ characteristics indicative of weediness including measurement of altered reproductive capacity; altered germination; altered flowering time; tolerance to environmental stress; and disease susceptibility.

Suitability of the applicant

The Regulator determined, at the commencement of the assessment process for this application, that Monsanto is suitable to hold a DIR licence under the requirements of section 58 of the Act. The Acting Regulator is satisfied that Monsanto remains suitable as no relevant convictions have been recorded, no licences or permits have been cancelled or suspended under OGTR legislation relating to the health and safety of people or the environment, and the organisation has confirmed its ability to comply with the licence conditions.

Conclusions of the consultation RARMP

The risk assessment concludes that this limited and controlled release of the GM cotton lines on up to 20 sites, located in various LGAs in NSW, QLD and WA, totalling no more than 40 ha per year over a two year period between 2008 and 2010 poses **negligible** risks to the health and safety of people or the environment as a result of gene technology.

The risk management plan concludes that these **negligible** risks do not require specific risk treatment measures. However, licence conditions have been imposed to restrict the dissemination and persistence of the GMOs and their genetic material in the environment and to limit the proposed release to the size, location and duration requested by the applicant as these were important considerations in establishing the context for assessing the risks.