



Office of the Gene Technology Regulator

APPLICATION FOR LICENCE FOR LIMITED AND CONTROLLED RELEASE OF  
GMOS INTO THE ENVIRONMENT: Application No. DIR 035/2003

SUMMARY INFORMATION

Project Title:	<b>Field trials of herbicide tolerant (Roundup Ready<sup>0</sup> MON88913) and herbicide tolerant/insect resistant (Roundup Ready<sup>0</sup> MON88913/Bollgard II<sup>0</sup>) cotton</b>		
Applicant:	Monsanto Australia Ltd PO Box 6051 Melbourne, VIC 8008		
Common name of the parent organism:	Cotton		
Scientific name of the parent organism:	<i>Gossypium hirsutum</i> L.		
Modified trait(s):	Enhanced herbicide tolerance, insecticidal action, antibiotic resistance, reporter gene expression		
Identity of the gene(s) responsible for the modified trait(s):	<ul style="list-style-type: none"> <li>• <i>cp4 epsps</i> gene from <i>Agrobacterium</i> sp. strain CP4 (herbicide tolerance)</li> <li>• <i>cryIAc</i> and <i>cry2Ab</i> genes from the bacterium <i>Bacillus thuringiensis</i> (insecticidal)</li> <li>• <i>nptII</i> gene from the bacterial Tn5 transposon (antibiotic resistance)</li> <li>• <i>uidA</i> gene from <i>Escherichia coli</i> (reporter gene)</li> </ul> <p>(Details of the gene construct, including the plasmid map and some of the regulatory sequences, and preliminary protein expression data, have been declared as Confidential Commercial Information under section 185 of the <i>Gene Technology Act 2000</i>)</p>		
Proposed release location	New South Wales (NSW), Queensland (Qld), northern Western Australia (WA), Northern Territory (NT) (see Appendix for possible local government areas for releases)		
Proposed release sizes and dates:	Dates	Number of sites	Maximum total area (hectares)
	Summer 2003/04	10	7.8
	Winter 2004	4	30
	Summer 2004/5	32	885.8
	Winter 2005	4	30
	Total	50	953.6

## Introduction

The *Gene Technology Act 2000* (the Act) took effect on 21 June 2001. The Act, supported by the *Gene Technology Regulations 2001*, an inter-governmental agreement and corresponding legislation that is being enacted in each State and Territory, underpins Australia's nationally consistent regulatory system for gene technology. Its objective is to protect the health and safety of people, and the environment, by identifying risks posed by or as a result of gene technology, and managing those risks by regulating certain dealings with genetically modified organisms (GMOs).

The Act establishes a statutory officer, the Gene Technology Regulator (the Regulator), to administer the legislation and make decisions under the legislation. The Regulator is supported by the Office of the Gene Technology Regulator (OGTR), a Commonwealth regulatory agency located within the Health and Ageing portfolio.

The legislation sets out the requirements for considering applications for licences for dealings with GMOs and the matters that the Regulator must take into account before deciding whether, or not, to issue a licence.

## The application and the proposed dealings

The OGTR has received a licence application from Monsanto Australia Limited (Monsanto) for the limited and controlled release of genetically modified (GM) herbicide tolerant cotton (Roundup Ready<sup>®</sup> MON 88913) and herbicide tolerant/insect resistant cotton (Roundup Ready<sup>®</sup> MON 88913 /Bollgard II<sup>®</sup>).

Roundup Ready<sup>®</sup> MON 88913 cotton contains two copies of the *cp4 epsps* gene that provides tolerance to glyphosate (the active ingredient in the herbicide Roundup<sup>®</sup>) in Roundup Ready<sup>®</sup> GM cotton. Conventional cotton is susceptible to glyphosate. The use of Roundup Ready<sup>®</sup> GM cotton allows the application of the herbicide Roundup<sup>®</sup> for the control of weeds that emerge in the crop. Roundup Ready<sup>®</sup> MON 88913/Bollgard II<sup>®</sup> cotton was produced by conventional breeding of Roundup Ready<sup>®</sup> MON 88913 cotton with GM Bollgard II<sup>®</sup> cotton which is resistant to the major caterpillar pests of cotton.

Monsanto proposes to conduct four trials (two in the southern summer growing season and two in the northern winter growing season) on 50 sites covering a total of 954 hectares, over three years (2003 - 2005) in the cotton growing regions of NSW and Qld and in northern WA, northern Qld and the NT.

Roundup Ready<sup>®</sup> MON 88913 cotton differs from the previous commercially released Roundup Ready<sup>®</sup> cotton in that tolerance to glyphosate is enhanced. The applicant has indicated that Roundup<sup>®</sup> can be applied to control weeds over a longer period of plant growth, giving growers increased flexibility in timing herbicide applications for integrated weed management.

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is responsible for the use and safety of herbicides in Australia. Glyphosate is not currently registered for use on cotton beyond the four leaf stage of growth. A research permit from the APVMA for use of glyphosate after this stage on Roundup Ready<sup>®</sup> MON 88913 cotton is not required for the first year of the proposed field trials as less than one hectare of cotton plants will be sprayed with glyphosate. However, an APVMA research permit will be required for such use of glyphosate in the subsequent three years of the proposed trials and any subsequent larger scale trials. If a new use pattern of glyphosate is proposed in relation to commercial releases of Roundup Ready<sup>®</sup> MON 88913 cotton this would require registration by the APVMA. Future trials and commercial release of Roundup Ready<sup>®</sup> MON 88913 cotton would also be subject to further application and approval by the Regulator.

The aims of the proposed field trials are to transfer and establish the MON 88913 trait into elite cotton varieties suitable for use under Australian conditions. Additional aims are to conduct evaluation and

gather data on Roundup Ready<sup>®</sup> MON 88913 levels of CP4 EPSPS protein expression, tolerance to glyphosate, seed composition, weed control effectiveness and glyphosate residue levels for future large scale or commercial releases, which would require separate approvals.

None of the cotton plants from the release, or their by-products, would be used for animal and human food. However, the applicant proposes to sell lint from the release. Lint does not contain genetic material or protein. Transport of the GM material would be in accordance with the transport guidelines issued by the Regulator.

Details of the gene construct, including the plasmid map, some of the regulatory sequences and preliminary protein expression data have been declared as Confidential Commercial Information (CCI) under section 185 of the Act. However, the CCI will be made available to the various prescribed expert groups that will be consulted on the preparation of the risk assessment and risk management plan.

## Previous releases of the GMO

Roundup Ready<sup>®</sup> cotton, containing one copy of the *cp4 epsps* herbicide tolerance gene, was approved for general (commercial) release in 2000 (GR-9), by the Minister for Health and Aged Care, on the basis of advice from GMAC. This Roundup Ready<sup>®</sup> cotton is tolerant to the herbicide Roundup<sup>®</sup> only up to the four leaf stage of growth.

Bollgard II<sup>®</sup> cotton and Bollgard II<sup>®</sup>/Roundup Ready<sup>®</sup> cotton were approved for commercial release by the Regulator on 23 September 2002, (licence number DIR 012/2002).

These commercial releases were restricted to the cotton growing regions of NSW and Qld south of latitude 22° South because of concerns about the potential weediness of the cotton in the northern tropical areas. Some field trials were approved under limited and controlled conditions north of latitude 22° South to gather data to further evaluate this issue.

Prior to commercial release, numerous limited and controlled releases of Roundup Ready<sup>®</sup>, Bollgard II<sup>®</sup> and Roundup Ready<sup>®</sup>/Bollgard II<sup>®</sup> cotton were conducted under the voluntary system overseen by GMAC, and four licences for limited and controlled releases of Bollgard II<sup>®</sup> and Roundup Ready<sup>®</sup>/Bollgard II<sup>®</sup> cotton were approved under the new regulatory system, as listed below:

Roundup Ready<sup>®</sup> cotton - 23 limited and controlled releases undertaken by:

- CSIRO Division of Plant Industry (PR-55, PR-55X, PR-55X2, PR-55X3 and PR-55X5 and PR-55X6);
- Deltapine Australia Pty Ltd (PR-32, PR-52, PR-52X, PR-52X2, PR-52X3, PR-71, PR-71X, PR-71X2, PR-83, PR-83X, PR-83X3, PR-140, PR-140X and PR-143);
- Monsanto (PR-83X2 and PR-83X4); and
- Cotton Seed Distributors Pty Ltd (PR 55-X4).

Bollgard II<sup>®</sup> and Roundup Ready<sup>®</sup>/Bollgard II<sup>®</sup> cotton - 20 limited and controlled releases undertaken by:

- CSIRO Division of Plant Industry (PR-123, PR-123X, PR-123X2, PR-131, PR-131X, PR-131X2, PR-131X3);
- Deltapine Australia Pty Ltd (PR-51X4, PR-112, PR-112X, PR-112X2, PR-118, PR-118X, PR-118X2);
- Bollgard II<sup>®</sup> and Bollgard II<sup>®</sup>/Roundup Ready<sup>®</sup> cotton in Qld (Licence No. DIR 005/2001, issued to Cotton Seed Distributors);

- INGARD<sup>®</sup>, Bollgard II<sup>®</sup> and Bollgard II<sup>®</sup>/Roundup Ready<sup>®</sup> cotton in WA and NT (Licence No. DIR 006/2001, issued to CSIRO);
- Bollgard II<sup>®</sup> cotton in WA (Licence No. DIR 009/2002, issued to Department of Agriculture (WA)).
- Bollgard II<sup>®</sup> and Roundup Ready<sup>®</sup>/Bollgard II<sup>®</sup> cotton in northern WA and NT (Licence No. DIR 012/2002, issued to Monsanto)

There have been no reports of adverse effects on human health or the environment resulting from these releases.

## Parent organism

The parent organism is cultivated cotton (*Gossypium hirsutum* L.), which is exotic to Australia and is grown as an agricultural crop in NSW and southern Qld and on a trial basis in northern Qld, WA and the NT.

## Genetic modification and its effect

Roundup Ready<sup>®</sup> MON 88913 cotton contains two copies of a herbicide tolerance gene, *cp4 epsps*, derived from a common soil bacterium, *Agrobacterium* sp. strain CP4. This gene encodes an enzyme that is not as sensitive to glyphosate, the active ingredient in Roundup<sup>®</sup> herbicide, as the plant's own equivalent gene.

Roundup Ready<sup>®</sup> cotton contains only one copy of the *cp4 epsps* gene and has little tolerance to glyphosate in reproductive tissues. This means that glyphosate can only be applied up to the four leaf stage of growth (ie prior to flowering) to control weeds, as after this stage of plant growth, application of the herbicide can lead to yield loss. The applicant has indicated that, as Roundup Ready<sup>®</sup> MON 88913 cotton has enhanced expression of the *cp4 epsps* gene and is tolerant of glyphosate at later stages of growth, the window in which glyphosate can be applied for weed control is longer, giving growers increased flexibility in timing herbicide applications for integrated weed management.

Roundup Ready<sup>®</sup> MON 88913 /Bollgard II<sup>®</sup> cotton plants contain, in addition to the herbicide tolerance genes, two insecticidal genes *cry1Ac* and *cry2Ab*, derived from a common soil bacterium, *Bacillus thuringiensis* (Bt). The insecticidal genes encode proteins that are toxic to lepidopteran caterpillars, including the two key *Helicoverpa* pests of cotton.

No antibiotic resistance marker genes are present in Roundup Ready<sup>®</sup> MON 88913 cotton. However, Roundup Ready<sup>®</sup> MON 88913 /Bollgard II<sup>®</sup> plants contain bacterial genes, as a result of the cross with Bollgard II<sup>®</sup>, conferring resistance to the antibiotics kanamycin and neomycin (*nptII* gene), and streptomycin and spectinomycin (*aad* gene). The *aad* gene is not expressed in the plants because the promoter that is required for its expression is not active in plants. This gene was used in the laboratory prior to the production of the genetically modified plants to select for bacteria containing the modified DNA.

A reporter gene (*uidA*) from the bacterium *Escherichia coli* encoding the enzyme  $\beta$ -glucuronidase (GUS), that enables visual identification of plant tissues in which this gene is being expressed, is also present in the Roundup Ready<sup>®</sup> MON 88913 /Bollgard II<sup>®</sup> cotton plants.

Short regulatory sequences that control expression of the genes are also present in the genetically modified cottons. These sequences are derived from the cauliflower mosaic virus, figwort mosaic virus, *Agrobacterium tumefaciens* and from soybean and two other plant species. Although three of these organisms are plant pathogens, the regulatory sequences comprise only a small part of their total genome and are not in themselves capable of causing disease.

## Method of gene transfer

The two copies of the *cp4 epsps* gene and associated regulatory sequences were introduced into Roundup Ready<sup>®</sup> MON 88913 cotton on a plasmid vector carried by *Agrobacterium tumefaciens* (a common soil bacterium). The vector is 'disarmed' since it lacks the genes that encode the tumour-inducing functions of *A. tumefaciens*.

Bollgard II<sup>®</sup> cotton was derived by particle bombardment of the *cry2Ab* and *uidA* genes into the GM INGARD<sup>®</sup> cotton containing the *cryIAc*, *nptII* and *aad* genes. This technique involves coating the DNA containing the *cry2Ab* and *uidA* genes onto very small particles which were 'shot' into the cotton tissue.

Roundup Ready<sup>®</sup> MON 88913/Bollgard II<sup>®</sup> cotton is generated through conventional breeding of GM Roundup Ready<sup>®</sup> MON 88913 and GM Bollgard II<sup>®</sup> cotton.

## Consultation on preparation of the Risk Assessment and Risk Management Plan

The Regulator has made an initial assessment as to whether the proposed release may pose significant risks to human health and safety or the environment, in accordance with section 49 of the Act. Due to the low risk potential of the GMOs and extensive experience with the release of similar GMOs at both limited and controlled release and commercial scales with no reported adverse effects on human health and safety or the environment, **the Regulator has decided that the proposed release does not pose a significant risk to human health and safety or the environment.**

This means that the Regulator is **not required to seek public comment** on the assessment of this proposal until the risk assessment and risk management plan has been prepared.

As required by section 50 of the Act, the Regulator is preparing a risk assessment and risk management plan in relation to the licence application and will seek input from a wide range of key stakeholders and expert groups comprising State and Territory Governments, relevant Commonwealth agencies, the Environment Minister, the Gene Technology Technical Advisory Committee and appropriate local councils.

As required by section 52 of the Act, the Regulator will again consult with these prescribed agencies and authorities in finalising the risk assessment and risk management plan that is expected to be issued in **late June 2003**. The public will also be invited to provide comment on the risk assessment and risk management plan over an eight week consultation period, via advertisements in the media and direct mail to anyone registered on the OGTR mailing list. Summaries and copies of the risk assessment and risk management plan will be available from the OGTR, or on the OGTR website.

## Issues to be considered by the Regulator

In making a decision on whether to issue a licence for the proposed release, the Regulator is required to consider applications and submissions within the context of the object of the Act, which focuses upon **protecting the health and safety of people and the environment.**

**Please note that issues such as food labelling, the use and safety of insecticides and herbicides, marketability and trade implications do NOT fall within the scope of the evaluations conducted under the Act as these are the responsibility of other agencies and authorities.**

Further information about food safety assessments and food labelling, and the use and safety of insecticides and herbicides are available from FSANZ and the APVMA, respectively:

Food Standards Australia New Zealand  
PO Box 7186  
Canberra Mail Centre ACT 2610  
Phone: (02) 6271 2222  
Fax: (02) 6271 2278  
E-mail: [info@foodstandards.gov.au](mailto:info@foodstandards.gov.au)  
<http://www.foodstandards.gov.au>

Australian Pesticides and Veterinary Medicines Authority  
PO Box E240  
KINGSTON ACT 2604  
Phone: (02) 6272 5852  
Fax: (02) 6272 4753  
Email: [contact@apvma.gov.au](mailto:contact@apvma.gov.au)  
<http://www.apvma.gov.au>

If you have any questions about the application or the assessment process, please contact the OGTR at:

**The Office of the Gene Technology Regulator**  
**MDP 54**  
**PO Box 100**  
**WODEN ACT 2606**

Tel: 1800 181 030  
Fax: 02 6271 4202  
Email: [ogtr@health.gov.au](mailto:ogtr@health.gov.au)  
Website [www.ogtr.gov.au](http://www.ogtr.gov.au)

## **Appendix**

### **Possible release shires for Licence application DIR 035/2002**

<b>NSW</b>	<b>QLD</b>	<b>NT</b>	<b>WA</b>
Balranald	Aramac	Katherine	Broome
Bingara	Balonne		Wyndham – East Kimberley
Bland	Banana		
Bogan	Cambooya		
Bourke	Chinchilla		
Brewarrina	Clifton		
Broken Hill	Dalby		
Carrathool	Emerald		
Central Darling	Fitzroy		
Coonamble	Flinders		
Deniliquin	Gatton		
Dubbo	Goodiwindi		
Forbes	Inglewood		
Griffith	Jondaryan		
Gunnedah	Kingaroy		
Hay	Milmerran		
Jerilderie	Monto		
Lachlan	Murilla		
Moree Plains	Murweh		
Murrumbidgee	Peak Downs		
Narrabri	Pittsworth		
Narromine	Richmond		
Parry	Rosalie		
Quirindi	Toowoomba		
Tamworth	Waggamba		
Walgett	Wambo		
Warren	Warroo		
Yallaroi	Wondai		