

LICENCE NO: DIR066
LICENCE HOLDER: Monsanto Australia Limited
ACCREDITATION NO: ACCR 034/2002

SUBMISSION: 2015 Annual Report for Commercial release of GM herbicide tolerant and/or insect resistant cotton lines
REPORTING PERIOD: 1 June 2014 – 1 June 2015
(covering 2014/15 cotton growing season)
DATE: 30 June 2015

PREPARED BY: 


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SECTION 1. LICENCE HOLDER DETAILS

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**Accreditation
Number:** ACCR 034/2002

SCOPE OF THE REPORT

This report addresses the annual reporting condition of the DIR066 commercial licence covering Roundup Ready® cotton, Roundup Ready Flex® cotton and the Bollgard II® trait issued to Monsanto Australia Limited by the Office of the Gene Technology Regulator.

This report details compliance with general and specific conditions of Sections 2 to 6 of the DIR066 licence as issued to Monsanto Australia Limited on 26 October 2006, and as varied 22 December 2006, 6 December 2007, 15 April 2009 and 20 June, 2013.

This report covers the period of time from 1 June 2014 to 1 June 2015, including the 2014/15 cotton planting season.

SECTION 2. LICENCE CONDITIONS

Condition 1. Duration of Licence

DIR066 has not been suspended, cancelled or surrendered.

Condition 2. Holder of Licence

Monsanto Australia Limited (Monsanto) remains the holder of the licence.

Conditions 3 and 4. Project Supervisor

The project supervisor is [REDACTED]

Condition 5. No dealings with GMOs except as authorized by this Licence

Persons covered by the licence did not deal with GMOs except as expressly permitted by the licence.

Conditions 6 and 7. Location

The licence allows for dealings with GMOs to be conducted anywhere in Australia. This licence supersedes any previous licences regarding location.

Conditions 8 and 9. Persons covered by this GMO Licence

Monsanto acknowledges that the persons covered by the licence are the licence holder and employees, agents or contractors of the licence holder and other persons who are, or have been, engaged to undertake any activity in connection with GMOs grown in a location pursuant to this licence.

Conditions 10 and 11. Informing people of their obligations

DIR066 was issued in October 2006, permitting dealings with the GMOs to be undertaken during the cotton growing seasons.

Monsanto Australia Limited informed all persons covered by the DIR066 licence of the obligations imposed on them as a result of the conditions of the licence. This was primarily achieved through the Monsanto accreditation program, which includes information on regulatory obligations as well as management of the crop.

Accreditation programs require all persons having management responsibility for Roundup Ready (no longer sold commercially), Roundup Ready Flex and Bollgard II cotton crops to undergo training.

Condition 12. Applicant to notify of circumstances that might affect suitability

During the reporting period, Monsanto Australia Ltd did not receive a relevant conviction occurring after the commencement of this licence; nor was there any revocation or suspension of a licence or permit held by Monsanto Australia Ltd under a law of the Australian Government, a State or foreign country, being a law relating to the health and safety of people or the environment; or any event or circumstance occurring after the commencement of this licence that would affect the capacity of Monsanto to meet the conditions of the DIR066 licence.

Condition 13. Licence holder must provide information on matters related to suitability

Monsanto acknowledges that it must provide information related to its ongoing suitability to hold a licence when requested to do so in writing by the Regulator and must provide information within a time period stipulated by the Regulator.

Condition 14. People dealing with the GMOs must allow auditing and monitoring if the dealing

Monsanto acknowledges that if a person authorized by this licence to deal with GMOs and a particular condition of this licence applies to the dealing by that person, the person must allow the Regulator, or a person authorized by the Regulator, to enter the premises where the dealing is being undertaken, for the purposes of auditing or monitoring the dealing.

Condition 15. Remaining an Accredited organization

At all times, Monsanto remained an accredited organization and complied with conditions of accreditation as set out in the OGTR Guidelines for Accreditation of Organisations.

Conditions 16 - 19 Additional information must be given to the Regulator

During the reporting period, Monsanto did not become aware of any additional information as to any risks to the health and safety of people, or to the environment, associated with the dealings authorized by this licence; or of any unintended effects of the dealings authorized by this licence.

Condition 20. Compliance Management Plan

A Compliance Management Plan was provided to the Regulator on issuance of the DIR066 licence. A copy of the current Resistance Management Plans showing compliance metrics is in Appendix A and B.

SECTION 3. GROWING THE GMOS
3.1 GMOs covered by this licence

The only dealings with GMOs under this licence were those with the GMOs described in DIR066 Licence.

3.2 Permitted dealings

Sales and planting of the Roundup Ready Flex (RRF), Bollgard II (BGII) and Bollgard II [REDACTED] were undertaken under a Technology User Agreement, which sets out the conditions for planting and growing a cotton crop containing RRF and BGII technology. Roundup Ready cotton has been removed from the market in Australia. In order to be eligible to sign such an agreement, a grower is required to attend an accreditation program and pass a test based on the material covered in the accreditation program.

3.3 Commercial Crop Locations and Volumes

Valley	BGII ha	RR ha	RRF ha	BGII w RR ha	BGII w RRF ha	BGII w [REDACTED] ha	Total ha
Belyando	0.00	0.00	126.84	0.00	1171.70	0.00	1298.54
Bourke	0.00	0.00	61.00	0.00	1566.15	0.00	1627.15
Darling Downs	11.10	0.00	2249.63	0.00	19926.51	0.00	22187.24
Dawson/Callide	0.00	0.00	56.03	0.00	3037.04	0.00	3093.07
Dirranbandi	0.00	0.00	11.45	0.00	11214.67	0.00	11226.12
Emerald	0.00	0.00	0.00	0.00	10585.18	0.00	10585.18
Gwydir	0.00	0.00	5200.57	0.00	21594.50	0.00	26795.07
Lachlan	0.00	0.00	67.22	0.00	11252.30	0.00	11319.52
Lower Namoi	0.00	0.00	3782.29	0.00	20884.49	0.00	24666.78
MacIntyre	0.00	0.00	98.76	0.00	11069.82	0.00	11168.58
Macquarie	0.00	0.00	202.35	0.00	10061.97	0.00	10264.32
McKenzie River	0.00	0.00	9.13	0.00	429.83	0.00	438.96
Mungindi	0.00	0.00	145.80	0.00	2211.14	0.00	2356.94
Murrumbidgee	0.00	0.00	769.44	0.00	33245.97	0.00	34015.41
St George	0.00	0.00	340.44	0.00	10011.80	0.00	10352.24
Tandou	0.00	0.00	345.23	0.00	3366.29	0.00	3711.52
Upper Namoi	0.00	0.00	1340.80	0.00	19420.17	0.00	20760.97
Walgett	0.00	0.00	0.00	0.00	894.97	0.00	894.97
Total ha	11.10	0.00	14,806.98	0.00	191,944.50	0.00	206,762.60

Total Bollgard II ha planted	191,955.60
Total Roundup Ready Flex ha planted	206,751.50

Note – Total Bollgard II figure includes Bollgard II, Bollgard II/Roundup Ready Flex and Bollgard II/[REDACTED]. Total Roundup Ready Flex figure includes Roundup Ready Flex and Bollgard II/Roundup Ready Flex.

Valley: Belyando

Boundaries: Includes the shires of Moranbah, Clermont, Kilcummin, Mistake Creek, Belyando, Elgin, Wolfgagn, Winchester, Old Labona, Gemini Mountains, Amaroo, South Copperfield, Laglan, Birimgan, Blair Athol and Pasha.

Valley: Bourke

Boundaries: West of Walgett Shire, north of Coolahbah. Includes Cunnamulla in Queensland.

Valley: Darling Downs

Boundaries: Follows the Condamine River. Includes Toowoomba, Murgon, Dalby, Chinchilla, Condamine, and Roma. South-west boundary is Surat.

Valley: Dawson/Callide

Boundaries: Includes Taroom, Biloela, Moura and Theodore regions.

Valley: Dirranbandi

Boundaries: Runs north toward St George and includes Lower Plains, follows south along the Balonne River right down to the NSW border.

Valley: Emerald

Boundaries: South-eastern boundary formed by the Expedition Ranges between Rolleston and Bauhinia. Region runs north-west from there to include Emerald and Dysart.

Valley: Gwydir

Boundaries: South of Fox Lane, north-west to Garah, west to Collarenebri, south to Bellata. The road that runs east-west through Bellata and to Rowena is southern boundary.

Valley: Lachlan

Boundaries: Northern boundary is Peak Hill and Tullamore and the cotton follows the Lachlan River through to Booligal. The southern boundary is the road through to Gunbar and then follows the Great Western Highway through to West Wyalong.

Valley: Lower Namoi

Boundaries: North-west of Baan Baa-Manilla Road and south of Bellata-Rowena Road. Western boundary is formed by the road that runs from Pilliga via Burren Junction to Collarenebri.

Valley: MacIntyre

Boundaries: North of Gwydir, western boundary is Garah to Talwood Road north include Moonie and east to include Texas. Southern boundary is Foxes Lane which runs Garah back to the Newell Highway and then along to Croppa Creek, Yallaroi and Coolatai.

Valley: Macquarie

Boundaries: Dubbo and south to Peak Hill. West to Tullamore. North through Tottenham. Nyngan and Coolabah, then east via southern boundary of Walgett shire and then south back to Dubbo via Coonabarabran.

Valley: McKenzie River

Boundaries: North West of Comet, to include McKenzie River and Alton Downs

Valley: Mungindi

Boundaries: West of Garah and Boomi Road to Talwood and follows Barwon River south-west of Mungindi towards Collarenebri. Southern boundary is the Watercourse Road from Colly through to Gingham and then to Garah.

Valley: Murrumbidgee

Boundaries: Northern boundary is the Great Western Highway from West Wyalong through Goolgowi to Gunbar, from Gunbar west to Booligal on the Lachlan River. Downstream of Booligal on the Lachlan and south-west is the Murrumbidgee River.

Valley: St George

Boundaries: Above Lower Plains on the southern side and north-east to include majority of Waroo Shire with the north-east boundary being Surat.

Valley: Tandou

Boundaries: surrounds Menindee shire. North of Mildura and west of the SA border

Valley: Upper Namoi

Boundaries: South-east of Baan Baa-Manilla Road. Includes Coolah, Merriwa, Mullaley, Gunnedah and Quirindi.

Valley: Walgett

Boundaries: Includes almost entirety of Walgett Shire, with eastern boundary being the road that runs south from Collarenebri to Burren Junction.

3.4 Trial/Research Crop Locations and Volumes

Valley	BGII ha	RR ha	RRF ha	BGII w RR ha	BGII w RRF ha	BGII w ha	Total ha
██████████	██	██	██	██	██	██	██
██████	██	██	██	██	██	██	██
██████	██	██	██	██	██	██	██
██████████	██	██	██	██	██	██	██
██████████	██	██	██	██	██	██	██
Total ha	0.00	0.00	55.23	0.00	192.16	11.50	258.89

APPENDIX A -

Resistance Management Plan for Bollgard II® Cotton 2014/2015

Developed by Monsanto Australia Limited and the Transgenic and Insect Management Strategy (TIMS) Committee of Cotton Australia Ltd.

The resistance management plan is based on three basic principles: (1) minimising the exposure of *Helicoverpa* spp. to the *Bacillus thuringiensis* (Bt) proteins Cry 1Ac and Cry 2Ab; (2) providing a population of susceptible individuals that can mate with any resistant individuals, hence diluting any potential resistance; and (3) removing resistant individuals at the end of the cotton season. The three principles are supported through the implementation of 5 elements that are the key components of the Resistance Management Plan. These elements are:

1. Refuge crops
2. Planting window
3. Pupae busting/Trap crops
4. Control of volunteers and ratoon cotton and
5. Spray limitations.

Growers of Bollgard II cotton are required to practice preventative resistance management as set out below. Compliance with the Resistance Management Plan is required under the terms of the Bollgard II Technology User Agreement and under the conditions of registration (*Agricultural and Veterinary Chemicals Act 1994*).

Section 1 is applicable to all regions in New South Wales and Queensland that grow cotton while sections 2 and 3 detail specific requirements for New South Wales and Southern Queensland, and Central Queensland respectively.

SECTION 1: NEW SOUTH WALES, SOUTHERN QUEENSLAND & CENTRAL QUEENSLAND

1. Refuges

Growers planting Bollgard II cotton will also be required to grow a refuge crop that is capable of producing large numbers of *Helicoverpa* spp. moths which have not been exposed to selection with Bt proteins Cry 1Ac and Cry 2Ab. These unselected moths are expected to dominate matings with any survivors from Bollgard II crops and thus help to maintain resistance to Bt proteins Cry 1Ac and Cry 2Ab at low levels.



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All refuge options are based on the requirement of a 10% unsprayed cotton refuge or its equivalent, as determined by the relative production of *Helicoverpa* spp. from each of the refuge types as described in Tables 1 and 2, for irrigated and dryland production scenarios respectively. Irrespective of the irrigation regime for the Bollgard II cotton, all pigeon pea refuges must be fully irrigated so that they are attractive to *Helicoverpa* spp. during the growing period of the Bollgard II cotton.

For each area of irrigated Bollgard II cotton planted, a grower is required to plant a minimum of one or a combination of the following:

Table 1. Irrigated Bollgard II cotton refuge options

Crop	Conditions	% of Bollgard II
Cotton	Irrigated, sprayed conventional cotton	100
	Irrigated, unsprayed conventional cotton	10
Pigeon pea	Fully irrigated, unsprayed	5

Table 2. Dryland Bollgard II cotton refuge options

Crop	Conditions	% of Bollgard II
Cotton	Dryland or irrigated, sprayed conventional cotton	100
	Dryland or irrigated, unsprayed conventional cotton	10
Pigeon pea	Fully irrigated, unsprayed	5

No other refuge options are approved for dryland Bollgard II.

Note: Unsprayed means not sprayed with any insecticide that targets any life stage of *Helicoverpa* spp. Bt products must not be applied to any refuge (including sprayed cotton).

If the viability of an unsprayed conventional cotton refuge is at risk due to early season pressure by *Helicoverpa* spp., and with prior approval from the Monsanto Compliance and Stewardship Manager, a non-Bt heliocide can be applied. An unsprayed refuge should not be planted in the same field as any crop sprayed with a rate of insecticide that is registered for *Helicoverpa* spp, with the exception of Bollgard II. Sprayed crops and unsprayed refuges that are planted in

adjacent fields must be separated by sufficient distance to *minimise the likelihood of insecticide drift onto the unsprayed refuge*.

For the purposes of this Resistance Management Plan, conventional cotton includes any cotton varieties that do not have Bt proteins in the plant that control *Helicoverpa* spp. larvae.

General conditions for all refuges:

- (a) Refuge crops are to be planted and managed so that they are attractive to *Helicoverpa* spp. during the growing period of the Bollgard II cotton varieties.

Irrigated: It is preferable that all refuge is planted within the 2 week period prior to planting Bollgard II. If this is not possible, refuge planting must be completed within 3 weeks of the first day of sowing of Bollgard II. At this time, sufficient refuge must have been planted to cover all of the Bollgard II cotton proposed to be planted for the season (including Bollgard II already planted and any that remains unplanted). Should additional Bollgard II planting be made after this date, which is not already covered by refuge, additional refuge must be planted as soon as possible and no more than 2 weeks after sowing of the additional Bollgard II.

Dryland: A dryland refuge must be planted within the 2 week period prior to the first day of planting Bollgard II cotton.

- (b) Pigeon pea refuges should not be planted until the soil temperature reaches 17°C, which is a requirement for germination, and should also be planted into moisture to ensure successful germination. If soil temperatures are not suitable to allow germination of pigeon peas in line with condition (a), an alternative refuge must be planted in its place within the prescribed period (under (a) above).
- (c) Once Bollgard II cotton begins to flower the corresponding refuge should not be cultivated.
- (d) Insecticide preparations containing Bt may be used on Bollgard II cotton throughout the season BUT NOT on any refuge crops.
- (e) All refuges are to be planted within the farm unit growing Bollgard II cotton. Subject to clause (f) below, all reasonable effort should be taken to plant the refuge either on one side of, or next to a Bollgard II cotton field and all Bollgard II fields must be no more than 2 km from the nearest associated Bollgard II refuge.
- (f) To minimise the possibility of refuge attractiveness being affected by herbicide drift, non-herbicide tolerant refuges should be separated from herbicide tolerant Bollgard II cotton crops by a sufficient distance to minimise such drift, but no more than 2km from the Bollgard II cotton.

- (g) To account for possible insecticide drift, the options for the width of refuge crops vary according to spray regime. If any sprayed conventional cotton is grown on the same farm unit, Bollgard II refuge crops must be at least 48 metres wide and each refuge area must be a minimum of 2 hectares. If no sprayed conventional cotton is grown on the same farm unit, Bollgard II refuge crops must be at least 24 metres wide and 24 metres long. Different unsprayed refuge options may be planted in the same field as a single unit; however a sprayed conventional cotton refuge must not be planted in a field that is also planted to an unsprayed refuge type.
- (h) In all regions, destruction of refuges should only be carried out after Bollgard II cotton lint removal has been completed.
- (i) Refuges for dryland Bollgard II cotton crops must be planted in the same row configuration as the Bollgard II crop unless the refuge is irrigated. If an irrigated option is utilised for a dryland Bollgard II crop, then that refuge may be planted in a solid configuration. Dryland cotton is measured as green hectares (calculated as defined in the Technology User Agreement).

2. Control of volunteer and ratoon cotton

Volunteer and ratoon cotton may impose additional selection pressure on *Helicoverpa* spp. to develop resistance to the Bt Cry 1Ac and Cry 2Ab proteins produced by Bollgard II cotton.

Growers must make all reasonable efforts to remove volunteer and ratoon plants, as soon as possible from all fields, including fallow areas, Bollgard II crops, conventional cotton crops and all refuges. **The presence of Bollgard II volunteers/ratoon cotton in any refuge will diminish the value of the refuge and must be removed as soon as possible.**

Note: The refuge should preferably be planted into fallow or rotation fields that have not been planted to cotton in the previous season.

3. Post-harvest crop destruction

As soon as practical after harvest, Bollgard II cotton crops must be destroyed by cultivation or herbicide so that they do not continue to act as hosts for *Helicoverpa* spp.

SECTION 2: NEW SOUTH WALES AND SOUTHERN QUEENSLAND ONLY

1. Planting windows

All Bollgard II crops are to be planted into moisture or watered-up by 15 November, unless otherwise advised by a Bollgard II Planting Window Variation Notice.

2. Pupae destruction

In Bollgard II cotton fields, each grower will be required to undertake *Helicoverpa* spp. pupae destruction after harvest according to the following key guidelines:

- Bollgard II crops should be slashed or mulched and fields cultivated for pupae control within 4 weeks of harvesting. All pupae busting must be completed by July 31.
- Ensure disturbance of the whole soil surface to a depth of 10 cm.
- All fields that are sown to any winter crop following a Bollgard II crop must be inspected by the Technology Service Provider before sowing commences in order to ensure that pupae busting has occurred.

In Refuge crops:

In New South Wales and Southern Queensland, to ensure maximum emergence of late pupae from associated refuges, soil disturbance of refuge crops should not be undertaken until after the pupae busting in Bollgard II cotton crops on the farm unit is complete. All unsprayed refuges, should preferably be left uncultivated until the following October.

3. Failed crops

Bollgard II crops that will not be grown through to harvest for various reasons and are declared to, and verified by, Monsanto as failed must be destroyed within two weeks after verification, in such a way that prevents regrowth. Crops abandoned before February 28 do not require pupae busting. Crops abandoned on February 28 or later must be pupae busted.

NB: If any grower encounters problems in complying with the Resistance Management Plan please contact your local Monsanto Regional Business Manager.

SECTION 3: CENTRAL QUEENSLAND ONLY

1. Planting Windows

Emerald: All Bollgard II crops are to be planted into moisture or watered-up in the period between September 15 and October 26, unless advised otherwise by a Bollgard II Planting Window Variation Notice.

Dawson Callide Valleys: All Bollgard II crops are to be planted into moisture or watered-up in the period between September 15 and October 26, unless advised otherwise by a Bollgard II Planting Window Variation Notice.

Belyando - Clermont: All Bollgard II crops are to be planted into moisture or watered-up in the period between November 4 and December 15, unless advised otherwise by a Bollgard II Planting Window Variation Notice.

Mackenzie: All Bollgard II crops are to be planted into moisture or watered-up in the period between November 4 and December 15, unless advised otherwise by a Bollgard II Planting Window Variation Notice.

2. Refuges

Pigeon Pea refuge should preferably be planted into a fallow or rotation field that has not been planted to cotton in the previous season to avoid volunteer and ratoon cotton.

In Central Queensland soil disturbance of refuge crops can only occur 2 weeks after final defoliation of the Bollgard II cotton.

3. Late summer pigeon pea trap crop

A late summer trap crop (pigeon pea) must be planted for all Bollgard II cotton grown in Central Queensland. The planting configuration of the trap crop should be the same as that of the Bollgard II crop. Irrigated Bollgard II must have an irrigated trap crop. Table 3 shows the requirements for the late summer pigeon pea trap crop. Dryland Bollgard II growers who do not have any irrigated cotton on their farm should contact their Monsanto Regional Business Manager for alternative options.

Refuge and late summer trap crops have different purposes and, if pigeon pea is selected for both, two separate plantings may be required. However, where a pigeon pea refuge is utilised as a trap crop the full 5% pigeon pea refuge area must be managed to become the late summer trap crop and must adhere to the requirements in Table 3 below.

Table 3. Late summer pigeon pea trap crop requirements in Central Queensland

Criterion	Trap crop*
Minimum area & dimension (Requirement)	A minimum trap crop of 1% of planted Bollgard II cotton crop is required. If sprayed conventional cotton is grown on that farm unit: the trap crop must be at least 48m x 48m. If no sprayed conventional cotton is grown on that farm unit: the trap crop must be at least 24m x 24m.
Planting time	The trap crop should preferably be planted between November 1 and November 30 Note: if growers choose to plant their trap crop to coincide with the planting of pigeon pea refuges they must manage the trap crop in such a way that it remains attractive to <i>Helicoverpa</i> spp. 2-4 weeks after final defoliation.
Planting rate **	35kg/ha (recommended establishment greater than 4 plants per metre)
Insect control	The trap crop can be sprayed with virus after flowering; while avoiding insecticide spray drift, except where a pigeon pea refuge is converted to a trap crop. In this case the full 5% pigeon pea refuge area managed to become the late summer trap crop can only be sprayed with virus after the first defoliation of Bollgard II cotton.
Irrigation	The trap crop must be planted into an area where it can receive the additional irrigation required to keep the trap crop attractive to <i>Helicoverpa</i> spp. until after the cotton is defoliated.
Weed control	The trap crop should be kept free of weeds and particularly volunteer Bollgard II cotton. When using the full 5% pigeon pea trap crop option, weed control must not be carried out by cultivation once flowering of the associated Bollgard II cotton crop has commenced

Crop destruction	The trap crop must be destroyed 2-4 weeks (but not before 2 weeks) after final defoliation of the Bollgard II cotton crop, (slash and pupae bust – full soil disturbance to a depth of 10cm across the entire trap crop area). All Bollgard II and associated trap crops must be destroyed by July 31.
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* A pigeon pea trap crop is to be planted so that it is attractive (flowering) to *Helicoverpa* spp. after the cotton crop has cut out, and as any survivors from the Bollgard II crop emerge. Planting pigeon pea too early (e.g. before November) or too late (e.g. mid December) is not adequate for cotton crops planted during September through to October.

** The planting rate is a recommendation based on a minimum of 85% seed germination.

NB: If any grower encounters problems in complying with the resistance management plan, please contact your Monsanto Regional Business Manager.

For further background information on the various components of this plan see the "Preamble to the Resistance Management Plan for Bollgard II" in the current Cotton Pest Management Guide.

APPENDIX B

Resistance Management Plan for Bollgard II® cotton 2014/2015 - Ord River Irrigation and Burdekin Bowen Basin Areas

Ord River Irrigation, Burdekin Bowen Basin and Richmond Areas
Developed by Monsanto Australia Limited and the Transgenic and Insect Management Strategy (TIMS) Committee of Cotton Australia Limited.

The resistance management plan is based on three basic principles: (1) minimising the exposure of *Helicoverpa* spp. to the *Bacillus thuringiensis* (Bt) proteins Cry 1Ac and Cry 2Ab; (2) providing a population of susceptible individuals that can mate with any resistant individuals, hence diluting any potential resistance; and (3) removing resistant individuals at the end of the cotton season. The three principles are supported through the implementation of 5 elements that are the key components of the Resistance Management Plan. These elements are:

1. Refuge crops
2. Planting window
3. Pupae busting/Trap crops
4. Control of volunteers and ratoon cotton and
5. Spray limitations.

Growers of Bollgard II cotton are required to practice preventative resistance management as set out below. Compliance with the Resistance Management Plan is required under the terms of the Bollgard II Technology User Agreement and under the conditions of registration (*Agricultural and Veterinary Chemicals Act, 1994*).

This RMP is for the following areas:

- **Ord River Irrigation Area**, Western Australia
- **Burdekin Bowen Basin Area**, Queensland
- **Richmond Area**, Queensland

1. Refuges

Growers planting Bollgard II cotton will also be required to grow a refuge crop that is capable of producing large numbers of *Helicoverpa* spp. moths which have not been exposed to selection with Bt proteins Cry 1Ac and Cry 2Ab. These unselected moths are expected to dominate matings with any survivors from Bollgard II crops and thus help to maintain resistance to Bt proteins Cry 1Ac and Cry 2Ab at low levels.

All refuge options are based on the requirement of a 10% unsprayed cotton refuge or its equivalent as determined by the relative production of *Helicoverpa* spp. from each of the refuge types as described in the tables below.

For each area of irrigated Bollgard II cotton planted, a grower is required to plant a minimum of one, or a combination of, the following:

Table 1. Irrigated Bollgard II cotton refuge options

Crop	Conditions	% of Bollgard II	Regions permitted
Conventional Cotton	Irrigated, unsprayed conventional cotton	10	All Regions
Pigeon pea	Fully irrigated, unsprayed	5	All Regions

Note: Unsprayed means not sprayed with insecticides that target any life stage of *Helicoverpa* spp. Bt products must not be applied to any refuge.

If the viability of an unsprayed refuge is at risk due to early or late season pressure by *Helicoverpa* spp., or any other caterpillar species, contact Monsanto immediately. With prior approval from the Monsanto Compliance and Stewardship Manager, a non-Bt heliocide can be applied.

An unsprayed refuge should not be planted in the same field as any crop sprayed with a rate of insecticide that is registered for *Helicoverpa* spp, with the exception of Bollgard II unless a sufficient buffer is in place to prevent insecticide drift.

Sprayed crops and unsprayed refuges that are planted in adjacent fields must also be separated by sufficient distance to *minimise the likelihood of insecticide drift onto the unsprayed refuge*.

For the purposes of this Resistance Management Plan, conventional cotton includes any cotton varieties that do not have Bt proteins in the plant that control *Helicoverpa* spp. larvae.

General conditions for all refuges:

(a) Refuge crops are to be planted and managed so that they are attractive to *Helicoverpa* spp. during the growing period of the Bollgard II cotton varieties.

Ord River Irrigation Area

It is preferable that all refuge is planted within the 2 week period prior to planting Bollgard II. If this is not possible, refuge planting must be completed within 3 weeks of the first day of sowing of Bollgard II. At this time, sufficient refuge must have been planted to cover all of the Bollgard II cotton proposed to be planted for the season (including Bollgard II already planted and any that remains unplanted). Should additional Bollgard II planting be made after this date, which is not already covered by refuge, additional refuge must be planted as soon as possible and no more than 2 weeks after sowing of the additional Bollgard II.

Burdekin Bowen and Richmond Areas

Refuges must be sown within the 2 weeks prior to planting any Bollgard II. This timing attempts to mitigate wet season planting risks.

(b) Group J legume inoculant should be used to treat pigeon pea planting seed just prior to sowing to ensure effective root zone colonisation by nitrogen fixing rhizobium bacteria

(c) Once the Bollgard II cotton begins to flower the corresponding refuge must not be cultivated.

(d) Insecticide preparations containing Bt may be used on Bollgard II cotton throughout the season BUT NOT on any refuge crops.

(e) All refuges are to be planted within the farm unit growing Bollgard II cotton. Subject to clause (f) below, all reasonable effort should be taken to plant the refuge either on one side of, or next to, a Bollgard II cotton field, and all Bollgard II fields must be no more than 2 km from the nearest Bollgard II refuge.

- (f) To minimise the possibility of refuge attractiveness being affected by herbicide drift, non-herbicide tolerant refuges should be separated from herbicide tolerant Bollgard II cotton crops by a sufficient distance to minimise such drift, but no more than 2km from the Bollgard II cotton.
- (g) To account for possible insecticide drift, Bollgard II refuge crops must be at least 24 metres wide and 24 metres long. Different unsprayed refuge options may be planted in the same field as a single unit.
- (h) Slashing of plants within the refuge should only be carried out after Bollgard II cotton lint removal has been completed. Soil disturbance of refuge crops can only occur 2 weeks after Bollgard II cotton plants have been harvested.
- (i) Refuges for Bollgard II crops must be planted in the same row configuration as the Bollgard II crop.

2. Control of volunteer and ratoon cotton

Volunteer and ratoon cotton may impose additional selection pressure on *Helicoverpa* spp. to develop resistance to the Bt proteins Cry 1Ac and Cry 2Ab produced by Bollgard II cotton.

Growers must make all reasonable efforts to remove volunteer and ratoon plants as soon as possible from all fields - including fallow areas, Bollgard II crops, conventional cotton crops and all refuges. **The presence of Bollgard II volunteers/ratoon cotton in any refuge will diminish the value of the refuge and must be removed as soon as possible.**

Note: The refuge should preferably be planted into fallow or rotation fields that have not been planted to cotton in the previous season.

3. Post-harvest crop destruction

As soon as practical after harvest, Bollgard II cotton crops must be destroyed by cultivation or herbicide so that they do not continue to act as hosts for *Helicoverpa* spp. Unsprayed refuges must be left uncultivated for two weeks after harvest to allow emergence of any pupating *Helicoverpa* spp.

4. Planting windows

All Bollgard II crops and cotton refuges are to be planted into moisture or watered-up in a five week window. In each region, the start date of the planting window will be determined by TIMS in consultation with local growers and reflected in a regionally amended “Bollgard II Planting Window Variation Notice”.

The planting window will occur within the following periods:

- Ord River Irrigation Area:** March 1 and May 1.
- Burdekin Bowen Basin Area:** December 1 and April 1.
- Richmond Area:** December 1 and April 1.

5. Refuge

Unsprayed Pigeon Pea refuge should preferably be planted into a fallow or rotation field that has not been planted to cotton in the previous season.

6. End of season chick pea trap crop

An end of season chick pea trap crop must be planted. The planting configuration of the trap crop should be the same as that of the Bollgard II crop. Table 2 shows the requirements for the chick pea trap crop.

Table 2. End of season chick pea trap crop requirements Criterion	End of season chick pea trap crop
Minimum area & dimensions	A trap crop of 1% of planted Bollgard II crop area is required. This planting must be at least 24 m x 24m wide.

Planting time	In April for Burdekin Bowen Area. In July/August for Ord area. The trap crop is to be planted such that it is attractive to <i>Helicoverpa</i> spp. from 2 weeks before defoliation of the Bollgard II cotton. It must remain attractive to <i>Helicoverpa</i> spp. until at least 2 weeks after defoliation of the Bollgard II cotton.
Insect control	The trap crop should be monitored and sprayed with insecticide if the larval pressure threatens the viability of the crop.
Irrigation	The trap crop is to remain attractive to <i>Helicoverpa</i> spp. until after defoliation of cotton. In some cases this may require one additional irrigation after the cotton is defoliated. The trap crop must be planted into an area where it can receive the additional irrigation required to ensure the trap crop remains attractive to <i>Helicoverpa</i> spp.
Weed control	The trap crop should be kept free of weeds and particularly volunteer Bollgard II cotton.
Crop destruction	The trap crop must be destroyed 2-4 weeks after defoliation of the Bollgard II cotton crop, but not before 3 weeks (slash and pupae bust – full soil disturbance to a depth of 10 cm across the entire trap crop area). All Bollgard II cotton and associated trap crops must be destroyed by: Burdekin Bowen Basin/Richmond Area – August 31 Ord River Irrigation Area – December 10

NB: If any grower encounters problems in complying with the resistance management plan, please contact your Monsanto Regional Business Manager.

For further background information on the various components of this plan see the "Preamble to the Resistance Management Plan for Bollgard II" in the current Cotton Pest Management Guide.