



# XTENDFLEX<sup>®</sup> COTTON

## WEED RESISTANCE MANAGEMENT PLAN

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## 1. OBJECTIVE

Herbicide resistant weeds have been a reality in Australia for decades – no herbicide is immune, and while the problem is significant it is also manageable. The XtendFlex® cotton Weed Resistance Management Plan (WRMP) details strategies that can be implemented to minimise the risk of glyphosate, dicamba or glufosinate herbicide resistance developing in weeds on-farm when one or all of the registered over-the-top (OTT) herbicides are used in XtendFlex® cotton. Prudent management of XtendFlex® cotton technology and mitigation of resistance risks will ensure these options for weed control are available to Australian cotton growers well into the future.

## 2. GROWING XTENDFLEX® COTTON

There are several requirements that growers need to be aware of when planting XtendFlex® cotton, as outlined by the Technology User Agreement (TUA) and the product labels for the registered OTT herbicide products. These registered products are: Roundup Ready® Herbicide with PLANTSHIELD®, Roundup Ready PL Herbicide with PLANTSHIELD Technology, XtendiMax® 2 Herbicide with VapourGrip® Technology, Roundup Xtend® 2 Herbicide with VapourGrip Technology and Nufarm Biffo® Herbicide.

The requirements are designed to support the longevity and effectiveness of the trait and herbicides, these include:

- Completion of an XtendFlex® cotton accreditation course prior to planting cotton containing the
- XtendFlex herbicide tolerance trait for the first time
- Reporting any suspected glyphosate, dicamba or glufosinate resistant weed species to a Bayer representative or Nufarm where Nufarm Biffo® Herbicide has been used.
- Implementing an integrated weed management (IWM) strategy
- Completion of the XtendFlex® cotton spray applicator training

Growers should make sure they familiarise themselves with both the TUA terms and conditions and the relevant herbicide product labels.

## 3. REPORTING SUSPECTED RESISTANCE

Naturally occurring populations of some weeds may possess biotypes with resistance to glyphosate, dicamba or glufosinate. Growers should be aware of this prior to using any of the registered OTT herbicides in XtendFlex® cotton and should aim to decrease the development and spread of resistant populations. If you suspect resistant biotypes are present, they should be sampled and tested. Contact the local Bayer Territory Business Manager for assistance with this process.

The WRMP aims to reduce the likelihood of weed resistance to glyphosate, dicamba or glufosinate herbicides developing, it does not guarantee that resistance will not occur.

## 4. UNDERSTANDING YOUR HERBICIDE RESISTANCE RISK

Each field planted to XtendFlex® cotton has its own unique risk of weed populations resistant to dicamba, glufosinate or glyphosate developing, based on herbicide usage history, the weeds present and their population density, and other historical rotations and agronomic management strategies employed.

As a part of any sound IWM plan, growers are encouraged to assess their resistance risk prior to planting XtendFlex® cotton when making decisions about weed management strategies

## 5. ON FARM FACTORS THAT CHANGE RESISTANCE RISKS

### Factors that decrease resistance risk

- Monitoring and preventing herbicide weed control escapes from setting seed.
- Planning and implementing an IWM strategy to reduce the weed seed-bank.
- Strategic use of alternative knockdown herbicides and tillage in fallows prior to sowing.
- Use of alternate herbicide modes of action including residual herbicides in crops and fallows.
- Use of a double-knock glyphosate followed by tillage or an appropriate double-knock partner such as paraquat (Group L) based products at effective rates.
- Applying stewardship plans when growing herbicide tolerant crops.
- Farm hygiene to prevent importing and moving herbicide resistant weed seeds.

### Factors that increase resistance risk

- Frequent glyphosate, glufosinate, or dicamba-based chemical fallow applications not followed by double-knocks to ensure no weed survivors.
- Continuous reliance on glyphosate, glufosinate, and mixtures with dicamba as a knockdown prior to sowing.
- Lack of tillage
- Lack of use of alternative herbicide modes of action in fallows and crops.
- Allowing survivors of glyphosate, dicamba or glufosinate applications to set seed.
- High weed numbers
- Lack of crop competition on weeds.
- Over-reliance on herbicide tolerant crops as a weed control mechanism.

## 6. RESISTANCE MANAGEMENT PRINCIPLES FOR XTENDFLEX® COTTON

Incorporating a range of cultural and herbicide management practices will maximise the control of any potential herbicide resistant weed populations. The implementation of these practices should also result in a reduction in the weed population entering the XtendFlex® cotton cropping phase.

Key IWM principles for XtendFlex® cotton are:

- a. Aim to enter the XtendFlex® cotton cropping phase of your rotation with a low weed burden.
- b. Integrate as many different weed control options (chemical and cultural) as possible through all phases of the crop rotation.
- c. Make every herbicide application count – use registered rates at the correct application growth stage and always assess its effectiveness.
- d. Rotate herbicides with different modes of action throughout the fallow and crop rotation.
- e. Regularly monitor the effectiveness of resistance management practices.
- f. Test weed populations for herbicide resistance status as a part of ongoing IWM.
- g. If planting into a paddock with suspected glyphosate, dicamba or glufosinate resistant weed populations growers must have a plan to manage such weeds.
- h. Stop weed seed set by aiming for 100% control of any survivors.

Growers should aim to prevent seed set from any weeds surviving glyphosate, dicamba or glufosinate herbicide applications to prevent resistance development and spread – never use the same herbicide/herbicide group twice on the same weed, or weeds growing from seed produced by a surviving weed.



The following table outlines some key principles for weed control at different stages through the cotton season.

<b>PRE-PLANT KNOCKDOWN</b>	<ul style="list-style-type: none"><li>• Always start clean by planting into a weed-free field using either tillage or an effective herbicide application.</li><li>• Know your field history in order to identify whether any volunteer cotton present is XtendFlex® cotton.</li><li>• Consider using approved tank mixes when applying any of the OTT registered products in XtendFlex® cotton (do not mix any ammonium containing products e.g. ammonium sulfate (AMS) with dicamba).</li></ul>
<b>RESIDUAL HERBICIDES</b>	<ul style="list-style-type: none"><li>• Residual herbicides should be used where appropriate in an XtendFlex® cotton system</li><li>• Consider using residual herbicides where weed pressure is high, or weeds will not be adequately controlled by the OTT products registered for use in XtendFlex® cotton.</li><li>• The residual herbicide can be applied as a pre-emergence application (either a pre-plant incorporated application, or at planting application).</li><li>• Use the recommended label rate and timing of the residual herbicide.</li></ul>
<b>IN-CROP WEED CONTROL</b>	<ul style="list-style-type: none"><li>• Refer to the product label to ensure target weeds are at the appropriate growth stage for all OTT products registered for use in XtendFlex® cotton.</li><li>• Select the timing and application rate of sprays based on the most difficult to control weed species in each field in accordance with the label.</li><li>• Post-directed sprays should be used to achieve more thorough coverage on weeds.</li><li>• Refer to the 'Weeds Controlled' table on the label for the rate recommendations on specific weeds for products registered for OTT use in XtendFlex cotton.</li><li>• Aim for 100% control of weeds. Monitor and where required implement additional tactics such as inter row cultivation, and/or alternative modes of action to control survivors.</li><li>• Be aware of any potential contamination of spray application equipment (including mixing stations).</li><li>• Ensure all equipment is thoroughly cleaned and free of residues.</li><li>• Only tank mix with products that are approved according to the label.</li><li>• Do not mix products containing ammonium ions with dicamba, including ammonium sulfate (AMS), glufosinate-ammonium and ammonium salts of glyphosate.</li><li>• Ensure all applications are made according to label guidelines on water volume, droplet size and environmental conditions and appropriate boom heights and application speeds are maintained.</li><li>• Be aware of off-target drift to susceptible crops and fields with both aerial and ground applications. Do not apply herbicides by aircraft unless approved on label.</li><li>• Monitor predicted conditions to manage the possibility of dicamba volatility and drift up to 72 hours post application (refer label).</li><li>• Growers should use registered herbicides other than glyphosate, glufosinate or dicamba where required to increase diversity of weed control tactics.</li></ul>

<b>LAY-BY APPLICATIONS</b>	<ul style="list-style-type: none"><li>• If you currently use lay-by herbicides, then consider maintaining this program.</li><li>• A robust lay-by program can provide residual control of weeds not controlled by glyphosate, dicamba or glufosinate.</li><li>• Use the recommended label rate and timing of the residual herbicide.</li></ul>
<b>PRE-HARVEST APPLICATION</b>	<ul style="list-style-type: none"><li>• An over-the-top application of a Roundup Ready Herbicide is possible, if required, before harvest and after cotton reaches 60% open bolls, as one of the 4 glyphosate applications. Rate: 1.5 kg/ha for Roundup Ready Herbicide with PLANTSHIELD or 1.9 L/ha for Roundup Ready PL Herbicide with PLANTSHIELD Technology.</li><li>• This application can be used to control late season weeds and improve harvest efficiency.</li><li>• Compatible with commonly used defoliants (see Roundup Ready Herbicide with PLANTSHIELD and Roundup Ready PL with PLANTSHIELD Technology labels).</li><li>• Do not use on crops intended for planting seed production.</li></ul>

Bayer strongly recommends that growers consult an agronomist when designing an IWM strategy for their property. For further resources and information see [www.weedsmart.org.au](http://www.weedsmart.org.au).

7. MONITORING HERBICIDE EFFICACY

All growers or agronomists should inspect fields between 14 and 28 days after spraying with glyphosate, dicamba or glufosinate to monitor the effectiveness of the herbicide application. During an inspection, any surviving weeds that are normally susceptible to the herbicide/s used should be identified. The outcomes of any inspection and any remedial application used should be recorded. Any case of suspected resistance should be reported immediately to Bayer (Nufarm for glufosinate) for further investigation.



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