

DU PONT



PIONEER

HERBICIDE TOLERANT CANOLA

STEWARDSHIP GUIDE





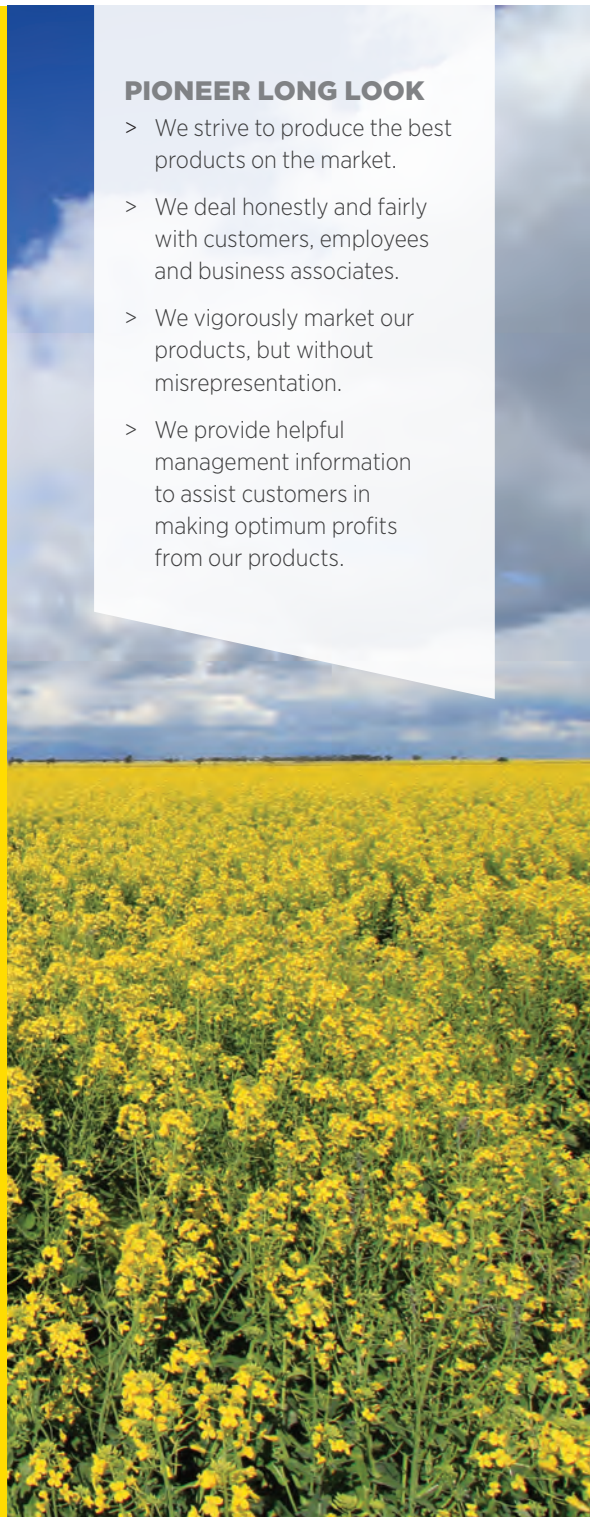
SERVICE QUALITY STEWARDSHIP

**SEED 360 REPRESENTS,
THE DUPONT PIONEER
TEAM'S COMMITMENT
TO ENHANCE THE
SUSTAINABILITY
AND PROFITABILITY
OF AUSTRALIAN
FARMERS AND THOSE
WHO SERVICE AND
SUPPORT THEM.**

We are dedicated to providing our customers with high-yielding quality seed and great supply. But it doesn't end there. SEED 360 also focuses on providing valuable advice, tools and stewardship to support your crop from the ground up.

PIONEER LONG LOOK

- > We strive to produce the best products on the market.
- > We deal honestly and fairly with customers, employees and business associates.
- > We vigorously market our products, but without misrepresentation.
- > We provide helpful management information to assist customers in making optimum profits from our products.



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THE DUPONT PIONEER COMMITMENT TO STEWARDSHIP

ADVANCING STEWARDSHIP IS OUR WAY OF DOING BUSINESS

Canola choices, today and for the future

DuPont Pioneer is providing leadership to deliver productivity gains through breeding innovation, better management and access to the latest global technology in canola to maintain Australia's competitive edge in export markets.

Industry partnerships along the supply chain

Pioneer is committed to proactively supporting stewardship of herbicide tolerant trait production systems in canola rotations which ultimately helps to preserve market choice and market access for all industry stakeholders from 'paddock to plate'.

STEWARDSHIP IS EVERYONE'S RESPONSIBILITY

Stewardship in sustainable farming systems

- › Advancing best production practices through stewardship and compliance that preserves the integrity of the grains supply chain and ensures Australian canola will be in high demand.
- › Industry stewardship initiatives in Australia for crop protection chemicals and for seed/biotech are described in CropLife Australia: 'Supplying sustainability through stewardship'

- › Responsible stewardship in canola rotations helps farmers continually reduce their environmental footprint through careful application of pesticides and promotes sustainable farming methods such as strategic integrated weed management (IWM) and minimum tillage practices.

STEWARDSHIP ALONG THE SUPPLY CHAIN

- › The core stewardship principle adopted by the Australian grains industry is that co-existence of technologies ensures growers and consumers can exercise their choice to use new production technologies and make consumption choices.
- › Putting stewardship management practices to action along the supply chain recognises the importance of encouraging innovation and investment in technology access, grower capability and market access for ALL key canola industry stakeholders.
- › Creating a 'community-based' stewardship program uses local knowledge and assures participation of ALL key stakeholders including farmers, industry, agronomists and state agencies.

STEWARDSHIP BEST PRACTICES

STEWARDSHIP INITIATIVES TO HELP ASSURE THE SAFETY OF AND PROMOTE THE RESPONSIBLE USE OF INNOVATIVE TECHNOLOGY ON-FARM AND THROUGHOUT THE SUPPLY CHAIN

For crop protection chemicals



For crop seeds/biotech



HERBICIDE TOLERANT CANOLA FARMING SYSTEMS

PLAN AND IMPLEMENT A DESIGNATED STEWARDSHIP PROGRAM WHEN GROWING HERBICIDE TOLERANT CANOLA IN CROP ROTATIONS INCLUDING PRE-SEASON AND POST-SEASON PRACTICES.

STEWARDSHIP IN PRACTICE

Australian farmers are at the forefront of having access to and adopting herbicide tolerant crops in cropping rotations.

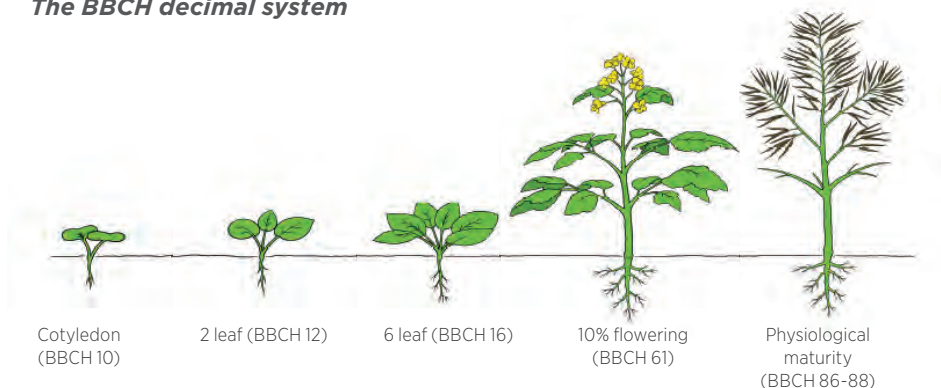
A range of herbicide tolerant (HT) canola systems provide choice and more management options. Stewardship aims to reduce the risk of herbicide resistance developing while capturing the many benefits of canola in the farming system.

Understanding canola plant development

It is important to understand the development of a canola plant and specific varieties grown. This information supports management decisions and allows proper timing of inputs e.g. spray applications and crop safety.

A standardised growth stage scale called the **BBCH decimal system** is used globally in canola and is recommended to describe canola growth stages.

The BBCH decimal system



SYSTEM-SPECIFIC STEWARDSHIP PRACTICES

Triazine guidelines

- › Carefully manage the lower crop vigour of TT canola to enhance crop competition;
- › Monitor triazine herbicide carryover risk for crop rotational planning;
- › Always adhere to mandatory application practices for triazine herbicides (atrazine, simazine) set by industry in cooperation with government e.g. limits on maximum annual rates, avoiding run-off into waterways.

Guidelines in Clearfield® Production System

- › Do not rely solely on ALS-inhibiting herbicides, for more than two out of four years, unless other IWM practices are implemented;
- › Monitor imidazolinone herbicide carry over risk for crop rotational planning.

Glyphosate guidelines

- › Reduce the amount of dependence on glyphosate as a stand-alone knockdown for other crops in the rotation and across the farming system;
- › If planting glyphosate-tolerant trait canola into a paddock, growers must have a plan to manage glyphosate resistant weed populations;
- › Glyphosate herbicide will NOT control crop volunteers in the fallow phase;
- › Segregate and market GM canola to approved, external receival sites.

**PLAN TO USE THE
COMBINATION OF
REGISTERED
PRE-EMERGENT
AND POST-EMERGENT
HERBICIDE APPLICATIONS
IN ALL HERBICIDE
TOLERANT CANOLA
SYSTEMS.**



HERBICIDE STEWARDSHIP PRACTICES

ALWAYS USE REGISTERED HERBICIDE – READ AND FOLLOW LABEL DIRECTIONS.

Herbicide application guidelines:

General guidelines

- › Avoid dry sowing and use a knockdown herbicide after the opening rains;
- › A pre-plant herbicide (e.g. trifluralin) is recommended;
- › Post-emergence herbicide application should be made when weeds are small (1-2 leaf ryegrass and/or broadleaf weeds are 2-3 cm diameter);
- › Always follow the herbicide label rate;
- › Match the most appropriate choice of droplet size, boom height set-up and choice of herbicide additive for each situation.
- › Limit selective herbicide application timings before elongation of canola plants (**BBCH 16**);
- › Rotate alternate herbicide modes of action (MOA) groups in consecutive years;

Avoid crop injury:

- › Use only registered herbicides;
- › Ensure all crops are sown with proprietary, quality assured seed (genetic and trait purity).

Herbicides and the Environment:

Container management and disposal:

- › Participate in the drumMUSTER* program for recycling of empty pesticide containers. Ensure disposal of obsolete chemical stocks in an environmentally safe way through the ChemClear® program.
- › **Minimise spray drift:**
 - › At no time should spray drift be allowed to enter waterways;
 - › Monitor conditions throughout the spraying operation
 - › Follow all application directions on the registered herbicide label.
 - › Communication with neighbours is fundamental;
 - › Whenever conditions are unsuitable, spraying must cease to prevent spray drift.

Manage residues in soil and grain:

- › Always adhere to withholding periods of the registered herbicide and label 'Directions of Use';
- › Adhering to label recommendations will reduce environmental contamination and adverse effects on following crops in the rotation;
- › Keep accurate records of all pesticide applications;
- › Managing maximum herbicide residue limits in grain is a priority.

* * registered trademarks of CropLife Australia.

HERBICIDE RESISTANCE MANAGEMENT

HERBICIDE RESISTANCE RISK ASSESSMENT CONTRIBUTES TO BEST MANAGEMENT STEWARDSHIP.

General objectives:

- › Aim to enter the canola phase of the rotation with a low weed burden;
- › Have a plan to manage surviving weeds in the crop season;
- › Aim to leave the canola phase of the rotation with a low weed seedbank.

Recommended industry strategies:

- › Use a long-term plan to diversify weed management practices (herbicide, hygiene and cultural) in paddock and across whole farm;
- › Apply stewardship plans when growing herbicide tolerant canola including a herbicide resistance risk assessment;
- › Always know before you sow – plant clean seed and increase crop competition using hybrids in the canola phase;
- › Use the double knock technique*
- › Ensure the effectiveness of every herbicide application;
- › Always monitor the results from herbicide application and use other integrated weed management practices to control weed escapes;

STRATEGICALLY INCORPORATE NEW TECHNOLOGIES AND REGISTERED HERBICIDES ACROSS THE CANOLA ROTATION SEQUENCE IN HERBICIDE RESISTANCE MANAGEMENT PLANS.

- › Consider late season weed control and in-crop spray-topping with alternative herbicide groups;
- › Avoid over-reliance on stand-alone herbicide knockdown where crop competition is absent. For example, crop borders, fence lines and road sides;
- › Test weed populations for herbicide susceptibility status to see what still works;
- › Where herbicide resistance is suspected, confirm this status using herbicide resistance testing to support future weed management decisions;
- › Incorporate weed seed capture practices at harvest;
- › Strategic use of alternate herbicide MOA groups in consecutive years throughout the crop rotation including pasture and fallow phases;
- › Be vigilant and proactive to stop weed seed set including alternate control strategies such as patch spraying and Optical Spray Technology;
- › Implement farm biosecurity and hygiene practices to prevent movement of resistant seed.



INTEGRATED WEED MANAGEMENT [IWM] PRACTICES

BE PROACTIVE USING DIVERSE WEED MANAGEMENT TACTICS TO ENSURE NO FURTHER WEED SEED SET IS ALLOWED TO OCCUR, AND DRIVE DOWN THE WEED SEED BANK.

EXAMPLES OF IWM PRACTICES IN HERBICIDE TOLERANT CANOLA SYSTEMS

	Herbicide	Cultural	Other
Pre Planting	<ul style="list-style-type: none"> › Herbicide resistance testing › Sow later – more knockdown opportunities before sowing › “Double knock” (glyphosate followed by paraquat) › Alternate pre-emergent herbicides used in other crops in rotation 	<ul style="list-style-type: none"> › Farm hygiene, avoid: <ul style="list-style-type: none"> - feeding hay on cropping area - spreading weed seeds with livestock/equipment › Autumn tickle › Full disturbance cultivation › Farm hygiene (clean seed) 	<ul style="list-style-type: none"> › Crop rotation sequence: <ul style="list-style-type: none"> - pasture manipulation - long spray fallowing - green/brown manure crops - double break cropping - crop topping - pulses - oaten hay crop
In Crop	<ul style="list-style-type: none"> › Post-emergent herbicide tactics (sequences/tank mixes) › Carefully manage spray application (label rates and directions of use) › Alternate herbicide MOA to control weed escapes 	<ul style="list-style-type: none"> › Increasing crop competition e.g. row spacing/ seeding rate/row orientation/use hybrid vigour in canola phase › Graze and grain (dual-purpose) › Cutting canola for hay/silage 	<ul style="list-style-type: none"> › Tramline/precision cropping system › Variable-rate nutrient mapping › Prevent weed seed transfer from crop borders/fence lines › Hand roguing and patch control › Weed mapping to target SSWM*

*Site-specific weed management



	Herbicide	Cultural	Other
Harvest	<ul style="list-style-type: none"> › Pre-harvest application with herbicide e.g. Weedmaster® DST* › Chemical crop desiccation e.g. Reglone® 	<ul style="list-style-type: none"> › Swathing/windrowing › Harvest weed seed capture: Chaff carts, Bale direct › Harrington Seed Destructor™ 	<ul style="list-style-type: none"> › Farm hygiene (grain) › Cleaning and transport of equipment › Herbicide resistance testing
Post-Harvest	<ul style="list-style-type: none"> › Chemical fallowing › Optical spray technology in fallow phase › Different MOA group herbicides across crop rotation sequence 	<ul style="list-style-type: none"> › Narrow windrow burning <ul style="list-style-type: none"> - canola › Grazing stubble 	<ul style="list-style-type: none"> › Minimise burial at depth of weed seed › Strategic tillage to control weeds and volunteers in fallow

* The effectiveness in weed control and prevention of weed seed set measured following use of different integrated weed management practices in Australia may vary across regions and farming systems. Refer to manufacturers' websites for herbicide label 'directions of use'.



WHOLE FARM STEWARDSHIP PLANNING

ALWAYS GROW HERBICIDE TOLERANT CANOLA SYSTEMS IN ROTATION WITH OTHER CROPS AND TECHNOLOGY.

Pre-season stewardship check list

- Have a paddock plan for managing weeds on crop borders including fence lines and roadsides.
- Use a farm rotational planner to provide an overview of crop and herbicide history.
- Consider potential herbicide soil residues from previous crops grown and fallow phase.
- Assess the weed species present and herbicide resistance status in the paddock.
- Ensure paddocks sown to HT canola are clearly identified on farm maps, at the boundaries of these paddocks and including entrance gates to prevent accidental herbicide application.

In-crop stewardship check list

- Use appropriate record keeping systems to meet regulatory and stewardship requirements.
- Always source quality-assured seed for trait purity and confirm seed identification: All Pioneer® brand canola seed packaging is marked with herbicide tolerant trait on seed label and closing bag tape.
- Clean-down all equipment used in the planting and growing of crops (e.g. fertiliser spreaders, spraying equipment and transport vehicles/bikes).
- **Managing outcrossing:**
 - › Talk to your neighbours about crop separation options.
 - › The recommended separation distance for HT canola systems in Australia is five (5) meters.
- Have a plan for managing weed escapes and have zero tolerance for weed seed setting in the crop season including control of late-season flushes
- Always follow industry safety guidelines and wear appropriate personal protective equipment.

Harvest stewardship checklist

- Plan in advance of harvest to target weed seed capture tactics.
- Ensure pre-harvest chemical applications adhere to the Australian Grain Industry Code of Practice.
- Pay particular attention to good harvest, transport and storage hygiene.
- Clearly identify the hybrid and GM status of the grain to truck drivers, at delivery and in storage areas on-farm through labels and records.
- Know the market your grain is going into to meet contract specifications including importing countries' maximum residue limits (MRLs).

**STEWARDSHIP
PRACTICES NEED TO
BE MANAGED ACROSS
THE CROP ROTATION
SEQUENCE ON-FARM
AND EXTEND ALONG
THE AUSTRALIAN
SUPPLY CHAIN**



© More crop, less weeds, Peter Newman, AHRI, 2013.

Post season stewardship checklist

- Review outcomes of management practices used in paddock plan with grower at end of cropping season.
- **Managing crop volunteers:**
 - › Inspect the paddock post-harvest for crop regrowth and/or volunteers.
 - › Target measures early to control volunteer plants when small (prior to four leaf stage).
 - › Know in advance what herbicides are registered and the best options for volunteer canola control for each HT canola system.
- Monitor the resistance status in the paddock through paddock records and herbicide testing.
- Consider a residual herbicide program in the fallow phase following herbicide tolerant canola using alternate mode of action herbicides where appropriate.
- Develop future cropping plans where herbicide tolerant canola is grown incorporating alternate mode of action group herbicides, diverse IWM practices (e.g. green/brown crop maturing) and competitive crops for effective in-crop weed control across cropping rotations.
- Ensure all documentation is easy to access, secure and “audit ready” to meet compliance within identity preservation, segregation and/or traceability supply chain management schemes.



SUPPORTING RESOURCES

MORE INFORMATION

DuPont Pioneer Australia:

www.pioneer.com/web/site/australia/stewardship/

Contact your local DuPont Pioneer Area Manager or Promoter Agent for planning your on-farm stewardship programs in herbicide tolerant canola farming systems.

USEFUL REFERENCES

Accredited agronomists are recommended to provide supporting herbicide and integrated weed management advice for your local conditions.

Integrated weed management:

WeedSmart 10-Point Plan:

www.weedsmart.org.au

***Australian Glyphosate Sustainability**

Working Group (AGSWG):

www.glyphosateresistance.org.au

Australian Herbicide Resistance Initiative

[AHRI]: www.ahri.uwa.edu.au

CropLife Australia:

www.croplife.org

Grains Research and Development

Corporation (August 2014):

www.grdc.com.au/IWMhub

Supply chain stewardship:

Australian Grains Industry

Code of Practice:

www.graintrade.org.au/node/670

Australian Oilseeds Federation

[AOF] (2014): “Canola volunteer control in summer fallow”

Australian Oilseeds Federation:

“Delivering market choice with GM canola”

www.australianoilseeds.com

General stewardship:

Excellence Through

Stewardship® program:

www.excellencethroughstewardship.org

Farm Biosecurity:

www.farmbioisecurity.com.au

CropLife International:

www.croplife.org

NEWLY RELEASED

Grains industry stewardship document:

“Growing Australian Grain – Safely managing risks with crop inputs and grain on farm” July 2015 GRDC

Canola best management practices

Grain Research and Development

Corporation (October 2013):

“Herbicide tolerant canola in farming systems – a guide for growers”

NOTES



Partners of:

**Australian Glyphosate
Sustainability Working
Group**

**Excellence Through
Stewardship**



every weed every seed
every farm every year

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