CropLife AUSTRALIA

*Representing **the best** of the plant science industry*

StewardshipFirst™

MyAgCHEMuse

best practice reference guide for **spray drift management**

Foreword

Modern crop protection chemistry such as herbicides, insecticides and fungicides, is crucial to farming in Australia and around the world. These essential products and tools are a core foundation to food production and their safe and sustainable use is of critical importance.

For this reason CropLife Australia has developed *MyAgCHEMuse: Best practice reference guide for spray drift management*. It has been developed with the technical assistance of Crop Protection Australia, CropLife Australia members, and our supporting partner farmer and producer organisations. The spray drift guide is part of CropLife Australia's Stewardship First program, which takes a whole-of-lifecycle approach to the plant science industry's products.

The Guide is a key resource for ensuring the safe and effective use of crop protection products. It compliments other Best Practice Manuals in our Stewardship First program. Successful stewardship requires collaboration, engagement and support by all stakeholders. CropLife and our members seek to actively support best practices being consistently applied in the use of pesticides for the safety of users, consumers, and the environment.

CropLife member companies contribute millions of dollars every year to stewardship activities, which ensures their products are sustainably managed for the benefit of users, consumers and the environment. The Stewardship First program includes CropLife's mandatory Code of Conduct for members, its comprehensive Resistance Management Strategies and programs run by CropLife's wholly owned subsidiary Agsafe, which include ***drum****MUSTER*, ChemClear® and Agsafe Accreditation and Training.

CropLife and its members are committed to providing Australian farmers with the latest, modern, innovative crop protection and agricultural biotechnology products and tools that allow them to produce high quality food, feed and fibre for Australia and the world. CropLife will continue to operate a world class stewardship program to ensure that these tools are managed properly and responsibly.

Matthew Cossey
Chief Executive Officer
CropLife Australia

About us

CropLife Australia is the peak national industry organisation representing the agricultural chemical and biotechnology (plant science) sector in Australia. CropLife represents the innovators, developers, manufacturers, formulators and registrants of crop protection and plant biotechnology products.

The industry provides products that protect crops against pests, weeds and diseases as well as crop biotechnologies that are key to the nation's agricultural productivity, sustainability and food security.

The plant science industry is worth more than $17.6 billion each year to the Australian economy and directly employs thousands of people across the country.

CropLife AUSTRALIA

*Representing **the best** of the plant science industry*

SUPPORTING PARTNERS

Aerial Application Association of Australia Ltd.

AGFORCE

Cotton Australia

GPA Grain Producers Australia

Grain Producers SA

NSW Farmers Growing the best

NT Farmers

PGA

QFF

WAFarmers

MyAgCHEMuse

Confidence in Australia's agricultural sector continues to grow in the knowledge that advanced crop protection technologies, products and tools will adequately address the pest risks that industries face now and in the future.

The agricultural industry requires confidence in delivering an increasing diversity of high quality food products to local and international markets.

Confidence in safe chemical use in Australian food products continues to be supported through the robust regulatory processes of the Australian Pesticides and Veterinary Medicines Authority (APVMA), and through the monitoring and management of risk of chemical residues and environmental contaminants in Australian food products by the National Residue Survey (NRS).

Pesticide resistance, and in particular herbicide resistance, continues to increase pressure on your business as a grower to utilise new integrated chemical management practices to maintain the efficiencies and profitability benefits that crop protection products deliver.

MyCROPprotection

MyProduce

MyFarm

MyCommunity

MyFamily

As a grower, you should have a plan for:

- Pest management:

Grains **Wine grapes** **Vegetables**

Cotton **Sugar** **Orchards**

Some industries have a more specific plan for:

- Weed management

Grains **Cotton** **Wine grapes**

- Disease management

Grains **Vegetables**

Now more than ever, Australia's agricultural sector needs to continue to deliver market and community confidence through best practice pesticide use and demonstrated stewardship. In order to minimise the build-up of resistant pest populations there is a need to combine pesticide management methods into an integrated control program.

CropLife Australia recognises the integral role crop protection products have in delivering confidence to agricultural industries and the resulting benefits to rural communities and consumers and their surrounding environment.

CropLife Australia's **MyAgCHEMuse** best practice reference guide for spray drift management aims to assist your business as a grower to:

- measurably improve stewardship of crop protection products
- actively seek out stewardship tools to support the use of CropLife Australia members' products
- recognise the value and confidence that CropLife Australia members' products deliver to your industry.

MyAgCHEMuse recognises the following key aspects impacting on your farm business, your farming family, staff, markets, environment and your community.

MyCROPprotection

Confidence in the science and safety of all crop protection products

MyProduce

Confidence in the safety and quality of farm produce

MyFarm

Confidence in the sustainability and future of the farming environment

MyCommunity

Confidence in farming practices that contribute to the wealth and vitality of the community

MyFamily

Confidence in the health, wellbeing and financial security of the working farm family.

Key tips for MyAgCHEMuse

- **Always read and follow the registered and approved crop protection product label** instructions on use to ensure safety and market compliance
- **Always use registered crop protection products** for their registered or permitted uses only
- **It is essential that when storing, mixing and using chemical products appropriate personal protective clothing and equipment (PPE) is used** as specified on the registered and approved product label
  - Check product label requirements for wind speed, buffer zones and other important weather parameters.
  - Monitor weather conditions—use a wind-speed gauge to record wind speed and direction before application to determine whether or not the application should proceed. Record wind speeds at various intervals during the application
- **Be aware of sensitive crops, aquacultural or environmental areas** requiring protection or farmed bees in your area
- **Plan to use the coarsest spray quality permitted** by the product label, and follow label instructions in relation to boom height for correct application
- **Water quality for spraying is critical**—poor water quality can adversely affect many products and their effectiveness
- **Make sure the wind is blowing away from susceptible areas, or an adequate buffer zone exists** to protect these areas from spray drift
- **Be aware of local topographic** and convective influences on wind speed and direction
- **Do not spray during still or low-level air temperature inversion conditions.**

MyCROPprotection

Confidence in the science and safety of all crop protection products

As a grower, your investment in crop protection products is an essential component of a sustainable Australian agricultural industry. It is estimated that up to $17.6 billion[1] of Australian agricultural output is attributable to the use of crop protection products, or up to 68 per cent of the total value of crop production.

Access to tools for effective management of pests, weeds and diseases provides your agricultural industry with the confidence to invest in one of Australia's largest domestic and export industries, contributing to the growth of the agricultural production sector and Australia's export wealth. Integrated management of weeds, pests and diseases are one of the most important tools available to you as a grower and your farm business to prevent the build-up of chemical resistant pest, weed and disease populations.

1 Deloitte Access Economics report 2013— *Economic activity attributable to crop protection products.*

Confidence in the label

Today it costs over US$286 million[2] to bring a new crop protection product from discovery to commercial use by growers. This investment addresses all aspects associated with the operator, the environment and food safety at a global level and includes the delivery of new registrations. It also often ensures that crop protection products can be used on produce destined for targeted export markets.

APVMA hazard and risk assessments

Crop protection products in Australia are actively and effectively regulated by the Australian Pesticides and Veterinary Medicines Authority (APVMA) under the *Agricultural and Veterinary Chemicals Code Act 1994*. Each product undergoes a comprehensive hazard and risk assessment with the outcomes of that assessment reflected in prescribed use directions and safety warnings on the APVMA approved label. This world's best practice hazard and risk assessment ensures registered crop protection products present no unacceptable risk to users, consumers and the environment when used according to label directions.

2 Phillips McDougall Report March 2016— *The Cost of New Agrochemical Product Discovery, Development and Registration in 1995, 2000, 2005–08 and 2010–14.* R&D expenditure in 2014 and expectations for 2019. A Consultancy Study for CropLife International, CropLife America and the European Crop Protection Association

In 1995, it took on average the assessment of 52,500 compounds to discover one new effective crop protection chemical active constituent. Because the majority of effective products have already been discovered, and because the regulatory requirements for new agricultural chemicals are becoming more stringent, it now requires the assessment of more than 140,000 compounds and the expenditure of more than US$286 million over an eight to 11-year period to bring each new successful crop protection product to the market.

As a grower, you can then transfer this investment and confidence to improved productivity in growing your produce.

Supported by a robust regulatory and stewardship framework through the **APVMA**, investment by members of CropLife Australia in quality crop protection products delivers:

- farm business confidence
- market confidence
- community confidence.

MyCROPprotection

Confidence in the crop protection product

As a grower using CropLife Australia members' products you can have confidence in the source, integrity and quality of the crop protection products you use and the assurance that you, your family and your business is not being exposed to an increasing global issue of counterfeit products and products with contaminants originating from unknown sources.

Online APVMA chemical registrations and labels

- APVMA Public Chemical Registration Information System database

As a grower, you can have confidence that investment by members of CropLife Australia in quality crop protection products supported by robust regulatory systems delivers you farm business, market and community confidence:

accensi
ADAMA
AgNova Technologies
Arysta LifeScience
BASF We create chemistry
BAYER
DOW Dow AgroSciences
DUPONT
FMC
ISK
LANDMARK
MONSANTO
Nufarm
SIPCAM Innovation Not Imitation
SUMITOMO CHEMICAL
syngenta

MyProduce

Confidence in the safety and quality of farm produce

As a grower, you reap the value of investment in development of crop protection product labels in delivering market confidence for your agricultural produce — including compliance with Australian maximum residue limits (MRLs).

Confidence in markets

Australian agriculture while being a relatively small producer in a global context, is a major global exporter of food produce. The recent free trade agreements signed with a number of markets has increased the number of opportunities for Australian growers to deliver quality food, fibre and animal feed products. Domestically, market demand is also increasing for a greater diversity of foods to meet the needs of our multi-cultural society.

Australia has a robust regulatory system which ensures that the assessment, registration and use of crop protection products used to deliver high quality produce from your business is safe for human consumption. This confidence can be demonstrated by the significant investment made in delivering well researched, understood and quality products and supports the comprehensive information contained on the crop protection product labels.

Good agricultural practice

Delivering market confidence in chemical use in agriculture requires that chemical use and any chemical residues detected meet locally (and in many cases, internationally) established and scientifically based maximum residue limits (MRLs), which indicates that the chemicals have been used in accordance with good agricultural practice (GAP) i.e. in accordance with the registered label.

The APVMA registers agricultural chemicals for use according to a carefully designed use pattern described on the product label that becomes known as the GAP for that product. Chemical residues are the traces of a chemical or its breakdown or metabolite products that remain in or on treated produce after a particular time.

Chemical residues in plant-based products can occur via directly treating produce (or its seed or planting material) with a chemical product, from use of contaminated water sources as well as from exposure to chemicals from off-target spray drift or run-off, or residual impacts from soil application (rotational crop residues).

Supporting improved chemical stewardship

Managing chemical residues in your crops is essential for you as a grower to have confidence in your produce and access to markets. You are responsible as a grower for ensuring that chemicals are used correctly according to the product label to avoid any chance of unacceptable chemical residues occurring.

As a grower you also need to be mindful that whilst the use of a product according to the registered label will ensure the chemical residues are acceptable to the Australian domestic market, a further assessment is required to ensure that the produce will be acceptable to markets outside of Australia if you are producing an export crop, as overseas countries can have different tolerances (MRLs) to those of Australia.

As a grower, you can have the confidence in the use of registered chemical products that have been developed and registered with a label that describes the correct way in which to use each product, so long as those label instructions are closely followed.

Confidence in produce

Most major agricultural industries in Australia demonstrate stewardship of crop protection products through an industry funded National Residue Survey. The National Residue Survey (NRS) is a vital part of the Australian system for managing the risk of chemical residues and environmental contaminants in Australian food products.

The NRS supports Australia's food industry and your business as a grower by facilitating access to key export markets and confirming Australia's status as a producer of clean food. NRS programs encourage good agricultural practices, help to identify potential problems and indicate where follow-up action is needed.

The NRS is the public report card for agricultural industries to demonstrate the quality and safety of food and feed produce in meeting MRL requirements. As a grower, you should be aware that your produce is being continually monitored. CropLife member investment in chemical labels detailing use requirements and withholding periods will continue to deliver agricultural industry confidence in meeting requirements and expectations of domestic and in some cases international markets.

Key links

- **National Residue Survey** (NRS) maximum residue limits (MRL) database link for products in key markets
- **FAO/WHO international CODEX MRL standards database**

Further reading

- **National Residue Survey**
- **GRDC — Ground Cover Supplement May 2016 — Spray Application**
- **GRDC — GRDC GrowNote Spray Application Manual**
- **GRDC — Practical tips for spraying fact sheet**
- **Wine Australia — Spray Application Grapevines**
- **Cotton Australia — Summer weed spraying best practice**

MyFarm

Confidence in the sustainability and future of the farming environment

New spray application technologies continue to advance the efficacy and targeting of crop protection products and include:

- New spray nozzle and adjuvant technologies to improve targeting of crop protection products while managing spray drift
- Differential GPS guidance and auto-steer plus automatic spray section control to reduce overlap, wastage, crop damage and reduce pest, weed and disease escapes from underlaps
- Camera spray technology improves the targeting of crop protection products for weed control and reduces chemical use and cost in the farm environment
- Where appropriate, spray shrouds and air assist systems improve the targeting of crop protection products while managing spray drift; and
- Improved chemical loading and mixing systems improve farm spray application efficiency and operator safety.

It is essential to your business that as a grower, you continually access the latest knowledge on spray application and drift reduction technologies (DRTs). This will ensure that your farm business achieves the maximum benefit from associated production improvements and efficiencies delivered by these crop protection technologies, supporting your business to remain profitable and sustainable in the longer term.

Have a spraying technology and DRT plan

It is important that as a grower, you keep up with the latest spray application and nozzle technologies.

This includes the use of nozzles delivering coarse spray qualities, air induction nozzles and other adjuvants to reduce spray drift or improve efficacy, where these are supported by the product label.

There is a range of publically available free tools to ensure optimal targeting of crop protection products and management of spray drift. These tools and apps can be used in your business in advanced planning for various weather conditions and spray application scenarios.

New tools and apps to assist with nozzle selection and setup include:

- **Australian Spray Performance Calculator**
- **GroundSpray App**

To assist with optimal efficiency in preparation and mixing of chemicals, apps include:

- **Syngenta TankCalc**
- **Tankmix by Dupont**

In addition to manual recording and maintaining spray controller records, a method of recording actual in- field spray application is contained in a new app:

- **SnapCard spray app**

Aerial crop protection product application

At some time, as a grower you may need to use aerial application of crop protection products to achieve timeliness, reduce crop damage or deal with poor trafficability conditions. Aerial crop protection product application is a highly regulated and professional service to agricultural industries that is supported through the Aerial Application Association of Australia (or AAAA) Improved control of drift and increasing spray efficacy has been the AAAA's industry focus for more than a decade. Managing droplet behaviour is now a significant part of an ag pilot's education. Ag pilots require a detailed knowledge of the variables that affect spraying such as changing meteorological conditions including atmospheric stability and the effect of water added to the chemical, the number of droplets required and the droplet size. AAAA ag pilots also utilise sophisticated computer models and tools to optimise the setup of aircraft spraying systems to manage spray drift.

The AAAA's mission is to promote, foster, encourage and support a sustainable aerial application industry based on the professionalism of operators, pilots and staff, and the pursuit of industry best practice. Further information on aerial agricultural chemical application is available from the **Aerial Application Association of Australia**.

Integrate spray application planning and records into a farm BMP

As a grower, you should integrate your crop protection program activities and record keeping of crop protection applications as an integral part of a best management practice (BMP) in your farm business. Industry examples include:

- **MyBMP (Cotton)**
- **Grains BMP** and **Grains Guide**
- **Horticulture BMP**
- **Grazing BMP**
- **Dairying Self Assessment Tool** and **Dairying Better'n Better**

Key links

- **GRDC practical tips for spraying**
- **GRDC Nozzle Selection for boom, band and shielded spraying: The Back Pocket Guide** — Efficient pesticide application ensures effective spray coverage of the target while minimising off-target effects of the application. Operation managers and spray equipment operators have a moral and legal obligation to ensure that spray applications do not impact on neighbouring properties. This nozzle selection guide will assist growers in selecting the correct nozzle for boom, band and shielded sprayers which will provide both flexibility and efficacy.
- **GRDC GrowNote Spray Application Manual** — Produced specifically for grain growers and operators, this resource covers a range of technical topics, including how to set up and correctly calibrate available spraying systems.
- **AIMS (Aerial Improvement Management System)** — Accreditation program for aerial operators identifies best practice and is independently audited by a third party.
- **Spraysafe** — Operation Spray Safe is a AAAA initiative for aerial operators which aims for continuous improvement and professionalism in the application of agricultural chemicals by aircraft.

Further reading

- **GRDC — *Ground Cover Supplement May 2016 — Spray Application***
- **GRDC — *Practical tips for spraying* fact sheet**
- **Wine Australia — *Spray Application Grapevines***
- **Cotton Australia — *Summer weed spraying best practice***
- **Nufarm — *SprayWise — Broadacre Application Handbook* (2nd edition)**

Useful spray application tools and apps

Australian Spray Performance Calculator

The Australian Spray Performance Calculator is a tool that can provide coverage information, droplet size data and drift potential scenarios specific to the nozzle, tank mix and operating parameters.

As a part of GRDC-funded projects, University of Queensland (UQ) researchers have measured the performance of more than 1000 combinations of nozzle, pressure and tank mixes that cover many Australian grain crop spraying scenarios and have assembled this data into this new calculator. This tool has been developed to provide reliable information to take some of the guesswork out of spray performance and help operators improve their drift-management strategies.

Some of the data used to develop the calculator has also been supplied to the Australian Pesticides and Veterinary Medicines Authority for inclusion in tools that may be approved for use in calculating modified downwind buffer distances as a part of proposed label changes.

A copy is available on request by emailing:

Dr Andrew Hewitt

Syngenta TankCalc

The Syngenta TankCalc app is a tool that can be used for efficient calculation of filling plans for spraying, saving time and increasing accuracy.

The calculator takes into account area, tank size, product, dosage and driving speed.

Get it on iTunes | GET IT ON Google Play

Tankmix by Dupont

The Dupont TankMix Calculator app allows the user to quickly work out the amount of product needed to treat specific field areas, tank sizes and desired Volume to Volume ratios.

Data can be measured using a range of metrics providing the flexibility of using either decimals or fractions.

Get it on iTunes

SnapCard spray app

Prior to SnapCard there were no quantitative procedures available to predict or measure efficacy and performance. SnapCard was developed by the University of Western Australia and the Department of Agriculture and Food to enable broadacre growers to predict spray coverage based on weather conditions and spray settings as well as record, measure, interpret and archive actual spray coverage providing better pest control, reduced risk of pesticide resistance development and optimisation of spray application costs.

SnapCard provides growers with access to a valuable decision support tool that can be used in three important ways:

- predicting spray coverage based on weather conditions; time of day, tractor speed, spray nozzles, spray volume, boom height and adjuvants
- comparing actual spray coverage with water sensitive spray cards, to the predicted spray coverage
- recordkeeping of treatment details and performance on a secure WA Department of Agriculture and Food server to comply with Health (Pesticides) Regulation 77 which requires treatment details to be recorded within two business days and held for three years.

Get it on iTunes | GET IT ON Google Play

Information has been sourced from websites of CropLife members and the Grains Research and Development Corporation. Links to these sources have been provided.

MyCommunity

Confidence in farm practices that contribute to the wealth and vitality of the farming and broader community

Profitable farm production is the lifeblood of a rural community. It is crucial that you as a grower and your community have confidence in having access to suitable crop protection tools to ensure agricultural industries are resilient from catastrophic loss of produce or trade. It is also essential that your community is confident that chemical products are being used appropriately, applied to the intended target with no undesirable environmental impacts.

Confidence in practices

Even though as a grower you have access to a number of information sources to manage and ensure environment, OH&S and food safety outcomes of chemical use, it is crucial to remember that the primary tool to manage these factors is the registered chemical label.

Many growers are limited in their time to respond quickly to label changes and market requirements. As a result, growers are more heavily reliant on farm advisers for their chemical use advice. Farm advisers, neighbour's practices and positive grower experiences significantly influence crop protection practices.

It is vital that growers follow label instructions to ensure business and community confidence in crop protection product use.

While as a grower you have usually developed robust knowledge in dealing with day-to-day pest threats supported by a chemical label to deliver grower, community and market confidence, new or sporadic seasonal threats often present urgent challenges. Also new or emerging industries have often not been established long enough or developed to a point where chemical labels to support these particular industries are registered. It is in these situations where, through a lack of knowledge and experience, there are enhanced chemical residue risks from off label use.

It is essential for your business as a grower in a new crop industry that you prepare for and use with confidence the crop protection solutions required for managing emerging pest threats. This can be realised through the use of emergency or minor use permits. These chemical use permits have the confidence of the regulator, industry and markets in dealing with those pest threats.

Registered labels and permits for crop protection product use in Australia can be searched online at:

- **APVMA Public Chemical Registration Information System Search (PubCRIS)**
- **APVMA minor use and emergency permits database**
- **Infopest the comprehensive Agvet chemical database**

MyCommunity

Since 2014 CropLife Australia and its members have been working with the Australian agricultural sector, through the AgVet Collaborative Forum, to deliver new permit and label solutions to manage high priority pest, weed and disease issues where there are no or inadequate current options available.

AgVet Collaborative Forum

This builds on minor use programs developed by several industry sectors

- **Grains Research and Development Corporation — Minor Use**
- **Pathways to registration —Tactical pesticide registration program**
- **Agrifutures — Minor Use chemical support for small and non-levied industries**

Confidence in spraying conditions

Crop protection products are used to control weeds, pests and diseases in all facets of the Australian environment, but the larger areas treated can be found on farms, parks and reserves. The application of crop protection products, whether from a ground boom sprayer, orchard airblast sprayer, knapsack or from the air, needs to be properly planned and carefully executed to minimise the risk of off-target chemical movement.

Crop protection products are an essential tool in an integrated approach to pest management. CropLife Australia promotes the responsible use of a range of pest management practices to ensure sustainable agricultural outcomes. Spray drift is the most common cause of off-target chemical movement.

Drift is the movement of agricultural chemicals through the air away from the target site of application. Drift leads to economic and productivity losses, potential neighbouring crop contamination or damage, environmental damage, or loss of beneficial insects—including farmed bees due to the crop protection product not all being applied where it is intended or needed. If not managed responsibly, in certain climatic conditions drift up to 10km away from the intended target site of application can occur.

Physical drift can be an issue for all pesticides if there is a lack of planning and attention to label directions. Growers can manage spray drift risks with planning and stewardship. An essential component of using crop protection products is to actively monitor the appropriateness of weather conditions for spraying. Planning ahead and taking into account rainfall events, wind speed and direction, temperature, relative humidity and air stability or air temperature inversions are all crucial to optimise the efficacy and targeting of crop protection products.

There are two kinds of drift, particle drift and vapour drift:

- Vapour drift is the movement of pesticide away from the target site in the form of a gas or vapour during or after application
- Particle drift is the movement of fine particles, or droplets, away from the target site while the pesticide is being applied.

While there are a number of weather sites providing weather forecast meteograms, there are only a few that provide the specific information needed to make active decisions on the suitability of spraying conditions in agricultural areas. Grower access to air temperature inversion risk warnings and awareness of forecasted risk is limited in Nufarm's SprayWise Decisions. More reliable forecasting of air temperature inversion risks is currently being developed.[3]

3 http://nwppa.net.au/wordpress/wp-content/uploads/2015/06/Management-of-spray-drift-through-inversion-risk-awareness-Graeme-Tepper.pdf

Spray application management weather forecasting tools

Nufarm SprayWise decisions — Including air temperature inversion risk management tools.

Nufarm SprayWise® Decisions

Syngenta weather forecast — There is considerable discussion around the future integration of advanced weather telemetry to on-board spray computers to assist in managing spray drift risks due to wind and air temperature inversions. Currently this is primarily limited to:

- Wind speed and direction
- Delta T
- Temperature
- Relative humidity.

syngenta®

The must do's to minimise drift

1. Monitor weather conditions
2. Check label requirements for wind speed, buffer zones and other weather parameters.
3. Be aware of sensitive crops, aquacutural assets, sensitive environmental areas or farmed bees in your area and use:

BeeConnected

CottonMap

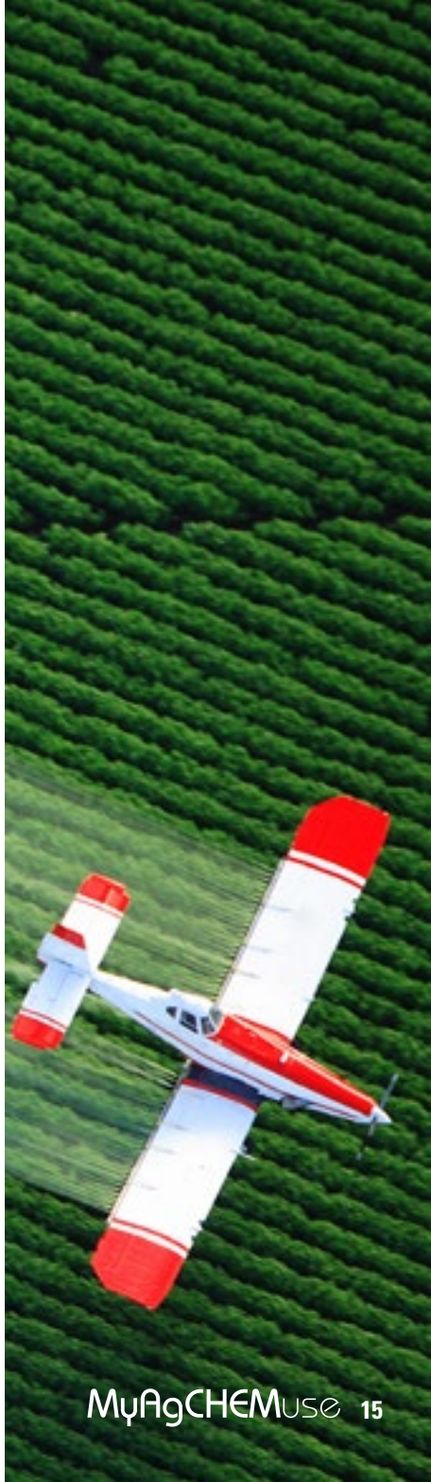
specifically for cotton growers

4. Plan to use the largest droplet size supported on the product label.
5. Minimise boom height, without compromising the spray pattern or achieving the spray target zone of the crop or situation.
6. Make sure the wind is blowing away from susceptible areas, or an adequate buffer distance is available
7. Be aware of local topographic and convective influences on wind speed and direction
8. DO NOT spray during still or low-level air temperature inversion conditions

There are potentially high risks of drift damage from phenoxy or Group I herbicides, which include products containing 2,4-D, MCPA, fluroxypyr and dicamba. These herbicides can have an adverse effect on susceptible plants such as cotton, grape vines, vegetables, pulses, pastures and native vegetation.

In addition to the must do's, to reduce drift and increase efficacy, users of Group I herbicides should:

- Select products with low volatile formulations;
- Only spray during the day as air temperature inversion conditions at night are extremely difficult to predict and monitor
- Avoid spraying:
  - 90 minutes before sunset
  - during the night and
  - until 90 minutes after sunrise
- Use the coarsest spray quality that will provide efficacy (labels require coarse or larger)
- Only use adjuvants that **do not** increase the drift potential
- Operate equipment at speeds and pressures that produce the desired spray quality (check manufacturers chart)
- **Do not** exceed speeds of 18 km/h unless there is excellent boom stability.



Remember! Watch for changes in weather conditions and if an air temperature inversion occurs, stop ***spraying immediately***

Recognising a surface air temperature inversion

Visual clues that a surface air temperature inversion is likely to be present include[4]:

- Mist, fog, dew or a frost have occurred;
- Smoke or dust hangs in the air close to the earth's surface and moves sideways rather than dispersing upwards;
- Cumulus clouds that have built up during the day collapse and flatten out towards the evening.
- Surface air temperature inversions may exist without any visual indicators.
- Other clues to help recognise a surface air temperature inversion include:
  - Wind speed is constantly LESS than 11 km/h in the evening and overnight
  - Cool, off-slope breezes develop during the evening or overnight
  - Distant sounds become clearer and easier to hear
  - Aromas become more distinct during the evening
  - Spraying under surface air temperature inversion conditions is considered unsafe as the potential for off-target movement is significantly increased.

4 Graeme Tepper (2013) Surface Temperature Inversions and Spraying. GRDC Fact Sheet and Graeme Tepper, (2014) Weather Essential For Pesticide Application GRDC.

Keep accurate spray records

Weather conditions should be measured and recorded at the site of application and at the start, finish and at least at every load during the spray application. Accurate records are a legislative requirement and are the best way to demonstrate you have complied with the label.

Minimum records to be made and kept include[5]:

- date, start and finish time of application
- location (address and areas sprayed)
- full trade names of products and rates per hectare
- area (ha) and crop stage or weeds/ situation treated
- weather conditions (wind speed, wind direction, temperature) additional records of relative humidity and delta T should also be considered.
- nozzle brand, type, spray angle, flow rate, spray quality and pressure (also record speed when using automatic rate controllers);
- name, address and contact details of property owner and operator applying the chemical.

5 Please note- State requirements vary across Australia – check your local requirements

New air temperature inversion forecasting tools coming soon…

GRDC-funded research in Western Australia, conducted by MicroMeteorological Research and Education Services (MRES) and managed by the Department of Agriculture and Food, WA, has demonstrated that many automated weather stations can be modified to collect additional information that will help to identify if a surface air temperature inversion is present and, more importantly, if it is safe to spray. While it is still early days with this research and the results need to be further tested in more complex landscapes, the techniques and instrumentation developed show promise for better defining suitable conditions for spraying. The outcomes of this research will be incorporated into current inversion risk forecasting models. Click to find out more and enter GRDC project code DAW00231

Since 2010, CropLife Australia and its members have been working with Australian agricultural industries through the National Working Party for Pesticide Applications to provide the scientific data to underpin a science-based regulatory system which will recognise the use of drift reduction technologies, deliver better education and practices to enable the use of smaller, practical buffer zones.

National Working Party on Pesticide Applications

Key links

- **GRDC Weather Essentials for Pesticide Application**
- **GRDC Surface temperature inversions and spraying**
- **GRDC practical tips for spraying**
- **APVMA spray drift**
- **APVMA spray drift labelling**

Further reading

- **Cotton Australia — *Summer weed spraying best practice***
- **Nufarm — *SprayWise — Broadacre Application Handbook* – 2nd edition**
- **Agriculture Victoria — *Spraying, spray drift and off-target damage***
- **Agriculture Victoria: Spray risk management video**
- **Grain Producers SA — *Hit your target***

Key tools

BeeConnected

CropLife Australia, in partnership with the Australian Honey Bee Industry Council, has launched BeeConnected, a world-first innovative communication tool to facilitate collaboration between farmers and beekeepers.

Through BeeConnected, farmers and contractors can register and will receive notifications when a registered beekeeper positions beehives near their properties or close to a proposed crop protection product application activity that the farmer is undertaking.

Registered beekeepers will also receive notifications alerting them when a registered farmer or contractor enters a proposed nearby crop protection product application activity. The tool also enables instant messaging between registered participants to assist beekeepers, farmers and contractors work together to keep Australia's honeybees healthy, whilst maintaining privacy through the use of a restricted in-App messaging service.

BeeConnected is a nation-wide, user-driven smart-phone app that enables collaboration between beekeepers, farmers and spray service contractors to facilitate best-practice pollinator protection. BeeConnected is free and available on iPhone, Android and desktop computers.

CottonMap

The Cotton Field Awareness Map is an industry initiative which has been designed to show the location of cotton fields. The service is provided free of charge with the purpose of minimising off-target damage from downwind pesticide application, particularly during fallow spraying.

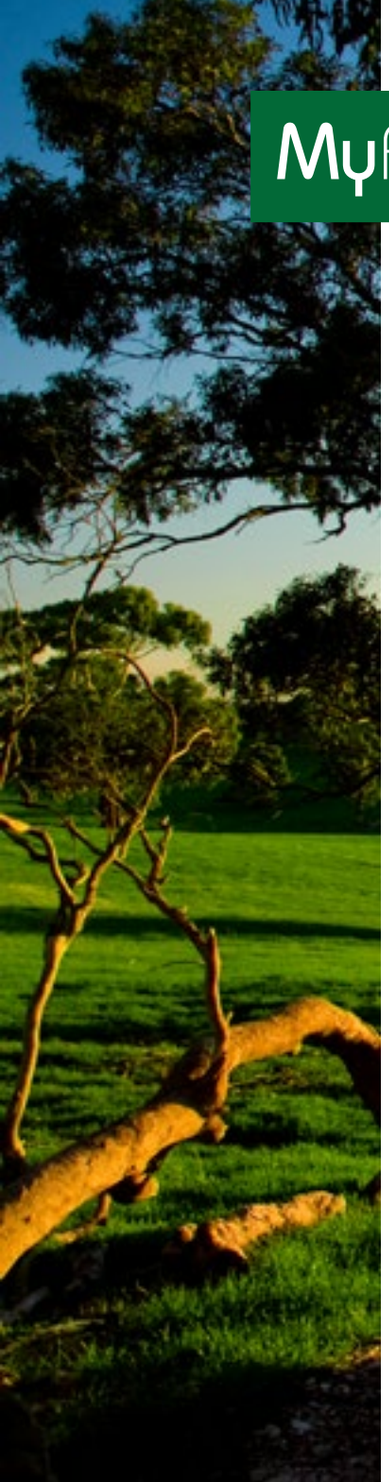
Farmers, farm managers, resellers, consultants, agronomists, applicators and contractors are encouraged to input their cotton field(s). Users can also access the Cotton Map to check the location of the paddock(s) they may be planning to spray to assess the proximity of the nearest cotton crop.

The map is a joint collaboration between Cotton Australia, Cotton Research and Development Corporation (CRDC), Grains Research and Development Corporation (GRDC) and Nufarm Australia Limited and was developed to meet industry needs.

Nufarm SprayWise decisions

Nufarm SprayWise decisions — including surface air temperature inversion risk management tools

Information has been sourced from websites and materials of CropLife members, Nufarm SprayWise Decisions, CottonMap, APVMA and the Grains Research and Development Corporation. References and links to these sources have been provided.



MyFamily

Confidence in the health, wellbeing and financial security of the working farm family

The most valuable part of a farm business is your family. Crop protection decisions made on your farm should not only consider impacts to the farming business and the user, but also to your family members and staff, especially if living on your property.

Confidence for your family

On farm safety to both the user and those living and working on the farm is the most important consideration when storing, mixing and using agricultural chemicals. Appropriate chemical storage and handling facilities to ensure the safety of yourself, your family and your employees is essential. While legislated chemical storage requirements vary by State they should at least include:

- **A securely fenced, but roofed area, a freestanding building or a room or attachment to another building** located at least:
  - 15m from the boundary property, 10m from buildings occupied by people or livestock, 3m from unrelated work areas, offices and amenities
  - 3m from flammable materials and fuel storage, 5m from any watercourse, body of water, drain or sewer

and should:

  - be fire resistant
  - be protected against extreme heat and exposure to sunlight
  - have floors and shelving that is impervious and resistant to chemicals
  - be kept secure and locked.
- **Segregation of minor storage —** Some types of pesticides and veterinary chemicals should be segregated from other chemicals
- **Ventilation and handling precautions —** Ventilation of the storage facility must prevent a build-up of chemical vapours.
- **Containing spills —** Spills must be contained by constructing a bunded (bunds are designed to contain spillages and leaks of liquids) area or sloping floor that drains to a containment pit or tank.
- **Safety showers and eyewash facilities —** A safety shower and eye wash facility should be installed in an area that is quick and easy to access
- **Control of entry —** All storage areas must be secured to prevent unauthorised access, including children
- **Signage —** Chemical signage for authorised access, no smoking and spill kit location are key requirements
- **Equipment —** Personal protective equipment (PPE), first aid and spill kits, fire fighting and mixing equipment.

Agsafe is CropLife's wholly owned subsidiary, which includes ***drum****MUSTER*, ChemClear® and Agsafe Accreditation and Training.
As a responsible grower, you must be aware of updates on label information for chemical use, safety, storage and disposal. Chemical users must be trained in sprayer calibration, application and decontamination.

- As a grower, you should also participate in the ***drum****MUSTER* chemical container disposal program.
  drum*MUSTER* collects eligible empty and clean agricultural chemical containers from participating manufacturers for recycling, providing an important service to ensure containers are not stored on-farm, sent to landfill, buried or burnt.
- ChemClear® is the national program available to you as a grower, dedicated to collecting and safely disposing of obsolete agricultural chemicals from participating chemical manufacturers
- Contact Agsafe

Confidence to yourself and your family

As a grower and chemical user, while you must complete the minimum training and accreditation for chemical use, you should also ensure that continuous education and training on best practice chemical use is achieved every year. There are a number of training service providers and training opportunities available, although certification and re-certification requirements vary from state-to-state.

Keeping up-to-date with the latest information on best practice for spray application is crucial to ensure that as a grower, your business is operating in the most efficient and sustainable way.

Keeping up-to-date to manage the continuous challenges of insect, fungi and weed resistance evolution is another reason to maintain a planned chemical use training and knowledge development program. This builds business confidence for you and your family in effectively managing future pest management and resistance risks.

There are currently active chemical resistance surveys being undertaken by a range of research institutions which are co-funded by a number of industry research and development corporations including:

- **Grains Research and Development Corporation**
- **Cotton Research and Development Corporation**
- **Horticulture Innovation Australia**
- **Wine Australia**

This includes investment in the following active programs:

- **Grains and wine fungicide resistance surveillance and research**
- **Grains, cotton and horticulture insecticide resistance surveillance and research**
- **Grains and cotton herbicide resistance surveillance and research**

CropLife Australia Resistance Management strategies

CropLife Australia promotes the responsible use of a range of pest management methods to ensure sustainable agricultural outcomes. Its members are committed to the pursuit of technologies that provide economically viable solutions to pest control. Crop protection products are an important tool in an integrated approach to pest management.

It is recognised that resistance management is a vital aspect of maintaining crop protection options for integrated crop management. In line with good farming practice, a comprehensive program of alternative management strategies is employed to minimise the development of resistant pest populations, whilst contributing towards the quality of the environment.

Highly Hazardous Pesticides

To be effective, pesticides need to kill or inactivate (control) organisms that pathologically infect, parasitize, consume or compete with crop plants, leading to a reduction in quantity and quality of crop yield. It is therefore not unexpected that in some cases pesticide substances are of high inherent toxicity. What then becomes the key consideration is evaluating whether the use would lead to exposure levels to humans or non-target wildlife that could lead to unacceptable adverse effects. Regulations for the commercialisation of pesticides require that the potential for pesticide products to cause unacceptable effects on operators, consumers and the environment be evaluated.

CropLife supports the development of an approach that allows the identification of products that can be considered to have a high potential inherent hazard (highly hazardous pesticides, HHPs). Identifying such products then allows them to be prioritized for an assessment of the potential risk of their uses and an action plan to be developed to mitigate any unacceptable risks, if such unacceptable risk is identified. Any risks should also be weighed against the need for the product, the benefits that its use secures, and the availability and risk/benefits of alternatives. The criteria that CropLife has proposed to prioritise this process take into account a number of issues including:

- The inherent acute oral and dermal toxicity of the product, whereby swallowing or skin contact of the undiluted product could lead to serious harm to humans;
- Products that contain substances at levels that are known or presumed to cause cancer in humans or affect the unborn child;
- Pesticide active ingredients that have already been identified as being unacceptable by society because they have the potential for long-range transport and accumulation in the food chain (persistent organic pollutants (POPs)) or because they damage the ozone layer;
- Products where there is credible evidence that its use is causing widespread adverse effects on either humans or the environment.

By prioritizing careful assessment of the use of products which have such properties, CropLife aims to ensure that society can enjoy the substantial benefits of pesticides (addressing food security and quality needs, underpinning sustainable economic growth through agricultural development, supporting societal development of agricultural communities by increasing profitability of agriculture), whilst managing the potential for harm by carefully assessing, managing and mitigating the risks.

Counterfeit and Illegal Chemicals

The global demand for productivity, higher-quality, healthier food has driven demand for agricultural chemicals. Unfortunately, this has been criminally exploited with illegal and counterfeit pesticides. In Europe, illegal and counterfeit pesticides have been estimated to make up 10 per cent of the overall market. In India and China illegal pesticides are estimated to be around 30 per cent of the pesticide market. The counterfeit and Illegal pesticide business is valued globally at approximately $6.5 billion.

The global trade in illegal pesticides is an increasing risk for Australian agriculture and such products are a threat to human health, the environment and the nation's economy. Australia is fortunate to have an effective, robust, rigorous and science-based agricultural chemical registration system that requires all pesticide products to demonstrate their human health and environmental safety before they can be registered for use in Australia.

CropLife member companies follow a strict code of conduct, which requires commitment to high standards of safety, stewardship and product quality. It is mandatory for CropLife members to comply with the United Nations International Code of Conduct on the Distribution and Use of Pesticides and participate in industry activities to support and enhance these requirements.

To have confidence as a grower in your pesticide products, you should check for an APVMA label approval number on the product packaging. If you have concerns in regards to illegal or counterfeit chemical products, you should contact the APVMA.

Adverse Experience Reporting

Any adverse or unexpected results of registered pesticide use should be reported to the APVMA through its Adverse Experience Reporting Program. The APVMA uses this information to decide whether an agricultural chemical should be restricted in use, withdrawn from sale or subject to an official review. Suspected non-compliance of chemicals should be reported to the APVMA including:

- the advertising and supply of unregistered agricultural and veterinary chemicals
- inappropriate manufacture of veterinary chemical products
- the importation of unregistered agricultural and veterinary chemicals.

Control of use of agricultural chemicals is regulated by each Australian state and territory and non-compliance or adverse events resulting from chemical use should be reported to the relevant state or territory organisation:

- **Victoria**
- **Tasmania**
- **New South Wales**
- **South Australia**
- **Queensland**
- **Western Australia**
- **Northern Territory**
- **Australian Capital Territory**

Key links

As a grower, you should ensure that you have access to the very best and latest training resources and materials on best practice chemical transport, storage, use and disposal relevant for your industry and state:

Victoria

- storage
- use

New South Wales

- storage
- use

Tasmania

- storage
- use

South Australia

- storage
- use

Queensland

- storage and use

Western Australia

- storage
- use

Further reading

- **Nufarm — SprayWise — Broadacre Application Handbook (2nd edition)**
- **GRDC — Ground Cover Supplement May 2016 — Spray Application**
- **GRDC — Practical tips for spraying fact sheet**
- **Wine Australia — Spray Application Grapevines**
- **Cotton Australia — Summer weed spraying best practice**

New spray application knowledge resource

A new GRDC GrowNote Spray Application Manual has been produced specifically for grain growers and operators. This resource covers a range of technical topics, including how to set up and correctly calibrate available spraying systems.

- **Find out more.**

Information has been sourced from websites and materials of CropLife International and CropLife members. Links to these sources have been provided.