

factsheet

Integrated weed management:

developing a plan using tactic groups



Integrated weed management (IWM): a flexible system, incorporating multiple weed management tactics, aiming to reduce weed numbers in an economic and sustainable manner.

Weed control tactic: method used to manage weeds in a target area.

Propagule: method of multiplication or spread used by a plant (or animal) to reproduce eg seeds, corms, vegetative parts, spores.

VET sector resource: RDT5402A *Develop a strategy for the management of target pests.*

Importance of IWM plans

Successful integrated weed management (IWM) depends on having a plan. It is important that the plan:

- Is flexible - able to respond to seasonal conditions;
- Is based on a good understanding of the target weeds' characteristics and life cycle;
- Uses a mix of weed control tactics.
- Is based on knowledge of the site - climate, soil and history;
- Is long-term and cost-effective; and
- Linked to long term land management goals.

Tactic Groups

The key goal of managing weeds is to stop the target weed from reproducing and spreading. Just as herbicides can be grouped by mode of action (MOA), weed control measures can be grouped according to their main aim (see *Table, right*).

Splitting tactics into these five '**Tactic Groups**' will assist in planning a more successful weed management program. The aim is to have control measures from one Tactic Group backing up control measures used previously, from

a different Tactic Group. Any survivors of a control measure used from one Tactic Group can be targeted at another opportunity by using one from the next Tactic Group. The more opportunities taken to control the weed, the fewer survivors there will be.

Tactic Group 1

Control measures in this group aim to deplete the reserve of weed propagules in the management zone. This may be done by destroying propagules on site (eg burning) or by encouraging germination and then killing seedlings.

Tactic Group 2

This group includes all weed management tactics that kill target weed plants, either as seedlings or adult plants, prior to them producing further propagules.

Tactic Group 3

These control measures aim to stop the formation of viable propagules. This may be to stop seed set or stop fruit production, but may not kill the weed.

Tactic Group 4

The aim of this group is to stop any surviving propagules from entering the management zone. This may involve picking, collecting and destroying fruit before it drops, or collecting residues containing weed seeds at grain harvest.

Tactic Group 5

This is the quarantine step! Group 5 tactics, such as machinery clean-down, aim to stop movement of propagules into the management zone from external sources.

Tactic Groups for weed management	
Tactic Group number	Aim of Tactic Group
Group 1	Deplete weed propagules in target area.
Group 2	Kill and remove weed from target area.
Group 3	Stop weed forming viable propagules.
Group 4	Prevent weed propagules from existing weeds entering the target area.
Group 5	Prevent viable weed propagules from external sources entering the target area.

Tactic Groups developed by Annabel Bowcher and Di Holding

Using Tactic Groups in an IWM plan

The best IWM plans will be effective in both the short- and long-term and will consist of a mix of tactics from a range of Tactic Groups.

The production of an IWM plan can be simplified by firstly allocating available weed control tactics into their appropriate Tactic Group. To do this, it is necessary to:

- have good knowledge of the weed management tactics available;
- understand the likely benefits and limitations of each tactic (including those unrelated to weed management);
- know which Tactic Group each tactic fits in; and
- know how the tactics complement other aspects of land or farm management.

Creating an IWM plan

Effective, long-term weed management involves trade-offs between:

- reducing weed numbers;
- economics of the tactic; and
- impact of weed control practices on non-target plants and all aspects of land-use management.

A successful weed management plan using Tactic Groups relies on:

- identifying target weeds;
- identifying all opportunities to control weeds; and
- regular record keeping.

This knowledge can then be used to develop an area-based weed management plan. There are eight key steps which need to be completed when constructing an IWM plan (see *Table, above*).

Steps involved in an IWM plan	
Step 1	Benchmark current weed situation - density, species, distribution, population dynamics, herbicide resistance status.
Step 2	Assess previous actions - paddock history, herbicide history.
Step 3	Determine objectives - what do you want to achieve and when. (Objectives should be SMART - Sensible, Measurable, Agreed upon, Realistic and Time constrained).
Step 4	Identify opportunities for weed management action - what growth stage provides the best opportunity to control the target weed? Which Tactic Groups are best suited?
Step 5	Identify the most effective and achievable tactics from the appropriate Tactic Groups. Ensure the tactics will have complimentary or synergistic effect rather than a conflicting effect on the weeds.
Step 6	Alter management to include tactics eg change crop rotation, change crop variety, fence management zone.
Step 7	Implement the plan.
Step 8	Monitor and review plan, and be flexible: revisit Step 1 to determine success of current plan; revisit Steps 2-6 as required.

Target weeds and control opportunities

It is important to correctly identify target weed(s) and their growth stage, and assess density and distribution.

With knowledge of the target weed, opportunities for control can easily be identified. A number of these tactics can be selected and combined into an IWM plan.

Records

Records should detail aspects such as:

- date of observations made;
- site details (soil type, topography);
- plants present (desirable and undesirable ie weeds);
- current weed situation (density, species, distribution, population dynamics);
- growth stage of target weed;
- past tactic usage;
- herbicide usage;
- herbicide resistance status; and
- future weed management plans, including proposed Tactic Groups.

Tactic Groups and annual cropping systems

In annual cropping systems, seed production is the primary means of weed propagation. This creates opportunities during the weed's life cycle where weed management can intervene. There are numerous weed management tactics that can be used in an annual cropping system (see *Table, top of next page*).

Planning is the key to selecting appropriate Tactic Groups and suitable tactics for use in a cropping system. These plans need to be flexible, realistic and create opportunities for maximum effect of the selected tactics.

Successful weed management plans in these farming systems will also have a 'zero tolerance' approach to weeds and seed produced by any 'escapes' from tactics applied earlier in the season.

A 'zero tolerance' approach to weeds requires the use of a mix of tactics from a range of Tactic Groups, eg crop topping with a non-selective herbicide to control seed-set of weeds that have escaped earlier tactics such as a pre-emergent herbicide.

Using Tactic Groups to manage weeds in an annual cropping system			
Tactic Group	Opportunity	Objective	Related tactics
Group 1 Deplete weed propagule numbers in target area.	Fallow, stubble, pre-sowing.	Encourage germination of weed seeds. Reduce viability of weed seed in the seedbank. Remove weed seeds from seedbank.	Autumn tickle, delayed sowing. Burning, inversion ploughing, grazing. Grazing, predation.
Group 2 Kill and remove weed from target area.	Fallow, stubble, pre-sowing, early post-emergent, late post-emergent.	Kill seedling weeds. Increase crop competitive ability.	Fallow/stubble herbicide, fallow cultivation, stubble burning, non-selective herbicide, pre-emergent residual herbicide, post-emergent selective herbicide, inter-row cultivation, inter-row herbicide. Crop & variety choice, seeding rate, row spacing, fertiliser placement, disease and insect control.
Group 3 Stop weed forming viable propagules.	Pasture phase, mature weeds in fallow and stubble, late in-crop.	Controlling weed seed-set while maintaining yield. Controlling weed seed-set while sacrificing yield.	Wick wiping, selective spray-topping, crop-topping, windrowing, spot spraying & roguing, pasture spray-topping, spray-graze. Green & brown manuring, crop silage, pasture hay cut or silage, grazing.
Group 4 Prevent weed propagules from existing weeds entering the target area.	Pasture phase, late crop salvage, harvest.	Physical removal of viable seed from paddock.	Residue collection at harvest, windrow/no graze/burn, grazing.
Group 5 Prevent viable weed propagules from external sources entering the target area.	Sowing, fallow, stubble, machinery operations, livestock management.	Whole farm hygiene.	Strategic livestock movement and supplementary feeding, sow weed-free seed, maintain weed-free fence lines, clean machinery.

Using Tactic Groups on-farm

The aims of a weed management plan on-farm should be to:

- reduce the soil seedbank using tactics from Tactic Group 1;
- kill weeds to avoid competition with the crop and minimise yield loss using tactics from Tactic Group 2; and
- determine how to treat any weeds that survive tactics imposed early in the growing season (Tactic Groups 3 to 5).

The focus should be on zero weed tolerance and zero seed tolerance!

An example of using a Tactic Group approach in one year of a weed management plan is shown in the Table opposite.

Example Tactic Group approach One paddock for one season of a weed management plan	
Crop: Field peas into wheat stubble.	Target weeds: Group A herbicide resistant annual ryegrass, wild radish and wireweed.
Tactic Group	Tactic
Group 1	Burn stubble early April - no grazing to avoid weed seed burial. Autumn tickle - to promote wild radish germination. Delayed sowing - to allow annual grasses to germinate after opening rains.
Group 2	Knockdown herbicide (MOA Group L) - to kill emerged weeds. Pre-emergent trifluralin (MOA Group D) - to target annual ryegrass and wireweed.
Group 5	Sow weed-free seed - prevent further weed problems by using machinery that has been thoroughly cleaned.
Group 2	Post-emergent diflufenican (MOA Group F) - to target wild radish escapes and late germinations.
Group 5	Maintain weed-free firebreaks using herbicide, cultivation or both.
Group 3	Crop-topping with Roundup PowerMAX® (MOA Group M) - to target seed-set of annual ryegrass escapes.
Group 5	Harvest seed blocks and cleanest paddocks first. Use clean machinery at harvest and transfer grain to clean storages.

Using Tactic Groups to manage non-crop weeds

The Tactic Group approach can also be used to manage weeds in other situations eg horticultural, environmental and broad-scale landscape weeds. The Table below

provides examples of possible tactics that may be available when managing weeds in non-cropping situations.

The Tactic Groups remain the same but the related tactics chosen and opportunities for control will differ according to the target weed(s), non-

target plants, weed location and site specific conditions.

By thinking about the available weed management options using Tactic Groups, IWM plans in these environments can be constructed for maximum impact on the weed(s).

Using Tactic Groups to manage weeds in non-crop situations		
Tactic group	Objective	Example tactics to choose from
Group 1 Deplete weed propagule numbers in target area.	Encourage germination of propagules.	Burning; soil disturbance.
	Reduce viability of weed propagules in area.	Burning; grazing, biological control.
	Removal of weed propagules from area.	Predation and physical removal of propagules.
Group 2 Kill and remove weed from target area.	Killing weeds.	Physical removal, various methods of herbicide application (see factsheet <i>Herbicides: knowing when and how to use them</i>), cultivation, burning, biological control, cutting.
	Increase competition from desirable vegetation.	Plant desirable, competitive species to replace the weeds, improve competition by using appropriate plant density, fertiliser, and disease and insect control, mulching.
Group 3 Stop weed forming viable propagules.	Controlling weed propagule formation while minimising the effects on the desirable vegetation.	Use alternative herbicide application techniques (eg wick wiping, selective spray-topping, spot spraying), hand roguing, spray-graze, strategic cutting or pruning.
	Controlling weed propagule formation but also causing a significant impact on the desirable vegetation.	Non-selective herbicide, strategic cutting, burning.
Group 4 Prevent weed propagules from existing weeds entering the target area.	Physical removal of viable propagules from target area.	Removing and destroying propagules eg seed heads or fruits by picking, cutting, burning.
Group 5 Prevent viable weed propagules from external sources entering the target area.	Improve hygiene of area to prevent entry of new weeds.	Quarantine area, limit animal (eg livestock) or machinery (eg recreational vehicles or boats, excavators etc) access to area.
		Use appropriate machinery or equipment clean down procedures and facilities.
		Use weed-free seed, seedlings, tube stock, mulch etc when establishing desirable plants in the area.
		Dispose of removed weeds/seeds/fruits by burning, deep burial, composting, covering with plastic or send to tip.

For further information visit the Weeds CRC's website: www.weeds.crc.org.au

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