

Integrated Weed Management for the Vegetable Industry



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Integrated weed management

- Hygiene
- Crop rotation (reduce seed bank, break cycles)
- Plastic mulch (depending on crop)
- Early inter-row weed control (herbicide or cultivation)
- Hand weeding (chipping)
- Herbicides (pre-plant, selective)



Plan, do and review
Be diverse, avoid patterns
Diligence and timing
Be strict about hygiene



Weeds have a significant impact

- Cost of management – herbicides, labour
- Reduce yield – compete with crop for resources
- Interfere with sowing and harvesting – large (e.g. mallow), prickly (e.g. stinging nettle), wrap around implements (e.g. wireweed)
- Affect quality – contamination and marking
- Act as hosts for pests & diseases
- Resistance, loss of effectiveness??



Economic impact

Crop	Weed control as a % of costs (excluding labour costs)
Cabbages	25
Lettuce	16
Beetroot, processing	12
Pumpkin, butternut	7
Carrot	6
Capsicum	2

What does it cost you per hectare??

Has this gone up or down over time?

Important weeds

- Growers and agronomists across Australia nominated the most important weeds in vegetable growing
- Many of the key weeds are common in all states, some unique weeds in Northern Territory

The bad weed types

- Heavy seeding annuals
- Biennials/perennials with persistent roots, corms, etc.
- Species that are difficult to control with herbicides
- Weeds related to the crop

Problem weed types

Fat hen
(*Chenopodium album*)



Crop competition,
reduces yield, hosts
aphids, seeds quickly

Nut grass
(*Cyperus rotundus*)



Difficult to control with
herbicides, spreads
easily,
pierces plastic mulch

Pigweed
(*Portulaca oleracea*)



Difficult to control with
herbicides, interferes with
cultivation, crop
contamination, reduces
yield

What would IWM look like for these?

What principles can we apply?

Integrated weed management

Planting into a low weed seedbank
is the GOAL

Use multiple strategies (diversity), **plan** ahead

- Cultural
- Mechanical
- Biological
- Chemical
- Hygiene



New & emerging technologies
changing the game

Farm hygiene



- preventing weed seeds arriving (farm-gate biosecurity)
- cleaning weeds seeds off farm machinery
- use dedicated, quarantined wash-down areas
- to limit weed spread between farms and between paddocks

Crop rotation

- vary the crops grown
- different families have different needs and timings
- enable different weeding methods to be used
- benefits for pest & disease management
- benefits for soil



Tillage

Tillage equipment includes an inter-row cultivator (scuffler) to cultivate on top of the raised beds before the crop is planted or between the raised beds, and a 'Weedfix' cultivator to work within the crop after it is planted.



Cultivation is carried out to form the raised beds in which vegetable crops are grown, and controls most weeds before planting. Later cultivation between the crop plants is carried out by some farmers.

Mulch and hand weeding



Plastic mulch is viable in some high value crops such as cucurbits (e.g. pumpkins, melons, zucchini), and capsicum. Controls many weeds, retains soil moisture, reduces crop spoilage.

Hand weeding (hoeing, chipping, pulling) is carried out to control persistent weeds that are not controlled by the other methods, especially for in-row. Effective but expensive!



Cover crops

Physical competition: quick growing, dense cover such as ryegrass & other cereals, some legumes

Biofumigation: relies on chemicals from the cover crop to suppress weeds (and soil pests), tricky to manage, only targets certain weeds, e.g. brassicas

Issues: poor establishment, termination, weediness, lost income



Other methods

Biodegradable mulch relatively new technology, breaks down on the ground; reduced impact; current trials in Australia

Thermal weeding using steam, flame or hot water. Prevents soil disturbance, but expensive and selective

Stale/false seedbeds – only feasible in districts where a fallow period is economically viable

Solarisation – using clear plastic mulch to cover soil and ‘cook’ the weeds and seeds (and soil pests)

Herbicides

Herbicide options include non-selective fallow, pre-emergent selective, post-emergent selective, and shielded inter-row non-selective.



Where there are gaps in herbicide availability (e.g. managing broadleaf weeds in broadleaf crops) farmers rely more heavily on other methods.



New technology

- Weed ID sensors that use NIR & leaf shape to locate and identify weeds

Some crops suit this technology better?

Excellent results in onions, beetroot



Other considerations

may or may not be relevant

- Reduced till → weeds more on the surface
- Soil residual herbicides generally work better placed closer to the weed seeds (top 3 cm)
- Stubble tie-up can be an issue for residual herbicides
- Shift the growing season on paddocks
- Warm, ideal temperatures assist crop competition

Consider sowing cleanest paddocks
in slow-establishment seasons

Integrated weed management

Key messages

- Plan, do and review

Managing the weed seedbank is the goal

- Diverse, avoid patterns

Use multiple strategies

- Be strict about hygiene

Those seeds again!

- Diligence and timing

A stitch in time saves 9 ... thousand



Acknowledgements

Vegetable farmers from across
Australia

Regional contacts: Michael Sippel,
Qld; Phil Frost, Tas; Simon Nowell,
Tas; Stephen Moore, Vic; Sarah
Houston, WA; Tony Burfield, SA;
Greg Owens, NT; Leigh James, NSW

Webinar: Marc Hinderager, Kelvin Montagu, Liam Southam-
Rogers AHR

HIA: Ben Callaghan, Byron de Kock, Will Gordon, Melanie
Davies, Jodie Pedrana and Angus Street

AUSVEG: Tim Shue

Reps: AgNova, Bayer CropScience, Crop Care Australasia, Dow
AgroSciences, Dupont, Nufarm, Serve-Ag, Syngenta, BASF
and Sumitomo



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Integrated weed management

Questions to consider

- What does it cost you per hectare?
 - Has this gone up or down over time?
- Identifying weeds?
- What would IWM look like for key weeds?
- What principles can we apply?
- What about herbicide resistance?