FAR Integrated Weed Management Road Show

Friday 28 August 2026, ***Ashburton***

Monday 31 August 2026, ***Timaru***

Tuesday 1 September 2026, ***Dunsandel***

Wednesday 2 September 2026, ***Gore***

Thursday 3 September 2026, ***Masterton***

Friday 4 September 2026, ***Bulls***

Ministry for Primary Industries
Manatū Ahu Matua

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ADDING VALUE TO THE BUSINESS OF CROPPING

Health & Safety

Please take appropriate care and be aware of potential hazards. For your safety, please:

- Follow instructions from FAR staff at all times.
- Stay within the areas specified by FAR.
- Report any hazards noted directly to a member of FAR staff.

First aid and emergencies

FAR staff are qualified First Aiders and there are First Aid kits on site. Should you require any assistance, please ask a FAR staff member.

Speaker Details

- Jackie Ouzman, Adelaide University (Australia)
- Mette Sonderskov, Aarhus University (Denmark)
- Zach Ngow, BSI AgResearch Group
- Chris Smith, Foundation for Arable Research
- Charles Merfield, Merfield consulting
- Pieter-Willem Hendriks, Lincoln University
- Chris Buddenhagen, BSI AgResearch Group
- Owen Gibson, Foundation for Arable Research
- Andrew Pitman, Foundation for Arable Research

Foundation for Arable Research Primary Sector Growth Fund (PSGF) project.

Integrated weed management in a world of herbicide resistance

Weeds are estimated to reduce crop yields by around 10%, while effective herbicide-based control can increase yields by up to 30%, delivering an economic return of around $2–$4 for every dollar invested. Despite this, weed management remains the primary agronomic challenge identified by New Zealand cropping farmers.

New Zealand's reliance on herbicides is high, but herbicide resistance (HR) is reducing the effectiveness of some of our most important weed control options. There is also an increasing risk of new HR weeds entering New Zealand and the loss of access to key herbicide chemistries. Developing effective integrated weed management (IWM) strategies is therefore critical to reducing reliance on herbicides, managing HR weeds and maintaining long-term farm profitability and sustainability.

The PSGF project is working with growers to develop practical, sustainable IWM strategies that protect the future of New Zealand's $2.1 billion grains and seeds sector and support the interconnected vegetable industry.

Latest FAR IWM research reports

Scan the QR code to read these reports

Weed Smart NZ - Programmes

Rural Professional Workshop, Ashburton

Session A: Weed management in a world of herbicide resistance

10.45 am – 11.15 am: Cost of weeds and herbicide resistance to cropping farmers in Australia (**Jackie Ouzman, CSIRO, Australia**)

11.15 am – 11.45 am: How do Danish cropping farmers integrate non-chemical weed control tactics into their weed management programmes **(Mette Sonderskov, Aarhus University**)

11.45 am – 12.15 pm: The status of Herbicide Resistance in cropping systems in New Zealand **(Zach Ngow, BSI AgResearch Group**)

12.15 pm – 1.00 pm: Lunch

Session B: Practical ways to get started

1.00 pm – 1.45 pm: Making a weed management or herbicide resistance plan to futureproof your farm - Getting the basics right – on-farm biosecurity and the FAR risk register **(Andrew Pitman, FAR**)

Panel and Audience Discussion: Panelists: **Alice Kerr (PPGW Seeds Agronomist), Mette Sonderskov (Aarhus University) and Roger Lasham (Independent Agronomist)**

1.45 pm – 2.05 pm: Putting your IWM/HR plan into action: Herbicide resistance can begin before planting **(Chris Buddenhagen, BSI AgResearch Group)**

2.05 pm – 2.25 pm: Putting your IWM/HR plan into action: Mapping your weeds (**Chris Smith, FAR)**

2.25 pm – 2.45 pm: Putting your IWM/HR plan into action: Strategies for managing HR risk in your fencelines **(Charles Merfield, Merfield consulting)**

2.45 pm – 3.05 pm: Putting your IWM/HR plan into action: Stopping Weeds setting seed: The impacts of rotational ploughing on weed seed banks **(Pieter-Willem Hendriks, Lincoln University)**

3.05 pm – 3.15 pm: Closing remarks

Grower Workshop Series

1. Introduction to Primary Sector Growth Fund (PSGF) Integrated weed management programme.
2. How do Danish cropping farmers integrate non-chemical weed control tactics into their weed management programmes? (**30 min, Mette Sonderskov, Aarhus University**)
    - Testing HR in Denmark – how does it help and how do they do it?
    - What tools do they have to support decision making (Crop Protection online/DK-RIM)?
    - What IWM tools are Danish growers adopting most successfully?
    - Can you expect to maintain yield/what does HR and IWM cost a Danish grower?
3. Current status on Herbicide Resistance in New Zealand arable systems (Zach Ngow South Island, Dr Trevor James, North Island)
4. Facilitated Grower discussion (1h 20 min, supported by Regional Facilitator and Mette Sonderskov)
5. Summary and close (5-10 min)

Cost of weeds and herbicide resistance to cropping farmers in Australia

Jackie Ouzman, The Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

Weeds and herbicide resistance remain one of the most significant challenges to Australian grain and cotton production, imposing substantial economic and agronomic impacts while also demanding ongoing innovation.

Here we report on two recent studies involving the Grains Research and Development Corporation (GRDC) and Cotton Research and Development Corporation (CRDC) investigating the cost of weeds to grain and cotton production in Australia including breakdowns of the costs and actions taken at the farm level. National costs attributable to weeds are estimated at $4.4 billion or on average $206 per ha, comprising 87% weed control expenditure and 13% yield and revenue loss. The costliest in crop weed species nationally include annual ryegrass, brome grass and sow thistle, while melons, heliotrope/potato weed and fleabane were the major fallow weeds.

Annual yield losses attributable to weeds, including fallow weeds, total 1.2 million tonnes, but comparison with previous studies over past decades indicate that the proportion of costs attributable to yield loss is declining despite major increases in herbicide resistance. We also identify the cost of herbicide resistance in grain production by using the same bio-economic modelling framework to explore hypothetical production scenarios including where herbicide resistance is absent and does not influence weed management options.

For the grains industry, the presence of herbicide resistance is estimated to cost growers $65/ha on average. While substantial ($1.4B nationally), this figure and the relatively low yield loss attributable to weeds, reflects a highly adapted agronomic system that is applying integrated weed management innovation to keep weed seed set relatively low, and benefiting from the introduction of important new herbicide technology.

These findings and the increasingly high level of investment in weed control reinforce the ongoing need for innovation to support resilient and profitable Australian cropping systems.

Typical Denmark Crop Rotations

Mette Sonderskov, Aarhus University, Denmark.

For farmers without specialised cash crops, winter crops have traditionally dominated production, including winter wheat, winter barley, and winter oilseed rape, often with spring barley also included in the rotation. Spring barley grown for malting purposes accounts for 30 to 35% of spring barley production (2025 data). Winter crops are established in autumn (winter cereals in September and winter oilseed rape in August). Spring barley is established as soon as soil conditions are suitable in spring (March to April). Field beans are becoming more widespread as a fodder crop (particularly for pigs) and can be considered a break crop in cereal rotations. Field beans are regarded as a spring crop and are established at the same time as spring barley, as early as possible in spring.

Farmers producing grass seed typically have longer rotations, with two to three years of seed harvest incorporated into rotations such as those described above. The most important grass seed species are *Lolium perenne*, *Festuca rubra*, *Poa pratensis*, and *Festuca arundinacea*. Danish producers contribute 66 to 75% of total EU production. Another important seed crop is spinach seed, for which Denmark produces approximately 75% of the world's supply.

In some areas, potatoes and sugar beet are grown. These crops are included in rotational systems, with three to four years between sugar beet crops and three to five years between potato crops to minimise rotation-related diseases. Rotations most commonly include cereals, legumes, and oilseed rape.

EU regulations now state that the same crop may only be grown on the same area for three consecutive years, after which a different crop must be established. In addition, a crop different from that grown in the previous year must be established on 35% of the farmed area each year (CAP, Common Agricultural Policy, 2023).

In livestock-producing areas, forage crops such as maize and grass are often included to support feed production. Maize and grass, or grass-clover mixtures, are commonly grown in monoculture systems (or as permanent grassland) or within very simple rotations. There are some exemptions from EU regulations for farmers with at least 75% of their land in grass, other green fodder crops, or legumes. In some cases, cover crops may be counted as a crop under the regulations, allowing continuous cultivation of crops such as maize, provided the cover crop remains in the field for a specified period.

Cover crops and “in-between crops” are a major focus in Denmark due to their role in reducing nitrogen leaching into waterways. Their use is regulated through mandatory cover and catch crop requirements. Oxygen depletion (hypoxia) in coastal marine waters is a high political priority, as it has reached critical levels in some areas.

Perennial high-value crops, including fruit, berries, and Christmas trees, make up only a small proportion of the cropped area. Vegetable production is also limited. Together, these crops accounted for only 1.3% of cropped land in 2025, with Christmas trees occupying the largest share of this area.

The status of Herbicide Resistance in cropping systems in New Zealand

Zach Ngow, BSI AgResearch Group

Herbicide resistance was first identified in 1979 in New Zealand, and since then cases have increased. There are now forty-three unique cases of herbicide resistance between twenty-three weed species. Eleven of these species were recorded as resistant for the first time as part of the MBIE programme "*Managing herbicide resistance*".

Arable fields from the Bay of Plenty to Southland were visited between 2019-2023 in randomised surveys to determine the prevalence of herbicide resistant weeds. Widespread resistance was observed, with prevalence ranging from 11-71% across different regions. In arable farms the major weeds with resistance were ryegrass (groups 1 & 2), wild oats (1,2) and sow thistle (2), but resistance was also detected for chickweed (2), prairie grass (2), lesser canary grass (1,2), poa annua (2), willow weed (2) and pineapple weed (2). Additional new cases were identified for spurrey (2) and ripgut brome (2). In maize, summer grass (nicosulfuron, group 2) and fathen (atrazine, group 5) were recorded as resistant.

Following from these surveys, a PSGF project "*Herbicide resistance surveillance*" has begun, with the first area sampled the Selwyn, Waimakariri and Hurunui districts of Canterbury, re-visiting a similar area to the original 2019 survey. In addition, growers and interested parties are free to submit seed samples for testing. Early results are available for ryegrass, but other species are yet to be tested. The new surveys have an increased focus on testing for resistance to pre-emergent herbicides. Future years will include vegetable crops.

FAR Arable Integrated Weed Management (IWM) Farm & Paddock Planning Template

Discussion-group strawman (draft) template for Canterbury arable growers. Adapt collaboratively to fit individual farm systems.

1. Farm Overview

☐ Farm name

☐ Area (ha)

☐ Soil types

☐ Irrigation

☐ Key crops

☐ Key weed species

☐ Known resistance issues

2. Farm Goals

☐ Top 3 weed management goals

☐ Production goals

☐ Resistance management objectives

3. Whole-Farm Weed Risk Map

☐ Identify high, medium and low pressure paddocks

☐ Mark gateways, headlands, wet areas, lanes and fencelines

4. On-farm Biosecurity

☐ Manage Visitor Risks

☐ Manage Contractor and Machinery Risks

☐ Manage Seed and Planting Material Risks

☐ Manage Feed, Grain and Straw Risks

☐ Manage Livestock Risks

5. Farm-Wide IWM Toolbox

☐ Chemical

☐ Cultural

☐ Mechanical

☐ Preventive

☐ Ecological/Biological

6. Five-Year Rotation Plan

☐ Year 1-5 crops

☐ Weed control opportunities

☐ MOA rotation plan

7. Annual Farm Action Calendar

☐ Winter planning

☐ Pre-sowing

☐ In-crop

☐ Harvest

☐ Review

8. Paddock Action Plan Template

☐ Paddock name

☐ Current crop

☐ Priority weeds

☐ Crop rotation in last three years

☐ Herbicide history in paddock

☐ Risk rating (R/O/G)

Paddock-Level IWM Plan

Paddock

Area

Soil Type

Current Crop

Priority Weeds

Resistance Status

Pressure Zone (R/O/G)

Target Outcome

Responsible Person

Management Tool	Actions	Timing	Success Measure	Notes

Putting your IWM/HR plan into action: Herbicide resistance in commercial ryegrass seed lots

Chris Buddenhagen, BSI AgResearch Group

Ryegrass (*Lolium* spp.) is a key forage providing a $14 billion contribution to New Zealand's gross domestic product (GDP). However, ryegrass can also act as a weed and evolve resistance to herbicides used for its control. Farmers suspected that imported seed might contribute to resistance issues. Herbicide resistance frequencies were investigated in commercial ryegrass seed lines intended for multiplication in New Zealand. Samples from 56 basic seed lots and 52 unique cultivars sourced from regions including New Zealand, United States, Europe and Japan were planted in field trials. Seedlings were then sprayed with three common herbicides: glyphosate, iodosulfuron, and haloxyfop. Surviving plants were retested to confirm resistance.

Resistance to haloxyfop and or iodosulfuron was detected in 79% of seed lines. However, frequencies were not significantly higher in imported lines (from United States and Europe) compared with New Zealand lines. Resistance was detected at frequencies between less than 1% and 10% for haloxyfop and between less than 1% and 14% for iodosulfuron Resistance to glyphosate was not found. There was no significant difference between the resistance detected in seed samples sourced from different seed companies.

It was found that 63% of resistant lines had resistance frequencies rarer than 0.1%, but this is potentially problematic considering typical sowing rates. Imported versus domestic seed sources were not significantly different; they pose similar levels of resistance risk to farmers. *Lolium multiflorum* had a higher resistance frequency compared to *Lolium perenne* (although only six *L. multiflorum* lots were evaluated). Breeders should screen progeny of early crosses for herbicide resistance.

Putting your IWM/HR plan into action: Mapping your weeds

Chris Smith, FAR

Key points

1. Mapping links strategic planning to practical field action.
2. Tools range from simple mobile apps to advanced camera-guided systems.
3. Green-on-green sensing is a rapidly developing area.
4. Consistency in record-keeping is more important than complexity.
5. Use existing technology first and build capability over time.
6. Focus on recording recurring weed patches and monitoring changes over time.

Why Map Your Weeds?

- An IWM/HR plan only works when weed locations are known.
- Mapping converts paddock knowledge into a permanent record.
- It identifies patch location, size and spread.
- It supports spot spraying, patch destruction and resistance testing.
- It provides an audit trail for staff and contractors.

What Technology Is Available?

- Apps for geo-tagged photos and drop-pin records.
- GPS-enabled machinery logging from tractors, sprayers and harvesters.
- Drones providing high-resolution RGB and multispectral imagery.
- Satellite imagery for repeatable whole-farm coverage.
- Optical real-time sprayers.
- Choose technology that fits your farm scale, budget and decision-making process.

Choosing the Right Tool

- Match the tool to the scale of the problem.
- Map weeds when they are easy to distinguish from the crop.
- Use drones when plant-level resolution is required.
- Consider operator skill requirements and total cost.
- Monitoring technologies can provide a lower-cost entry point than full optical application systems.
- Ensure collected data can be exported into farm-management or GIS software.

Current Advances

- Green-on-green weed detection, advancing fast, offering more crops & more weed details.
- Camera-guided site-specific spraying systems.

Making It Practical on Your Farm

- Start by recording known weed patches with photos and dates.
- Use consistent naming conventions and processes each season.
- Pay attention to surviving weeds following treatment.
- Review maps before planning rotations and spray programmes.
- Share records so all staff manage patches consistently.

Putting your IWM/HR plan into action: Strategies for managing HR risk in your fencelines

Charles Merfield, Merfield consulting

What is the highest risk?

Fencelines are a growing concern as a source of herbicide resistance (HR) weeds that spread into crops. In Australia, that shares many fenceline management practices with New Zealand, fencelines are a proven source of in-crop HR weeds.

The highest risk for all forms of HR is repeatedly using the same Mode of Action (MoA) or worse, the same active ingredient (AI). However, this is the most common way of managing fencelines with herbicide - repeated application of glyphosate.

As most HR in arable is groups 1 and 2 minimising the risk of glyphosate resistant weeds, especially ryegrasses establishing is utterly vital. Glyphosate resistant weeds will have major negative impacts particularly on herbage seed production.

Cost vs. benefits

The new "Keep what works, working" campaign from A Lighter Touch is totally clear, it's much cheaper and more effective to prevent resistance in all its forms than try and manage it once established. Smarter ways to manage fencelines are therefore essential.

If you need to maintain bare soil under fencelines, for example for seed certification, then the simplest and lower cost option is to diversify your herbicides. As fencelines are not crops you also have a much wider range of herbicide options than in-crop. One option is a tank mix of different groups, like TAG® G2 (terbuthylazine Group 5, amitrole Group 34, oxyfluorfen Group 14 and glyphosate Group 9). This combines knock-downs with residuals which is a powerful combo. The alternative is to rotate modes of action, e.g., use a knockdown, then a residual to give longer term control. The non-chemical option for bare ground is to use undervine weeders. Clearly there is considerably more cost than spraying, including purchase, often tying up a tractor with the weeder and the hours spent weeding the fencelines.

If you don't need to have bare soil, just stopping spraying and letting pasture re-establish itself is by far the cheapest and simplest option. If you don't need bare soil but want to keep the pasture in check, then an undervine mower is the way to go. As for undervine weeders, there is the capital cost, but they often have faster work rates. Also think about when pasture must be mown, vs. just mowing it all the time.

The final option is permanent woody vegetation. Gorse and broom hedges were once widespread and though considered weeds in some areas, in the right location they provide additional benefits such as early flowers for pollinators and beneficial insects. FAR has been funding extensive work on native woody species for field margins to support pollinators, so there is potential to triple dip and plant up fencelines with natives for beneficial insects, out compete fenceline weeds and boost native biodiversity.

Putting your IWM/HR plan into action: Stopping Weeds setting seed

Pieter-Willem Hendriks, Lincoln University

This research uses FAR's long-term tillage strategy trial to investigate how cultivation practices influence weed populations and weed seedbanks over time. Running continuously for 23 years, this unique experiment provides a rare opportunity to understand the long-term consequences of different tillage systems on weed community dynamics and the persistence of weed seeds in the soil. The recent decision to strategically plough half of the trial plots to a depth of 30 cm creates an exceptional opportunity to study both the legacy effects of long-term tillage management and the impact of a one-off strategic tillage intervention.

The trial compares weed seedbanks and above-ground weed populations that have developed under contrasting tillage strategies over more than two decades. By monitoring weed communities before and after the strategic tillage event, we can evaluate how long-term management shapes weed populations and determine how effectively strategic tillage redistributes weed seeds within the soil profile, alters weed emergence patterns, and influences weed pressure in subsequent seasons.

A particular focus of this work is understanding the interaction between long-term tillage history and strategic tillage. Strategic tillage is increasingly being considered as an Integrated Weed Management (IWM) tool for managing difficult-to-control weeds and reducing weed seedbank pressure. However, there is limited long-term evidence to guide decisions on when it should be used and how frequently it should be repeated.

The unique structure of this trial allows us to address questions that are difficult to answer in short-term experiments:

- How do different tillage systems shape weed seedbanks over decades?
- What is the immediate impact of strategic inversion tillage on weed populations?
- How quickly do weed communities recover following a strategic tillage event?
- How long do the benefits of strategic tillage persist?
- What is the optimal interval between strategic tillage operations?

By combining weed seedbank assessments with measurements of above-ground weed populations over time, we will be able to track the short-term and long-term responses of weed communities to strategic tillage.

The findings from this research will provide growers with evidence-based guidance on the consequences of long-term tillage strategies for weed management, the opportunities and limitations of strategic tillage as an integrated weed management tool, and the likely duration of its benefits. Ultimately, this work aims to identify how strategic tillage can be most effectively integrated into modern arable systems and to help define the optimum interval between strategic tillage events to maintain weed populations at manageable levels while minimising unnecessary soil disturbance.

By leveraging one of New Zealand's longest-running tillage experiments, this research will generate practical recommendations that support more resilient, profitable, and sustainable weed management strategies for arable growers.

KEEP WHAT WORKS WORKING

BECAUSE HERBICIDE RESISTANCE DOESN'T WAIT.

Keep What Works Working is an industry-led awareness campaign focused on helping growers understand, prevent and manage herbicide resistance.

The campaign promotes:

- **Knowing Your Weeds**
- **Diversifing Weed Control**
- **Protecting Herbicide Performance**
- **Sharing Knowledge**

HERBICIDE RESISTANCE IS A GLOBAL CHALLENGE.

More than 500 unique herbicide resistance cases have been documented worldwide, spanning hundreds of weed species and cropping systems. Sustainable management requires both innovation and stewardship.

Learn more at:
https://www.keepwhatworksworking.co.nz

FAR®

FAR Strategy 2026-2031

Vision for the arable sector

A confident, resilient and profitable arable sector, producing trusted foods, feeds and seeds

Purpose of FAR

Connecting growers with science and information to support successful arable farms and a valued arable sector

Trusted research, development and innovation

Goal - Contribute to arable farm success

We will…

- **Engage growers** to identify research that matters
- **Prioritise research** for maximum impact from available resources
- **Partner with growers**, research providers and industry in New Zealand and globally

Extension with impact

Goal - Deliver value to arable growers

We will…

- **Deliver results** promptly
- **Provide** trusted and timely information
- **Translate research results** to support practical on-farm decisions
- **Deliver to growers** through multiple channels and partners

Building arable sector understanding

Goal - A visible and valued arable sector

We will…

- **Champion arable's contributions** to New Zealand farmers and society
- **Build a robust evidence base** to promote the value of our industry
- **Strengthen and align relationships** with government, commercial providers and other primary sectors

An efficient and effective FAR

Goal - A focused and agile organisation

We will…

- **Be sound stewards** of grower investment
- **Monitor, evaluate and evolve** delivery to arable growers
- **Build** a connected and capable FAR team
- **Support and develop** our staff and grower and industry volunteers
- **Invest** in systems to improve efficiency and performance

Principles

Focused on growers
Enhancing arable community

Values

Trusted · Independent · Curious
Collaborative · Engaged

Notes:

Notes:

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