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CROPS

Annual Expo 2026

Wednesday 25 November 2026

FAR Arable Site, 1904 Rakaia Highway, Chertsey
10.00am - 4.15pm, lunch provided



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Welcome to CROPS 2026

Please take this opportunity to view the FAR trials and industry demonstrations, and hear up-to-date research findings from New Zealand and overseas experts.

Today's event features a mix of speakers from FAR and collaborative partners, as well as from overseas. The two visiting overseas speakers are Adam Christie, of Scottish Agronomy, on the United Kingdom version of Cultivar Performance Trials (CPT) and UK agricultural engineer and soil expert Philip Wright on soil compaction. To illustrate the compaction presentation, a soil trench is being dug at the Chertsey site so those attending can graphically see the soil layers and how compaction may impact on root development through the soil profile.

Other topics include arable carbon footprints for New Zealand-grown animal feed, which flowers drive white clover seed yield, and a demonstration of the SVS (Sustainable Vegetable Systems) nitrogen use efficiency tool. There will also be a discussion on tools for mapping and managing weeds.

What's on?

The programme and map over the page outline the titles, times and locations of all of today's presentations. Each speaker will give their presentation twice - once in the morning, and again in the afternoon. Talks are 20 minutes long with time for questions and discussion.

Sponsors' presentations

Our Platinum sponsors' sites are available to visit throughout the day; their talks will be immediately after lunch. Our Gold sponsors also have a wealth of information and material on display. Please support all our sponsors, by visiting their sites, talks and demonstrations.

Questions?

Should you require any assistance throughout the day, please don't hesitate to contact a member of the FAR team who will be more than happy to help.

Want to know more?

Contact details for all of today's speakers can be found throughout this book.

We are confident that you will leave the event with valuable information to assist you in making farm management decisions and improving the economic and environmental performance of your crop production systems.

Enjoy your day!

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Speakers and talks:

1 **Nitrogen use efficiency: does the SVS tool work?**
Andrew Barber, Agrilink and Abie Horrocks, FAR

2 **Integrated pest management in mixed cropping rotations.**
Jo Drummond FAR and Daniel Sutton NZ Veg

3 **Cultivar performance: making the most of genetics.**
Jacqueline Straathof, FAR and Adam Christie, Scottish Agronomy

4 **Not all flowers are equal: which ones drive white clover seed yield?**
Fiona Anderson and Sean Weith, FAR

5 **Ag chem for minor use crops: a pathway?**
Andrew Pitman, FAR and Bruno Gatimel, A Lighter Touch

6 **Where are the weeds? Mapping and managing.**
Chris Smith, FAR and Ecorobotix

7 **Managing compaction for improved profit.**
Philip Wright, Wright Resolutions

8 **Arable feed carbon footprints: from seed to feed.**
Dirk Wallace, FAR

Timetable:

10.10am	10.30am	11.00am	11.30am	12.00pm	12.30pm
Welcome	1				Lunch
		2			
			3		
				4	
				5	
			6		
		7			
	8				

1.25pm	2.15pm	2.45pm	3.15pm	3.45pm	4.15pm
Sponsors	1				End
		2			
1.25pm - 1.40pm Syngenta			3		
				4	
1.40pm - 1.55pm Adama				5	
			6		
1.55pm - 2.10pm Bayer		7			
	8				

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BAYER

Nitrogen use efficiency: How does the SVS tool work?

Andrew Barber, Agrilink and Abie Horrocks, FAR

Nitrogen (N) optimisation is essential from a cost, plant yield and quality, and regulatory perspective. Factoring soil-supplied N into fertiliser decisions can reduce N inputs and lower costs while still achieving target yields.

Sustainable Vegetable Systems (SVS) is a decision-support tool. It improves understanding of N dynamics, improves fertiliser use efficiency, and reduces environmental impacts. The model that forms the basis of the SVS Tool has been built on scientific research trials conducted by BSI (formally Plant and Food Research), and grower monitoring and experience across New Zealand. While the tool uses modelling to project N flows, growers can replace modelled values with actual in-season soil mineral N test results, improving the accuracy of guidance.

SVS is both a planning tool and in-season tracking and decision support tool. While planning is based on an average season, no one is growing in an average season. That is when the soil N tracking component comes into its own. Changes can be made to reflect the season as it progresses.

A FAR, NZVeg and Potatoes NZ SVS demonstration trial has been established at Chertsey. Crop performance will be compared under different N management approaches. "Typical" grower practice will be compared to a programme planned and then tuned in season using the SVS decision support tool. Four crops are included in the demonstration: wheat, maize, potatoes, and broccoli (Figure 1). Treatments compare N rates guided using the SVS Tool with a typical grower N programme. Soil mineral N measurements will feed into the SVS Tool during the season. Monthly soil mineral N measurements will also be taken from a fallow area to quantify net N release from soil mineralisation throughout the growing season. The trial will continue through to harvest, when crop yields and N use efficiency will be assessed.

Extending SVS

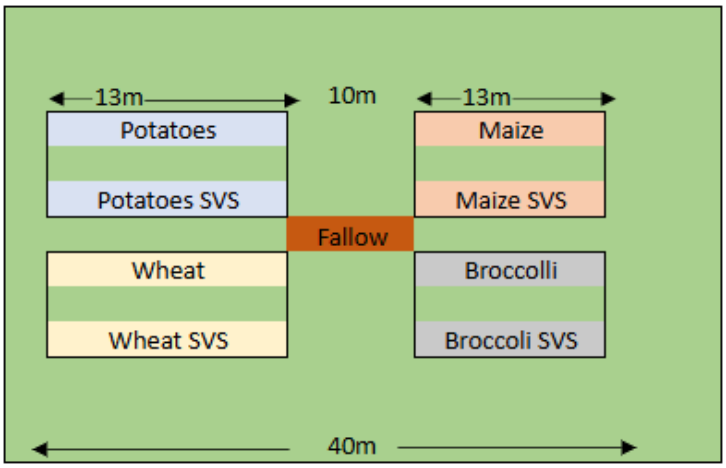


Figure 1. SVS decision-support tool demonstration trial lay out, Chertsey.

A current SVS extension project, supported by MPI's Catchment fund, has enabled Andrew Barber to discuss:

- How the SVS Tool improves understanding of the multiple sources of nitrogen available to crops, not just fertiliser N.
- How the SVS Tool helps growers account for the N already present in the soil, as well as the N likely to become available through soil mineralisation and crop residue breakdown.
- How improved understanding of the N cycle can help optimise fertiliser use, maintain crop performance, and deliver positive environmental outcomes.

Station 1: 10.30am & 2.15pm

Sustainable vegetable systems

Optimisation: Plan, Monitor, Adjust

Chertsey: Potatoes, 2026/27 season

A side-by-side demonstration comparing a typical nitrogen management practice for a potato crop to one planned and guided by the SVS Tool.



Why run this trial?

- Demonstrate and therefore build confidence in the SVS Tool
- Refine the SVS Tool based on user feedback
- Track soil mineralisation, its contribution and timing
- Improve soil mineralisation knowledge and how to factor this into N fertiliser decision making

Trial snapshot

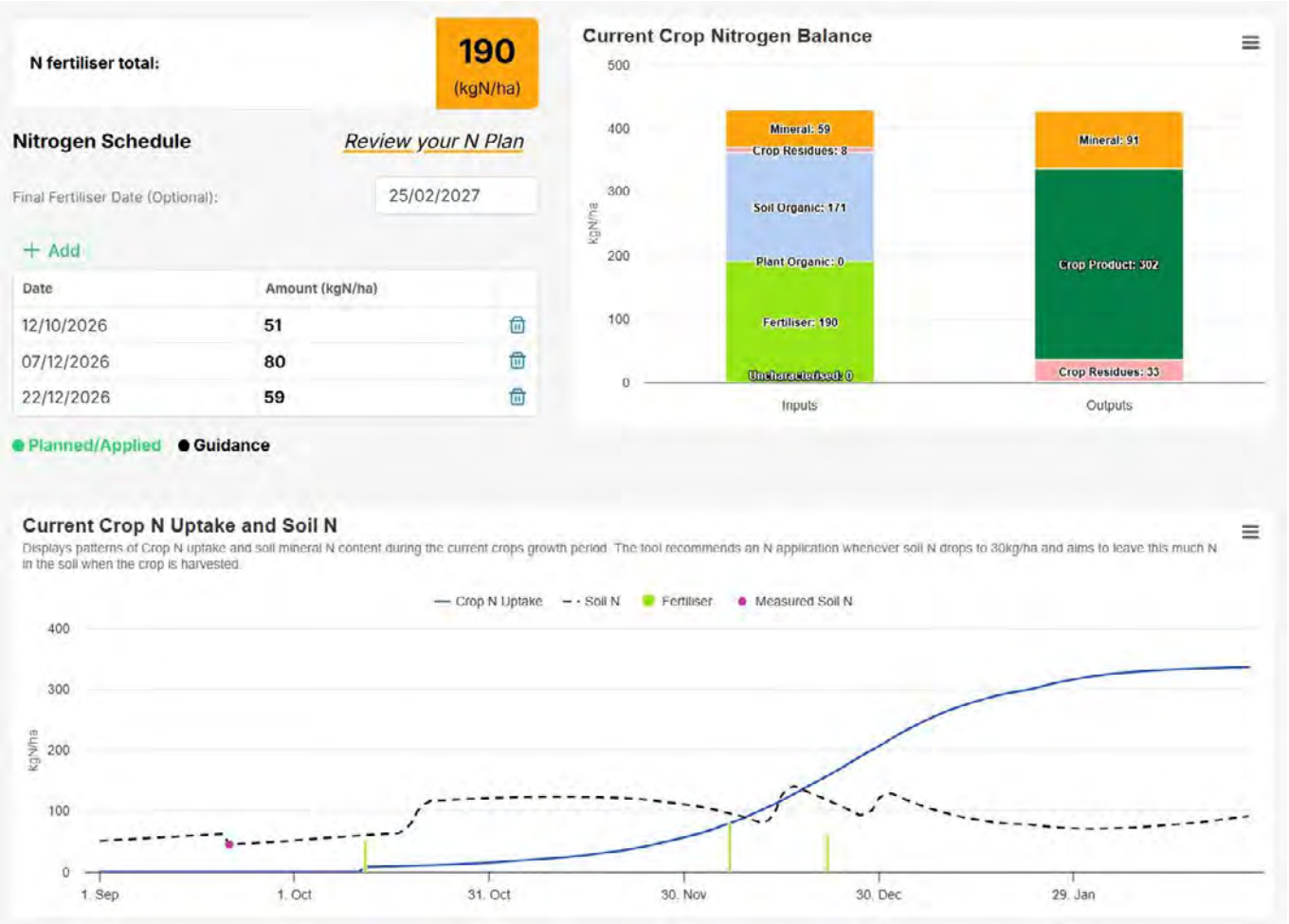
Site	FAR Chertsey Arable Research Site
Crop	Potato - Agria
Soil	Sedimentary silt loam
Potentially Mineralisable Nitrogen (PMN)	85 mg N/kg Full irrigation = 170 kg N/ha during crop growth (No irrigation = 100 kg N/ha) Planting
Planting	12/10/2026
Crop finish	25/2/2027 (136 days)
Target yield	80 t/ha

N fertiliser programme

Grower Plan		SVS Guidance		SVS Plan	
Date	**Rate (kg N/ha)**	**Date**	**Rate (kg N/ha)**	**Date**	**Rate (kg N/ha)**
7/10/26	53	12/10	51	7/10	53
20/11/26	68	7/12	80	20/11	78
4/12/26	68	22/12	59	4/12	59
	189		190		190

The process was to enter the grower's typical programme. A copy was made and the grower planned fert was deleted and replaced by SVS Guidance. Reassuringly the total quantity is effectively identical. The SVS Guidance for the 2 side dressings was 2 to 3 weeks later than the growers timing. The SVS Plan used a combination of the grower's knowledge and SVS guidance to develop its plan.

Station 1: 10.30am & 2.15pm



Commentary

A soil mineral N test prior to planting overrode the default mineral N levels.

Due to the high PMN result (85 mg N/kg), it is anticipated that 170 kg N/ha will be mineralised and become available to the crop. Note approximately 20 kg N/ha occurs after most of the crop growth has occurred, so effectively 150 kg N/ha can be considered in setting the budget.

The 80 t/ha crop is taking off 300 kg N with a further 30 kg N left behind in the crop residue.

Generally, you are targeting finishing with 30 to 50 kg N/ha of mineral N (orange segment on outputs graph above). Towards the end of the crop soil mineral is 70 kg N and then through soil mineralisation, when there is little crop uptake, rises to 90 kg N. It may be possible to pull the final fertiliser application back.

The plots will now be monitored for mineral N prior to the side applications. The results will be entered into the SVS Tool and adjustments made based on the soil mineral N's deviation from the plan.

Contact: Andrew Barber andrew@agrilink.co.nz

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Integrated pest management: Putting the pieces together with A Lighter Touch

A LIGHTER TOUCH

Jo Drummond, FAR and Daniel Sutton, New Zealand Vegetables

Key points

- Good decisions start with good monitoring – understanding risk is more valuable than reacting to every aphid.
- Farming systems are connected – pests, beneficial insects, weather, crops and the wider landscape all influence outcomes.
- Collaboration helps us understand how generalist predators can help suppress multiple pests across arable and vegetable crops.
- No two seasons are the same – aphid and virus risk varies from year to year, so management decisions need to adapt to seasonal conditions.
- IPM is about knowing more, not doing less – better monitoring and understanding lead to more confident, targeted and resilient pest management decisions.

As *A Lighter Touch* comes to an end, one thing has become clear: good decisions come from good information and there's no substitute for monitoring. Over the past few years, we've learned that effective pest management isn't about reacting to every pest we see. It's about understanding risk, monitoring what's happening in our crops, and having the confidence to act when action is genuinely needed.

We've also learned that farming systems are connected (Figure 1). Pests don't exist in isolation. Beneficial insects, weather, management practices and the wider landscape all influence pest populations and the decisions we make. For example, cereal aphids have a range of alternative hosts, such as maize, cover crops (especially oats) and grasslands, which can act as sources of virus. We can't manage aphids everywhere, but we can manage how we respond to them.

Collaboration with ALT partner New Zealand Vegetables highlighted the value of taking a broader, systems-based view of IPM. Monitoring spring barley and brassica crops at Pukekohe, where pest pressure is often high, demonstrated how generalist predators such as lacewing and hoverfly larvae can help suppress multiple pest species across arable and vegetable systems. Rather than targeting a single pest in a single crop, these beneficial species provide a wider ecological service, helping build resilience and supporting IPM approaches that work across diverse farming landscapes.

A Lighter Touch was also the driving force behind Aphid Chat, a decision-support tool designed to help growers understand risk. Using data from a network of regional monitor paddocks and a supporting development and reproduction model, Aphid Chat combines information on winged aphids, beneficial species, temperature and crop growth stage to provide a picture of seasonal risk. The aim is not to make decisions for growers, but to encourage closer monitoring and support informed management choices.

Conditions that drive aphid activity and virus spread vary considerably between seasons, meaning risk is rarely consistent (Figures 2-3). Therefore, IPM approaches will look different from year to year. Our work has reinforced the importance of monitoring and understanding seasonal conditions rather than relying on calendar-based decisions alone. However, no model is perfect and many of us were challenged by low numbers of winged aphids captured on traps during the 2025-26 season.

Aphid Chat was never intended to be a binary "spray or not spray" tool. Its job is to identify risk, not eliminate it. Looking beyond trapping data, Aphid Chat's development model identified periods in mid-September

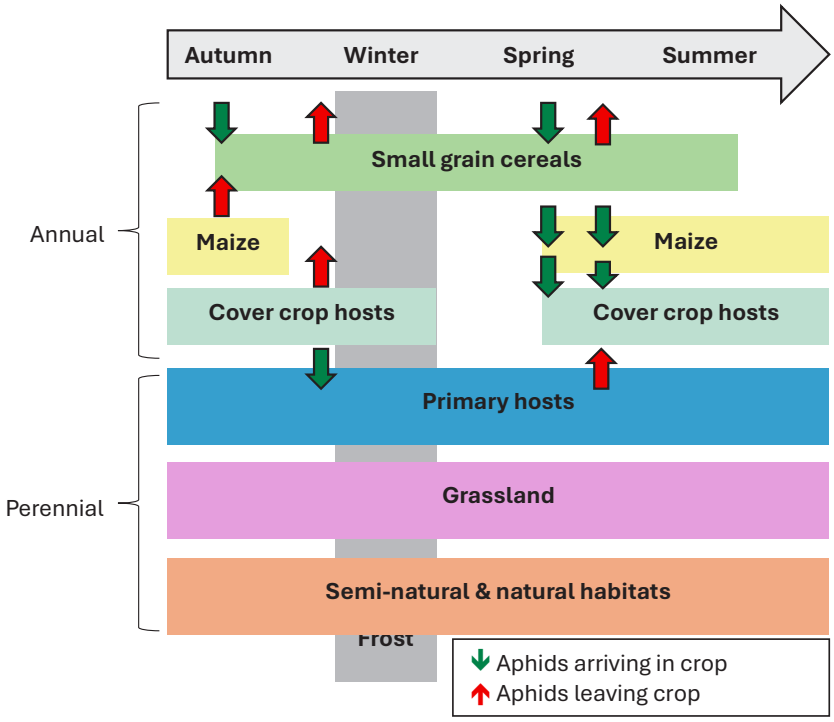


Figure 1. Overview of the hosts of cereal aphids throughout the year. At different times cereal aphids migrate from one host to another. The green arrows show when aphids enter and leave a host crop. Adapted from Van den Eynde et al. 2020.

and early-October that were the highest in 25 years. These coincided with many crops reaching growth stage (GS) 31, marking the end of the high-risk period for virus infection (Figure 4). The lesson is that understanding risk requires more than a single measure. Aphid Chat wasn't inherently wrong; rather it reinforced the importance of looking at the full picture when assessing seasonal risk. While seasons like 2025-26 are memorable, they are often less frequent than we think.

It has been encouraging to learn of growers engaging with Aphid Chat and considering integrated approaches. Some growers have adopted more selective chemistries in place of broad-spectrum insecticides, while others are paying more attention to the weather during high-risk periods – such as wearing shorts in late-August. In many cases, the most valuable outcome has been the conversations and observations that monitoring has prompted.

Perhaps the biggest lesson is that IPM doesn't mean doing less or doing nothing. It means knowing more. More monitoring. More understanding. More confidence in our decisions. The future of pest management isn't about eliminating every pest. It's about understanding risk, learning from experience and making better decisions that support productive, profitable and resilient farming systems.

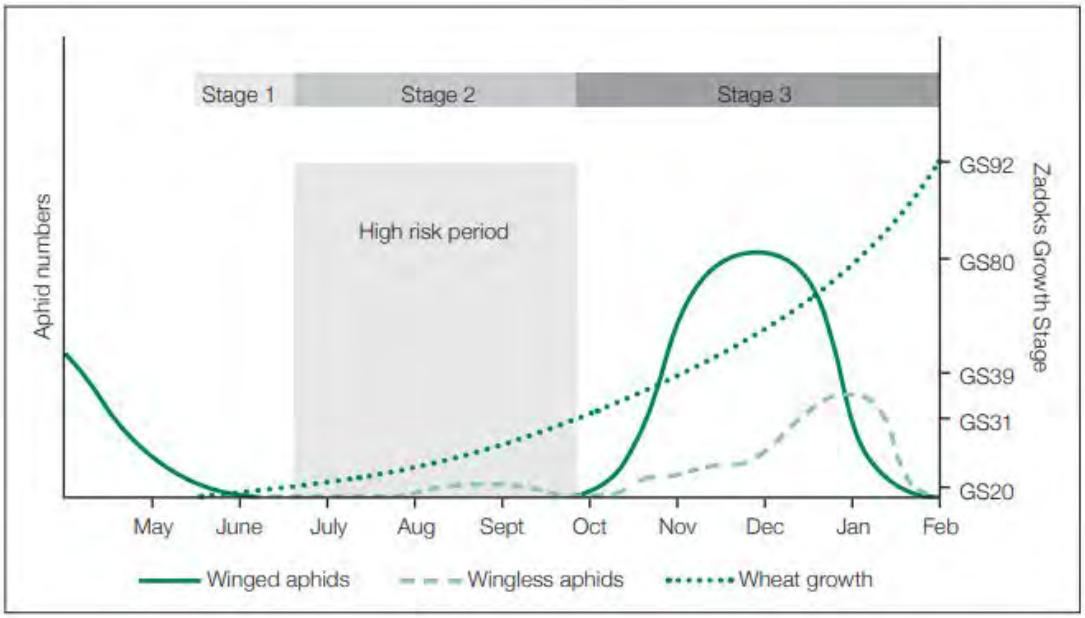


Figure 2. Example of low aphid pressure (winged and wingless) in autumn-sown wheat (FAR 2015).

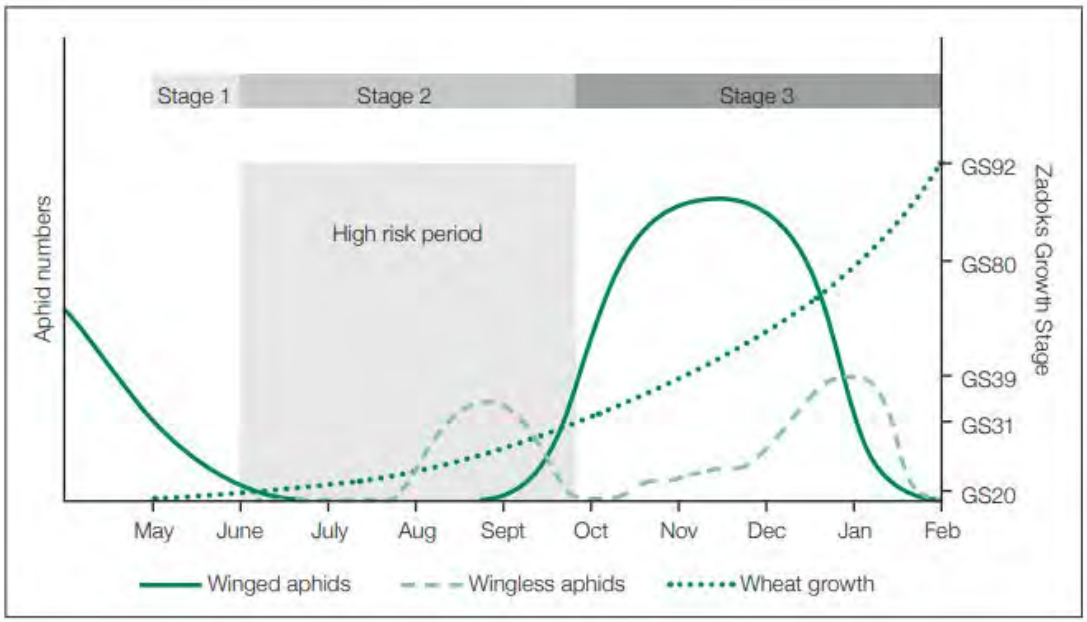


Figure 3. Example of high aphid pressure (winged and wingless) in autumn-sown wheat (FAR 2015).

Station 2: 11.00am & 2.45pm

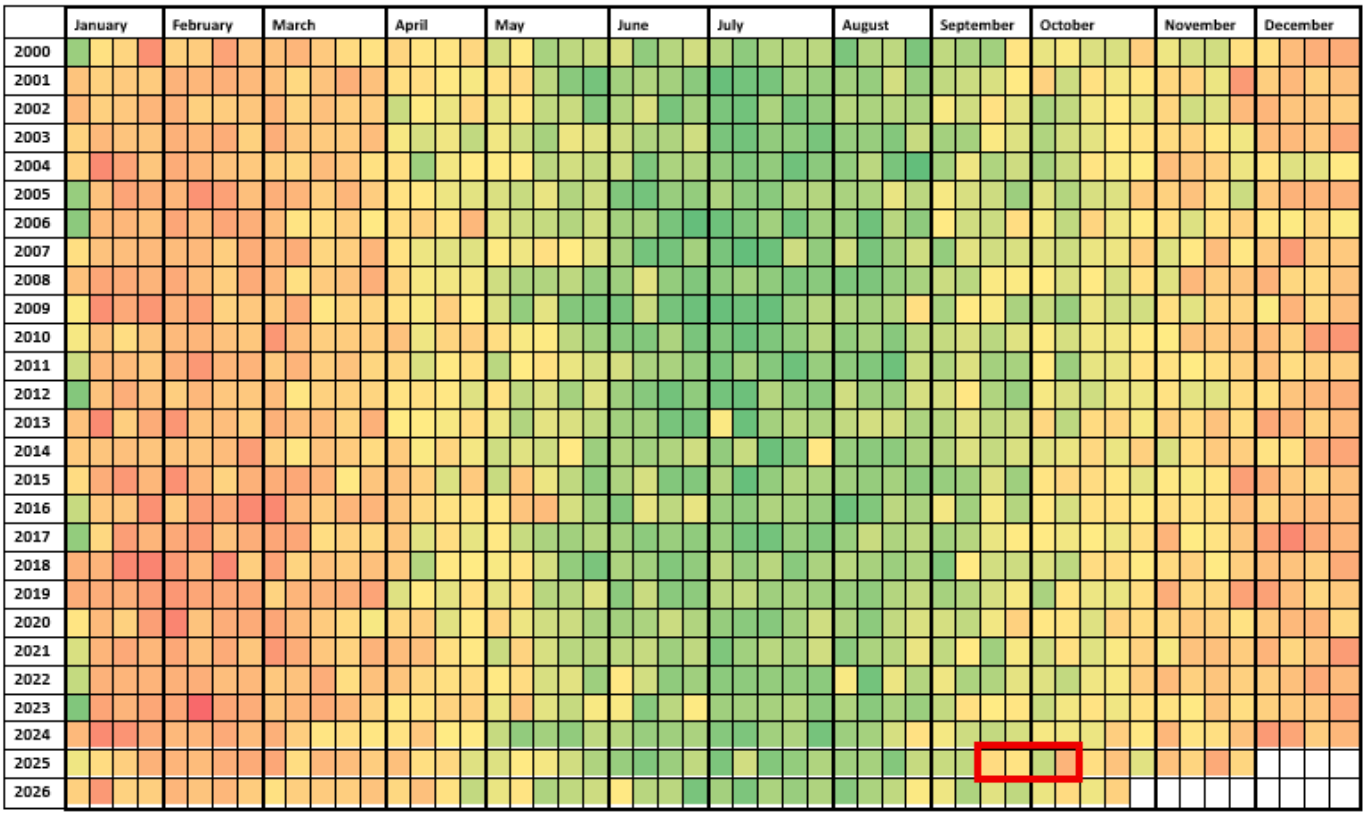


Figure 4. Degree weeks above 5.8°C (the minimum threshold for aphid development and reproduction) for Lincoln, Canterbury from 2000 – 2026. Green = low risk; red – high risk.

References

FAR (2015). Integrated Pest Management. FAR Focus Issue 12 https://www.far.org.nz/resources/far-focus-12-integrated-pest-management

Gilabert A, Gauffre, B, Parisey N, Le Gallie, J-F, L'homme P, Bretagnolle V (2017). Influence of the surrounding landscape on the colonisation rate of cereal aphids and phytovirus transmission in autumn. Journal of Pest Science 90 (2). DOI: 10.1007/s10340-016-0790-3

Van den Eynde, R, Van Leeuwen, T and Haesaert, G (2020). Identifying drivers of spatio-temporal dynamics in barley yellow dwarf virus epidemiology as a critical factor in disease control. Pest Management Science 76: 2548-255. DOI: 10.1002/ps.5851

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While TOWER® is well proven across Europe and the UK, getting it ready for New Zealand conditions has required extensive local trial work. ADAMA began its first local trials in 2017, starting a programme focused on confirming performance, crop safety, and fit within local farming systems.

Since then, trials using TOWER confirm its performance under New Zealand conditions, setting practical use guidelines such as withholding periods and plant-back intervals.

A collaboration with PGG Wrightson's Technical Team built a strong understanding of how TOWER adds value in local systems.

In autumn 2025, PGG Wrightson Technical Specialist in Agronomy, Chris Lowe, facilitated a replicated trial and commercial demonstration on Glen Currie's farm near Methven, to test the product under real farm conditions.

"The stacked mode-of-action approach gives growers another tool for tackling key weeds," says Chris.

"It helps reduce reliance on Group 2 and Group 4 herbicides for species like fathen, chickweed and ryegrass."

Chris says resistance is no longer a future issue.

"We have not seen major issues around Methven yet, but resistant weeds have been found nearby in Mayfield, only 34 kilometres away. It is not a question of if, but when. Southland, Canterbury, and other parts of the country are already dealing with it."

Methven grower Glen Currie says early results are encouraging.

"After seeing how it performed in a commercial trial in autumn 2024, and talking through resistance management with Chris, we have decided to use TOWER on a larger area this autumn," says Glen.

"It is about staying ahead of resistance and strengthening the programme."

Combining three proven actives, chlorotoluron (Group 5), pendimethalin (Group 3) and diflufenican (Group 12), for broad spectrum of control on key broadleaf weeds and some grasses in autumn and spring-sown wheat and barley.

Alan Steel, Canterbury Commercial Manager for ADAMA NZ, says the product brings something genuinely new to cereal weed control.

"This is the first time chlorotoluron is available to New Zealand growers," says Alan.

"It also brings pendimethalin into cereals, which some growers will already be familiar with from other crops."

TOWER works through the roots and shoots of germinating weeds, giving residual control during early crop establishment when weeds do the most damage to yield.

Alan says controlling polygonum weeds, which have typically been a weak spot in pre-emergence programmes, is a real stand out.

Flexibility is another advantage.

"Applying a pre-emergent herbicide controls weeds from the start, supporting strong crop establishment" he says.

It also helps ease pressure later in the season.

"A pre-emergent herbicide moves that job earlier, spreading the workload. Starting clean gives growers more flexibility with timing and helps make sure later-season applications are not compromised."

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UK Recommended Lists: Supporting better variety decisions

Adam Christie, Scottish Agronomy and Jacqueline Straathof, FAR

Key points

- Yield is one of many factors that influence the success of a variety.
- Variety selection should balance yield, profitability, input costs, risk, market opportunities and operational practicality.
- Disease resistance is becoming increasingly important due to fungicide resistance, changing pathotypes, reduced chemical options, regulatory pressure and rising input costs.
- Regional testing is important.
- There may be too many varieties on the list, diluting the key message of what each variety is intended to offer.
- Current disease resistance thresholds may be too low, allowing too many varieties with inadequate resistance to progress through the system.
- Timely publication of trial results allows growers to benchmark performance and make more informed variety decisions.

Background

The Recommended List plays an important role in helping growers compare available varieties and make informed decisions. Developed through extensive independent testing, it provides information on the performance of new and existing varieties and helps determine whether they offer sufficient benefit to justify their place in commercial production.

Although yield is an important factor in variety selection, it is only one of many factors that influence the success of a variety. Recommended List evaluation considers a wide range of characteristics, including quality, marketability, disease resistance, standing power, maturity, resistance to shedding, resistance to sprouting, and ease of harvest.

The information provided helps growers balance yield, profitability, input costs, risk, market opportunities and operational practicality.

Marketability and regional suitability

Market requirements also remain an important consideration. In some cases, market acceptance can be just as important as agronomic performance. To be able to sell the crop, it will need to consistently achieve quality.

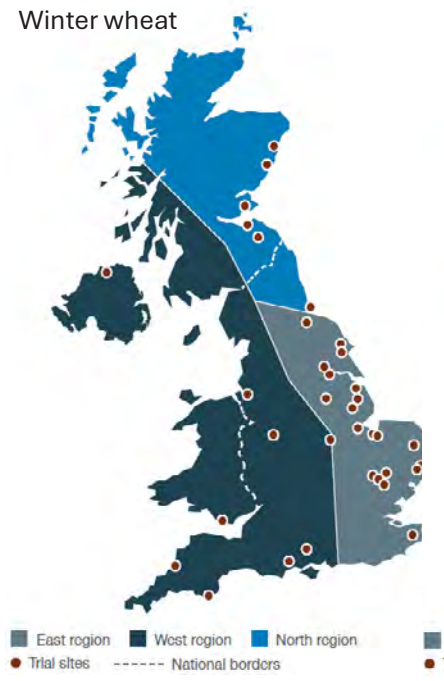


Figure 1. Regions used for calculation of winter wheat regional yields and the locations of harvest 2025 RL winter wheat fungicide-treated trials.

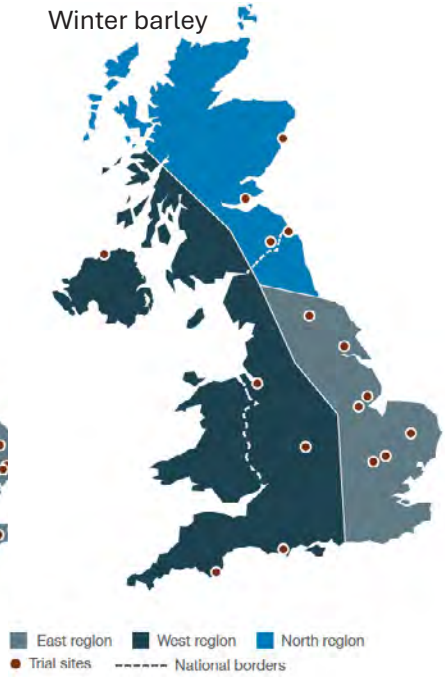


Figure 2. Regions used for calculation of winter barley regional yields and the locations of harvest 2025 RL winter barley fungicide-treated trials.



Figure 3. Regions used for calculation of spring barley regional yields and the locations of harvest 2025 RL spring barley fungicide-treated trials.

Markets are also subject to change. For example, changing drinking habits, both locally and globally, are influencing market opportunities for malting and distilling barley.

Regional suitability is another important factor, with variety performance differing across growing environments, climates, soil types, disease pressures and production systems. Trial sites are therefore distributed across regions to assess performance under a range of conditions. Disease resistance remains a key component of variety evaluation, with concerns including fungicide resistance, reduced chemical options, regulatory pressure and rising input costs.

Resistance ratings can change when new pathogen strains emerge. Recent experiences with yellow rust in the United Kingdom, with the breakdown of YR15, highlighted how quickly disease challenges can develop.

This demonstrates the importance of untreated trials, as they provide information on the underlying disease resistance of varieties by allowing performance to be assessed in the absence of crop protection treatments. Comparing treated and untreated plots helps identify varietal strengths and weaknesses and contributes to disease resistance ratings. It also shows what could happen under extreme conditions.



Figure 4. Untreated plots help identify varietal strengths and weaknesses in resistance.

Standing power and height are other key factors, although issues can be seasonal. But no one wants to see their crop fallen over.

In contrast to yield being a key driver, earliness to harvest is also important. Selecting an early crop can make the difference between being able to harvest and not being able to harvest in some years. This could become even more important if glyphosate is lost.

Furthermore, the crop needs to stay intact, making tolerance to shedding and sprouting another important consideration. For some crops, such as oats and oilseed rape, harvestability is a major factor.

Some of these factors are very difficult to quantify, and localised trials and set protocols will help us do this.

Timely publication and information gaps

The value of the information generated through these trials depends not only on what is collected, but also on how quickly it reaches growers. Early publication allows growers to compare their own crop performance with independent trial data while harvest is still underway, providing the opportunity to use the data for variety selection in the coming season. The information enables growers to benchmark their production, assess how their chosen varieties are performing against alternatives, and begin making decisions for the following season. The value of timely information was highlighted as an often-underestimated benefit of the system.

However, some quality testing programmes providing information on the suitability of a variety for the market will not be completed before early publication. For example, in spring barley, approval for malting can play a major role in variety uptake. However, the malting approval list is published after the Recommended List. This can create uncertainty, as varieties that fail to achieve acceptance face limited market opportunities, while even varieties that meet formal testing requirements may still encounter issues if end users identify processing concerns.

Traits such as sprouting tolerance and shedding resistance can have a significant impact on crop performance, yet verified information is not always available.

Station 3: 11.30am & 3.15pm

Challenges within the current system

The number of varieties within the system is substantial. In winter wheat, 60 varieties were entered into trials, while 35 varieties appeared on the Recommended List. This is too many and can create a dilution effect where the key message of what each variety is intended to offer gets lost.

Current minimum disease standards are too low, leaving too many varieties without good disease resistance. Examples include increasing disease thresholds for barley, yellow rust and septoria in wheat, and light leaf spot in oilseed rape.

Another challenge is the balance between yield and maturity. Earliness to harvest remains an important trait, particularly for northern growers, raising questions about the place of relatively late-maturing varieties within the recommendation process.

Changes would come with major investments, which raises the question: Do we go for less varieties and more sites, or for more varieties and less sites?

Despite these challenges, caution was urged when considering major changes to the system. Any alternative approach would need to demonstrate clear advantages over the existing framework.

Contact: Jacqueline.Straathof@far.org.nz or a.christie@scottishagronomy.co.uk

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Station 4: 12.00pm & 3.45pm

Not all flowers are equal: Which ones drive white clover seed yield?

Fiona Anderson, FAR

Key points

- Flower numbers drive seed yield, making stolon development and crop management important for seed production, alongside weather conditions.
- Only a portion of total flowers contribute to harvested yield, with early flowers prone to seed loss and late flowers often too immature at harvest.
- Harvest timing can be a difficult decision, with this project investigating whether targeting specific flower generations can improve seed capture.
- Flexible harvest timing may reduce weather-related losses, particularly during wet harvest seasons when sprouting risk is high.
- The trial will explore the trade-offs between yield, seed quality, harvestability and farm logistics when altering harvest timing.

Background

The aim of this season's trial at Chertsey is to further our understanding of flowering in white clover and test any possible flexibility in time of harvest (and find the pro/cons in doing so).

- **Who:** a large leaf cultivar 'Legacy' (PGG Wrightson Seeds) and a medium leaf cultivar 'Demand' (Cropmark Seeds), sown on 13 March 2026.
- **What:** measuring how stolons grow into the inter-row space and produce flowers, according to thermal time/growing degree days. A one-off topping treatment was included on 8 October.
- **When:** when will each generation of flowers reach maturity, and what do they bring to the table? (seeds/flower head, thousand seed weight etc.). When the target population is mature, a plot combine harvest will be completed, alongside quadrat harvests for further detail.
- **Why:** understand what proportion of the total flowers produced will be ready, when, and investigate if flexible harvest timing can capture more yield during difficult harvest seasons compared with a business-as-usual approach.

White clover flowering and seed production

Seed yield is mainly determined by flowers/m^2, the number of florets per flower, the number of seeds per floret, and how well those seeds are filled (TSW).

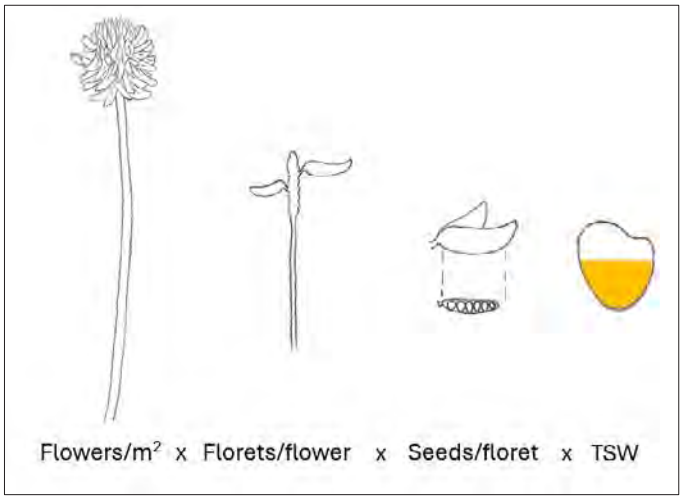


Figure 1. The seed yield components of a white clover seed crop.

In order to maximise flowers/m^2, we need sufficient plants/m^2 with numerous stolons that are well supported to grow outward and produce flowers. Branches produced early enough in the season can also contribute to the flower population.

e.g. with 42 plants/m^2, each bearing 8 reproductive stolons, with 3 flowers on the main stolon and 50% of stolons with 1 flower on a branch, this comes to 1176 flowers/m^2 (42 x 8 x 3.5 = 1176). If 1 flower/m^2 = 1 kg seed/ha, this means a yield of 1180 kg/ha could be possible, in an ideal world. However, there could only be an average of 2-3 reproductive stolons per plant, which would bring the potential yield down to ~750 kg/ha.

Station 4: 12.00pm & 3.45pm

Flowers are induced in growing points (tips of stolons and branches) during cool temperatures (0-10°C) and long daylength (>12 hr). For these flowers to emerge, the reproductive node and supporting leaf must be produced first. This process follows a relationship with thermal time, which is useful for predicting development.

e.g. a flower initiated on 15 October might take ~5 weeks to appear as a flower bud (~480°Cd), then ~5-6 weeks to reach physiological maturity (660°Cd).

Flower population during the season follows a bell-shaped curve. The majority of September-October induced flowers contribute to peak flowering in December. Desiccation timing for harvest should intend to capture the maximum number of mature flower heads with ripe seed. Optimum desiccation timing is approximately 750°Cd or 7 weeks after peak flowering.

During a favourable season, desiccating for harvest at the end of January captures the peak flowering population. Flowers that were produced earlier in the season have around 50% chance of contributing to seed yield, but are often too old and brittle, leaving their seed behind. Flowers produced >2 weeks after peak flowering are unlikely to be mature enough to contribute to seed yield when the crop is desiccated.

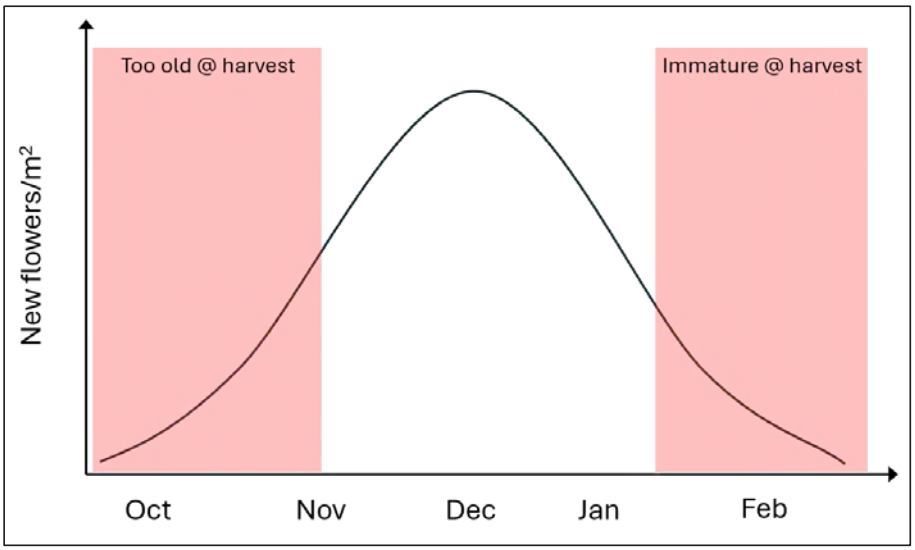


Figure 2. An indication of the number of new flowers being produced per m² by white clover seed crops, and what portion of those populations are generally excluded from capture during harvest due to flowers being geriatric or immature at harvest time.

The concept for this season's trial at Chertsey is to target specific generations of flowers when they are mature. This will give unusual harvest timings, but should give insight into how much each portion of the curve is contributing to seed yield. The first harvest (H1) will target the 1st and 2nd generation flowers (ripe by Christmas). H2 will target 3rd generation flowers (ripe mid-end January). H3 will target the "peak flowering" flowers (ripe early-mid February), with the business-as-usual approach generally relying on 2nd and 3rd generation flowers being included in harvest anyway.

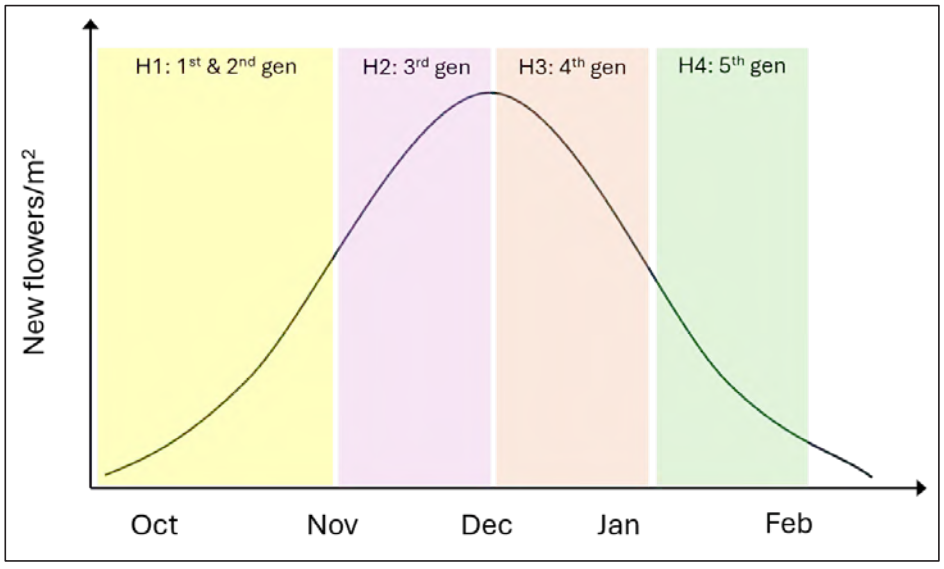


Figure 3. An indication of the number of new flowers being produced per m² by white clover seed crops, and what portion of those populations the proposed harvest timings (H1-H4) will seek to capture, according to generations of flowers.

Station 4: 12.00pm & 3.45pm

The principle behind this is if a total of ~1110 kg seed/ha is possible in a perfect season, then the business-as-usual harvest timing should collect this amount. If a prolonged period of rain is predicted, harvest could be brought forward to capture H1 and/or H2, which would otherwise have been lost to sprouting. If the rain is weathered and harvest is delayed, possibly only H3 or H4 may be contributing to harvest. Waiting for the later generations to come through, rather than prioritising the early generations of flowers, puts the peak flowering population at risk of loss to sprouting during this time. This project aims to quantify the seed yield of each generation, and determine what flowers might be captured during harvest, depending on the scenario.

Some considerations with changing the harvest window:

- Will the germination and quality of seed be affected according to harvest timing?
- Will harvestability be compromised with early timing? The crop won't have naturally "gone off", crop bulk may respond differently to desiccation herbicides.
- Will high numbers of immature flowers interfere with combine activity?
- Will flexibility in white clover harvest timing interfere with optimum harvest timing of other crops in the rotation?

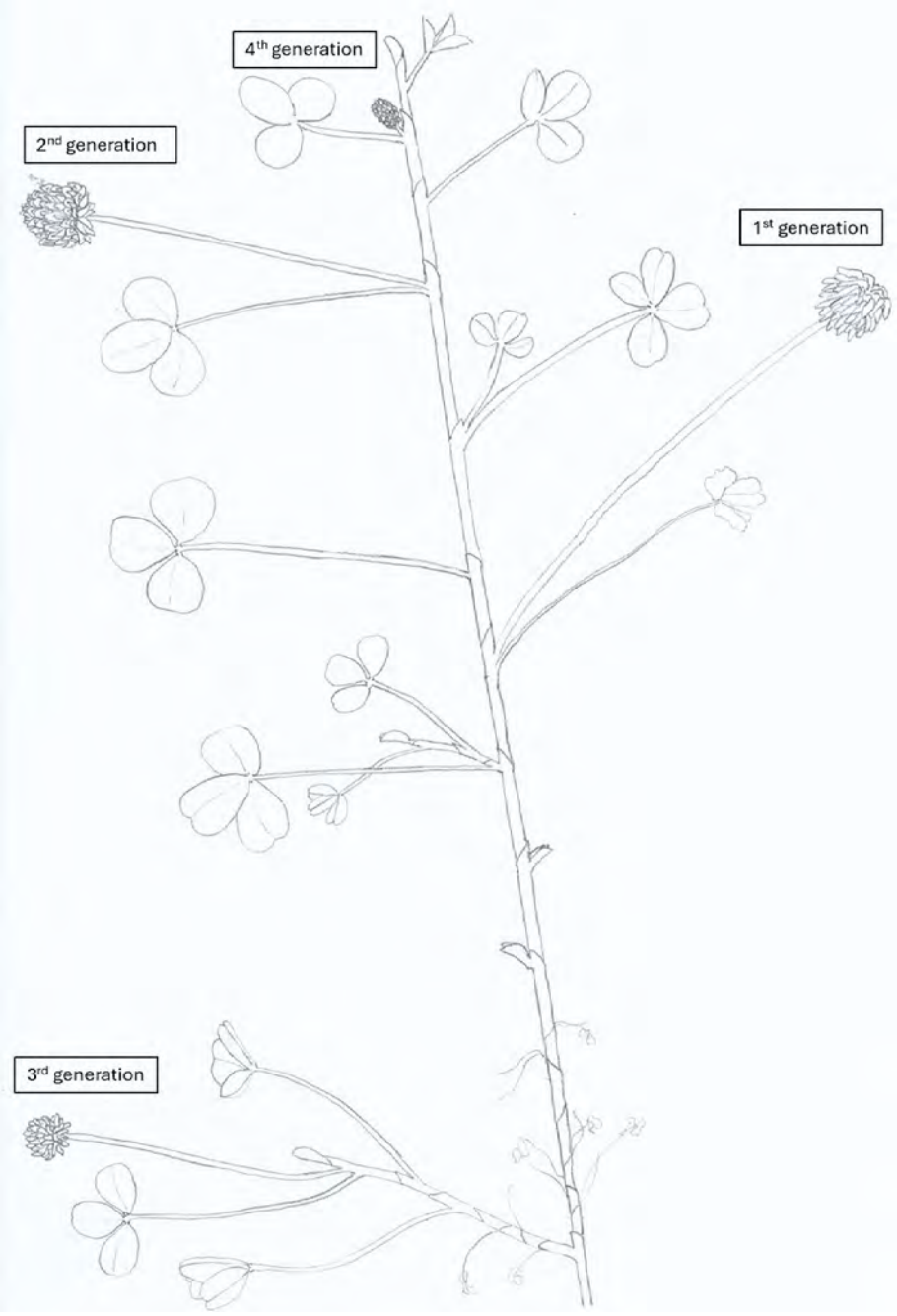


Figure 4. A stolon with each flower generation that would possibly be present in December-January.

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Minor use trials: A pathway for registration of crop protection products?

A LIGHTER TOUCH

Bruno Gatimel, A Lighter Touch and Andrew Pitman, FAR

Key points

- Crop protection tools for minor crops are becoming more limited, increasing the importance of identifying and validating alternative products.
- FAR is working with ALT 's Minor Use programme to generating independent New Zealand data to support future product registrations and label extensions for growers.
- Canterbury pea trials identified several fungicide options that provided equal or better control of Ascochyta than current industry-standard treatments.
- Biological fungicides show promise but generally need to be applied preventatively and managed differently from conventional chemistry to achieve reliable results.
- Collaboration between growers, researchers, industry groups and crop protection companies is critical to maintaining and expanding future crop protection.
- Continued investment in Minor Use research helps ensure growers retain access to effective disease management solution as regulatory and market pressures change.

New Zealand growers are facing a progressively narrower range of crop-protection tools. Resistance to established products, changes in product availability and limited commercial incentives to register new uses all contribute to the challenge. For many arable and vegetable crops, the cost of generating efficacy and regulatory evidence can be difficult to justify against a relatively small market. In processed vegetables, off-label applications may also be unacceptable under processor specifications or market requirements. The result is a growing need for effective, appropriately authorised alternatives.

Minor Use trials offer a practical pathway to address these gaps. Rather than simply screening products, they investigate how innovative tools perform in local cropping systems, whether they are safe to crops and how they might fit into realistic and sustainable spray programmes. This evidence also helps sectors and registrants decide which products warrant further investment.

Connecting industry priorities with promising products

A Lighter Touch (ALT) brings together the Foundation for Arable Research (FAR), Process Vegetables New Zealand, trial providers and registrants to address crop-protection priorities identified by industry. Sectors first identify significant pest, disease and weed problems; ALT then consults crop-protection companies to match potential solutions with those needs, while considering product availability and regulatory feasibility.

Candidates can include new synthetic chemistry, novel modes of action, biological and microbial products, and products already registered in New Zealand for other crops or uses. Replicated trials are designed to produce reliable data on efficacy, crop safety, application timings and programme positioning. Where needed, additional residue work can support the development of a comprehensive data package for EPA and ACVM, our NZ regulators. As a result, the programme connects immediate grower concerns with longer-term opportunities for a broader toolbox.

Ascochyta in peas: Canterbury evidence

Ascochyta blight (Figure 1) is a useful example of why coordinated Minor Use research matters. Both process pea and pea seed production have limited options for disease management, while processors may restrict off-label applications. Collaborative ALT/FAR/Process Vegetables NZ trials in Canterbury have been evaluating potential alternatives and generating evidence to inform both practical disease management and possible future registration and label claims.

In a Timaru feed-pea trial, mean infected leaf area in the middle canopy was 15.0% with Tri-Base Blue®, compared with 29.4% for the untreated control and 20.6% for the industry-standard Amistar® (Figure 2). Other copper-based and softer-chemistry candidates recorded infection levels between 18.1% and 20.0% at this assessment. Six biofungicide treatments ranged from 22.5% to 28.8%. These results highlighted promising alternatives to Amistar® for Ascochyta blight control. While copper-based treatments showed statistically significant differences from the industry standard, biological treatments showed encouraging trends despite no significant differences. Further trials are needed to confirm their efficacy, application timings and consistency under varying disease pressures.



Figure 1. Ascochyta infection in feed peas.

Station 5: 12.00pm & 3.45pm

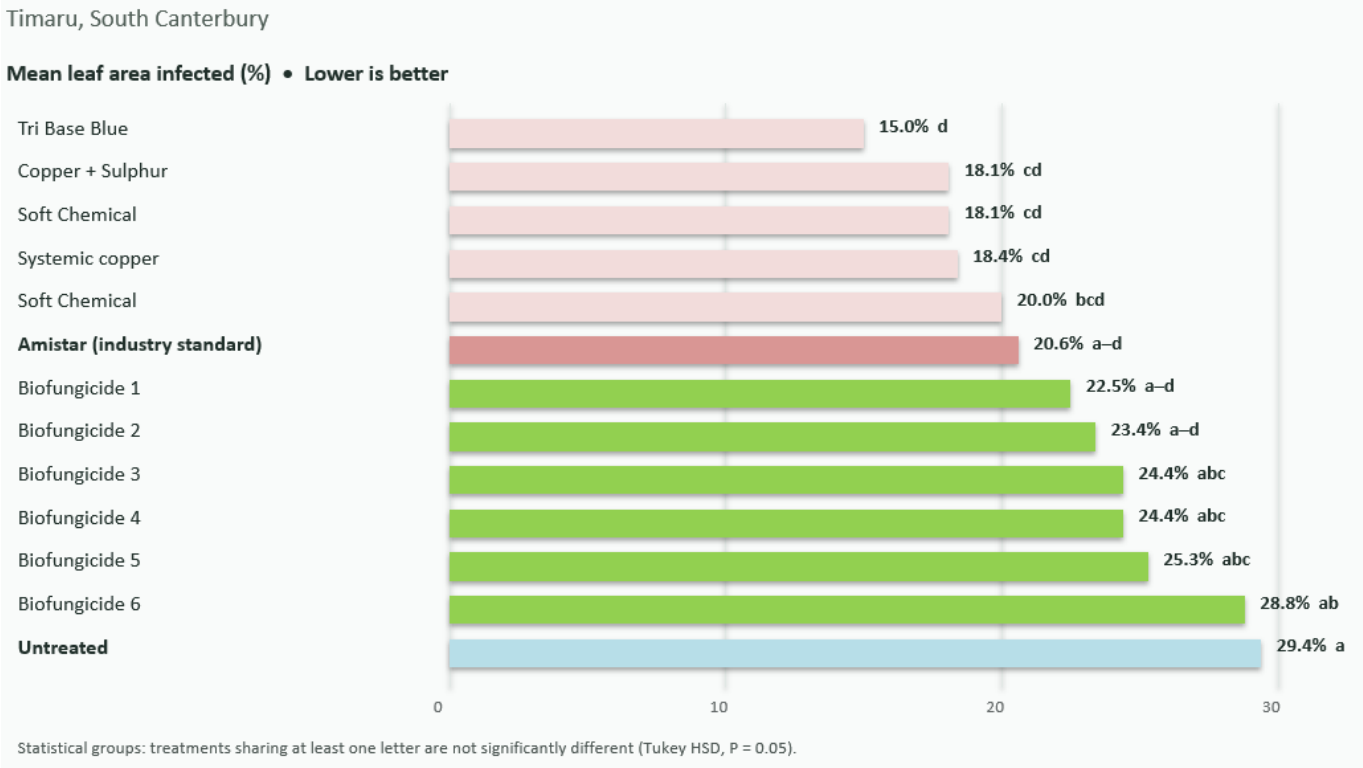


Figure 2. Ascochyta severity in irrigated feed peas treated with different biological and soft chemical fungicides.

In 2026-27, the trials on Ascochyta blight will continue to produce data on the efficacy of biological and soft chemical fungicides to support New Zealand registration or label extension of promising products. Table 1 reflects the different registration status of products in the trials.

Table 1. Registration status of products being assessed in Ascochyta blight minor crop trials in 2026-27.

TREATMENT CODE	PRODUCT NAME	REGISTERED IN NZ	REGISTERED ON PEAS	REGISTERED ON ASCOCHYTA
ALTFAR1-1	TRI-BASE BLUE	YES	YES	YES
ALTFAR1-2	Soft Chemical	YES	NO	NO
ALTFAR1-3	Copper + Sulphur	YES	NO	NO
ALTFAR1-4	Soft Chemical	YES	NO	NO
ALTFAR1-5	Biofungicide 1	NO	YES	YES
ALTFAR1-6	Biofungicide 2	YES	YES	YES
ALTFAR1-7	Biofungicide 3	YES	YES	YES
ALTFAR1-8	Biofungicide 4	YES	NO	NO
ALTFAR1-9	Biofungicide 5	NO	NO	NO
ALTFAR1-10	Biofungicide 6	NO	NO	NO
ALTFAR1-11	Biofungicide 7	YES	YES	NO
IS	AMISTAR	YES	YES	YES
UN	UNTREATED			

Station 5: 12.00pm & 3.45pm

Using biologicals differently

A key lesson from Minor Use research is that biological products often require different approaches to their evaluation and practical use compared with agrichemicals. Many depend largely on preventative activity and may perform best when applied before infection becomes established. Application timing and intervals, weather and the prevailing disease pressures all influence outcomes. A conventional fungicide trial protocol may therefore fail to identify the most effective use pattern for a biological product.

The research question becomes not only "*Does it work?*" but "*How and when should it be used?*" Trials can examine preventative positioning, the intervals needed to maintain protection and ways of combining or sequencing treatments in an integrated crop-protection strategy.

For example, combining copper-based fungicides with microbial products may raise compatibility concerns and require separate applications to avoid reducing microbial viability and efficacy.

The research can also open opportunities beyond the original disease target. Products showing activity against Ascochyta blight may warrant evaluation against other pea diseases, including Sclerotinia. The potential of biological control agents, particularly some beneficial bacteria and fungi with multiple modes of action against a range of pathogens, supports these opportunities. However, further scientific evaluation is essential to confirm their efficacy against additional targets under relevant field conditions.

A pathway from research to registered access

In the short term, independent results give sectors better information about product performance, application strategies and potential integration with resistance-management and IPM programmes. Over time, robust datasets can support registrants' regulatory dossiers for new registrations or label extensions. Some products may fail to demonstrate sufficient efficacy, while others may require further work on use patterns, crop safety or residues before progressing towards registration. Identifying these limitations early reduces risk for growers, industry groups and suppliers.

The pathway is collaborative: growers and sectors identify the need; suppliers suggest solutions; trials generate New Zealand evidence; registrants prepare the regulatory dossier; regulators assess the proposed use; and growers may ultimately gain access to innovative registered crop-protection tools.

One example is the collaboration between ALT, Summerfruit NZ and BASF, which supported efficacy and residue trials in cherries, apricots and peaches to extend the label of Belanty® (Active ingredient: 75 g/L mefentrifluconazole) fungicide for brown rot control. The resulting data provided the evidence needed to pursue registration through MPI ACVM, illustrating how collaborative research can help address crop-protection gaps in minor crops.

As ALT approaches its end, maintaining an effective mechanism for collaboration among FAR, product groups and crop-protection companies will be important. Alternative approaches, including a third-party registration pathway, could also be explored, whereby crop sectors or independent entities coordinate, support and potentially submit registration applications on behalf of, or in agreement with, product owners. Such models could help overcome commercial barriers to registration, particularly for minor crops where the potential market may not justify investment by individual crop protection companies.

Ultimately, innovation alone does not deliver grower access. Credible scientific evidence, coordinated investment and appropriate regulatory pathways are essential to bridge that gap.

Acknowledgements

This FAR project (B25-00-00) was funded through the A Lighter Touch SFFF with co-funding from the Seed Industry Research Centre (SIRC). FAR acknowledges collaborators Process Vegetables and Nigel Rowe Lucas (Heinz-Watties) as well as trial host farmer Hamish Dunbar and trial operators Field Tek.

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Station 6: 11.30am & 3.15pm

Where are the weeds? Mapping and management

Owen Gibson and Chris Smith, FAR

Key points

- Use your maps to guide decisions in the paddock.
- Technology options range from phone apps through to camera-guided spray systems.
- New green-on-green weed detection tools are improving quickly.
- Good records matter more than complicated systems.
- Start with the technology you already have and build from there as confidence and capability grow.
- Track problem weed patches each season and monitor whether they are getting better, worse or spreading.

Why map your weeds?

Good weed control starts with knowing what weeds are in each paddock. A weed map doesn't need to be complicated. Just note which weed is present, its location, how big the patch is, and whether it's spreading or shrinking over time. Those records help you target control measures, identify areas that may need resistance testing, and make it easier to brief staff and contractors. In short: map it, monitor it, and act on it.

What technology is available?

Start with the tools you already have. A photo taken on your phone, saved with a location, can be enough to keep track of small or isolated weed patches. Many modern tractors, sprayers and harvesters also allow you to mark problem areas using their GPS systems to drop a pin location while you're in the paddock.

If you want to map larger areas, satellite imagery can provide regular whole-farm coverage, while drones offer much greater detail for identifying and monitoring weed patches. The trade-off is that higher-resolution imagery usually means more time spent collecting and processing data, which can take time.

Optical camera-based systems can detect weeds and apply herbicide (or other control methods) only where it's needed, helping reduce chemical use and improve targeting. However, not all systems create a detailed treatment map, so it's still important to check the results in the paddock.

The best option is usually the one you'll use consistently. Start simple, build good records, and add more technology only when it helps answer a management question or improve a decision.

Choosing the right tool

Choose a tool that matches the size of the problem and what you plan to do with the information. A phone may be all you need to record a few weed patches, while larger areas may justify satellite or drone imagery. If investing in equipment doesn't stack up, consider using a contractor.

Timing is important. Weeds need to be visible and easy to distinguish from the crop if you want to map them accurately. Before booking a drone flight, take a photo looking straight down at the crop canopy with your phone. If it's difficult to spot the weeds in the photo, automated detection systems are likely to have the same problem.

Also think about the practical side of managing the information. Consider operator time, training, software subscriptions, data storage and internet requirements. Just as importantly, make sure you can easily access, share and use your information to support management decisions. There's little value in collecting detailed data if it never leads to action in the paddock.

What's changing?

More weed detection and mapping technology is becoming available each season. FAR is currently evaluating several drone-based weed-mapping platforms, including CropUp, Cultiwise, Agremo and Pheno-Inspect. Costs vary between providers, with some using annual subscriptions and others charging per-hectare. Once imagery is uploaded, results are typically available within a few hours to a couple of days, although upload times can be affected by file size and internet speed.

One of the biggest areas of development is green-on-green weed detection, where cameras identify weeds growing within a crop. These systems are becoming more accurate and capable. Camera-guided and site-specific spraying technologies are also improving, giving growers more opportunities to target weeds and reduce chemical use.

For larger farms, work rate is an important consideration. Systems need to cover enough area to fit practical spraying windows.

Station 6: 11.30am & 3.15pm

Newer technologies are starting to provide image records, operational data and as-applied maps, making it easier to review detections and actions. These tools can add value but also increase the amount of data to be transferred, stored and managed.

Putting it into practice

Start with the weed patches you already know about. Record the weed, the date, its' location, the size of the patch and what action was taken. Keep the process simple and use the same approach each time so records can be compared from season to season.

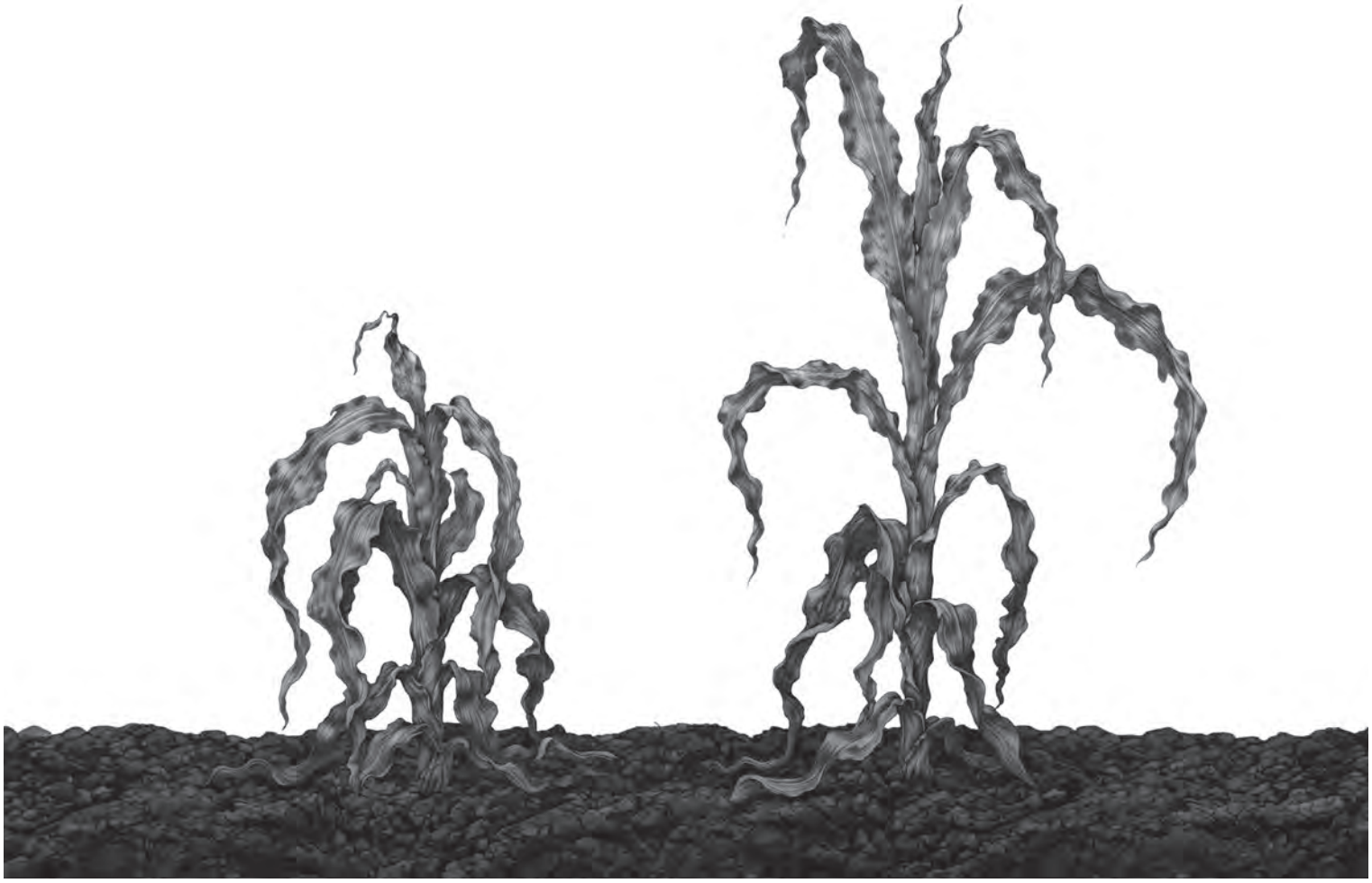
Before making rotation, cultivation or spraying decisions, check your records for any changes. Are weed patches shrinking, expanding or appearing in new areas? Share this information with staff and contractors so everyone knows the problem areas and can target their efforts accordingly. The goal isn't to create more data. It's to build a clear picture of where weeds are, how they're changing over time, and where management actions are having the greatest impact.

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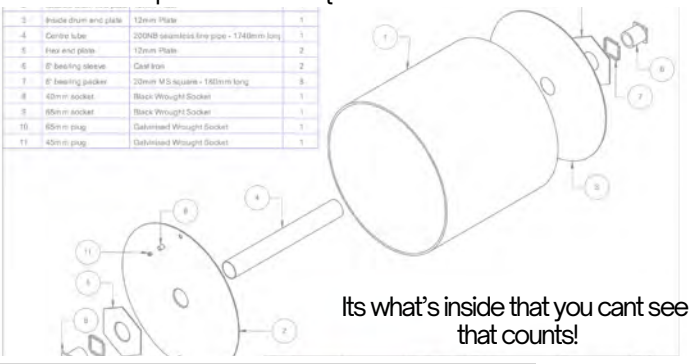
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Managing compaction for improved profit

Philip Wright, Wright Resolutions Ltd

Key points

- Soil compaction adversely affects yield by restricting root growth, soil biological activity, and infiltration.
- The effect of compaction can be clear (for example turning headlands on yield maps), or more subtle – for example, the effect of the drilling tractor on yield in these trafficked zones.
- Prevention before cure usually gives the most effective result, although this is not always possible when soils are vulnerable (when wet, loose, or both).
- Managing compaction by soil loosening is often required when prevention is not possible. There are many ways of doing this, not all are successful, and some can make the situation worse. Learn from the mistakes often made in the UK and minimise any downsides of moving to a more "regenerative" approach.

When it comes to 'managing' compaction, prevention (minimising ground pressures) should be the first part of the process where this is feasible. When cultivating soils, "less can be more" to ensure overall soil health is maximised. However, "zero" (tillage) is often not enough – especially in non-self-structuring soils with a proportion of fine silt particles present.

Having crop roots growing in the soil whenever possible helps to maintain structure. Can this be enough to avoid tillage? Sometimes, but not always – it depends on soil type, cropping, and where your soils are in the process.

Can we quantify the adverse effects of compaction?

Much work has been done in combinable and grass crops to assess the effect of compaction. It is key to understand the effect of ground pressure (tyre pressures, or the effect of tracked vehicles), and also vehicle weight (axle loading). The principles are relatively straightforward and repeatable, so this talk outlines the pressure and load effects.

What technology is available to limit the effects of trafficking?

While vehicle weights have generally increased over time, partly to improve the effective transfer of power to the ground, tyre and track technologies have evolved alongside them. Central Tyre Inflation Systems (CTIS) make it easier to adjust tyre pressures to suit the task, balancing field performance with the speed and power requirements of transport. But is the investment worthwhile? This talk explores the potential yield benefits of CTIS and evaluates how effectively these gains translate into a financial return on investment.

Choosing the right tool to remove compaction

It is important to identify the extent of any compaction present in the paddock. This is a straightforward process, which with some experience becomes second nature. Key indicators include sudden changes to root growth and soil moisture levels at a specific depth, alongside the normal surface effects associated with waterlogging, and poor crop competitiveness (leading to increased weed and/or pest issues). Moisture probe results to depth can assist this.

Having identified the extent of compaction present, choosing the most appropriate tool to correct this is the next step. How much the soil is "lifted and stretched" will depend on several factors, the key one being to avoid under- or over-loosening. This ensures the results are sustainable over a longer period and also minimises excessive surface disturbance which can de-stabilise the profile, cost fuel, adversely affect the crop (if present), and also encourage excessive biological activity in the soil.

Options for the future?

Controlled soil movement, to correct a problem, can be combined with a form of zone tillage, to leave some areas less disturbed than others. Such zones act as support for traffic, and also for the biota present in the soil. The soil movement and cutting action needed to produce effective drainage and root pathway channels can compromise many forms of soil biota. By having a paddock which combines both more and less disturbed zones, it is possible to better conserve the positive soil biota, which can then quickly re-colonize across the zones of greater disturbance. Choosing the most appropriate loosening tool can assist in this – it might be just a simple job of changing (fine tuning) the ground engaging parts on a machine in many cases.

Station 7: 11.00am & 2.45pm

Putting it into practice

A spade (shovel) is essential to examine the structure in a paddock. Start with the areas which are in good order, so that you can assess how easy it is to dig – this will depend on many factors including soil type, moisture and cropping. From here, move to areas where possible issues are present and compare the results. This will give a good idea of the extent of any issues present, and what is likely to be needed to correct them. In many cases, dry soil is mechanically strong, and can appear compacted, whereas it is just the low moisture content. Use the other indicators, including root growth, to compare in such cases.

Having assessed any issues, choose the most appropriate tool to correct them. Check alongside the machine, both in areas loosened and yet to be loosened to compare the results, tuning the ground engaging parts if needed.

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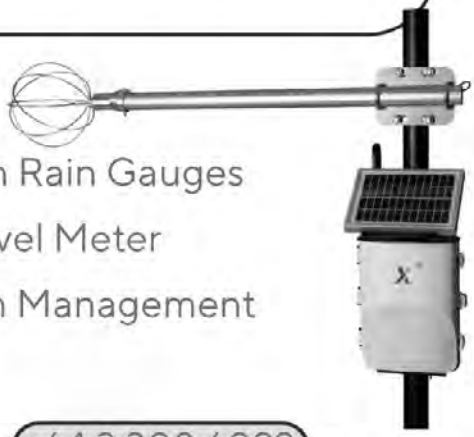






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Arable feed carbon footprints

Dirk Wallace, FAR

Key points

- New Zealand-specific carbon footprint values have been developed for feed wheat, feed barley, maize grain and maize silage using data from 23 arable farms.
- Locally grown arable feeds have relatively low carbon footprints, with maize silage recording the lowest emissions of the feeds assessed.
- The carbon footprint of New Zealand arable feeds generally compare favourably with imported feeds such as PKE.
- The data will improve carbon accounting for dairy supply chains and better recognise the contribution of New Zealand-grown feeds.
- Substituting higher footprint feed with lower footprint New Zealand-grown feeds presents an opportunity to reduce the carbon footprint of milk.

Updated greenhouse gas emissions profiles have been released for four New Zealand-grown arable animal feed crops. The figures, which cover feed wheat, feed barley, maize grain and maize silage, use real New Zealand arable grower data. An arable feed carbon footprint is a tally of the amount of greenhouse gases it took to grow a crop expressed per tonne of grain or dry matter.

FAR commissioned the Ag: LCA team at the Bioeconomy Science Institute (BSI) (formerly AgResearch) to carry out this research as they are an independent research organisation whose methods are internationally recognised and widely used across the food and fibre sector in New Zealand.

Why did we do the work?

Food manufacturers track and record the emissions of their 'end products'; this means they need to know the emissions generated from their ingredients. Arable feeds feature as a Scope 3 emission for milk production, this means arable feed footprints can change the footprint of exported milk products. There is a need for the carbon footprints for arable feed to be grounded in reality so we are not misrepresented by assumptions, and we are telling an accurate story of what we produce.

How were the numbers calculated?

A group of 23 arable growers from across New Zealand contributed their crop production and management information to this project. These data were used to create a national average carbon footprint for each of the crops selected using a life cycle assessment methodology. Figure 1 details what is in and what is out of the calculation. This is referred to as the life cycle assessment boundary.

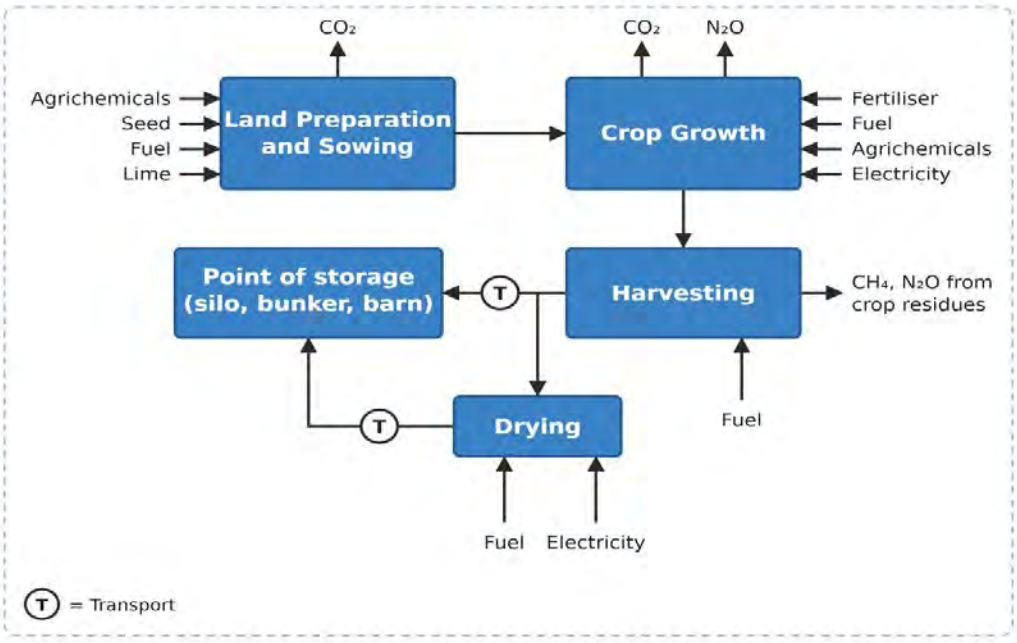


Figure 1. Life cycle assessment boundaries. Everything in the dotted line is included in the calculation.

What were the numbers?

The calculated carbon footprints for maize silage, barley grain, wheat grain and maize grain are presented in Table 1 and visually in Figure 2.

Table 1. Production-weighted national average cradle-to-gate carbon footprint for New Zealand grown dried feeds delivered to the point of storage (e.g. silo, bunker).

Crop	Emission Factors	Weighted SD
Maize silage	0.18 kg CO_2e /kg DM	±0.04
Barley grain	0.21 kg CO_2e /kg grain (14% MC)	±0.05
Maize grain	0.31 kg CO_2e /kg grain (14% MC)	±0.08
Wheat grain	0.30 kg CO_2e/kg grain (14% MC)	±0.02

MC = moisture content; DM = dry matter; SD = production-weighted standard deviation; CO_2e = Carbon dioxide equivalent.

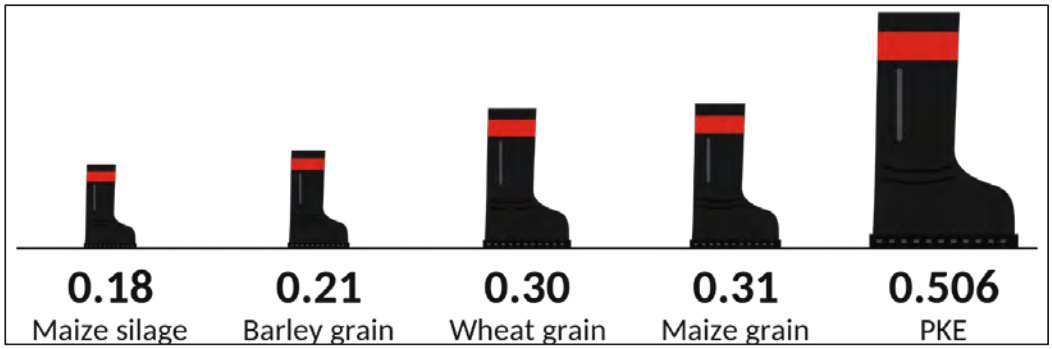


Figure 2. Production-weighted national average cradle-to-gate carbon footprint for New Zealand grown dried feeds delivered to the point of storage (e.g. silo, bunker). Numbers are reported as kg CO_2-e/kg DM for Maize silage, and kg CO_2-e/kg grain for barley, wheat and maize grain. The figure for PKE is reported as kg CO_2-e/kg DM and is taken from Ledgard and Falconer (2015).

How do these numbers compare to other feeds?

Locally produced arable feeds in general have lower footprints than imported supplements such as PKE (Table 2). It is important to note that each feed serves a different nutritional purpose in terms of milk production, so any comparisons need to be made in a like for like situation. Comparative footprints of imported feeds were not produced in this report and are taken from Ledgard and Falconer (2015), CSIRO (2025) and Barber and Stenning (2021).

Table 2. Feed footprints reported by Ledgard and Falconer (2015) for other supplementary feeds used on dairy farms, *taken from CSIRO (2025), excludes transport to New Zealand, transport is estimated to add 0.052 kg CO_2-e/t wheat from Barber and Stenning (2021).

Supplementary Feed	kg CO_2-equivalent / kg DM
PKE	0.506
Concentrate	0.355
Pasture silage (baled)	0.201
Cereal silage	0.185
Molasses	0.079
Brewers grain	0.004
	kg CO_2-equivalent / kg grain
Australian wheat*	0.32

Station 8: 10.30am & 2.15pm

How will the numbers be used?

The updated figures will be incorporated into the Ag:LCA dairy footprint model by May 2027 (Falconer pers. Comm. 2026). This means NZ arable and dairy will be using the same information and the number used in this work will directly change the milk footprint of dairy farmers who supply processors such as Fonterra.

What does it mean on a dairy farm?

Meeting cow energy requirements by replacing a high footprint feed (PKE) with a comparable lower footprint feed (maize silage) has been modelled to be the most effective currently available mitigation to lower the carbon footprint of milk, with reductions of 5% and 19% forecast for Canterbury and High Input-Waikato dairy (Mazzetto *et al.*, 2025). This points to the potential value of locally produced feed crops and the fact that our customers could see a meaningful change in the footprint of their product if they choose our product.

References

Barber, A., & Stenning, H. (2021). Wheat Flour Carbon Footprint. Foundation for Arable Research.

CSIRO. (2025). Australian Grains GHG account 2020.

Ledgard, S., & Falconer, S. (2015). Total greenhouse gas emissions from farm systems with increasing use of supplementary feeds across different regions of New Zealand. M. f. P. Industries.

Mazzetto, A. M., Falconer, S., Edwards, P. J., Glassey, C. B., Neal, M. B., & Ledgard, S. F. (2025). Effects of management and technology scenarios on the carbon footprint of milk from pasture-based dairy farm systems. Journal of Dairy Science, 108(11), 12407-12420. https://doi.org/10.3168/jds.2025-26924

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Climate change and greenhouse gases

Arable feed footprints


agworld
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Keeley Farms, Lismore, Canterbury
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