



2025 RESULTS

UPPER NORTH FARMING SYSTEMS

ANNUAL RESEARCH & EXTENSION COMPENDIUM





Port Pirie

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producers

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CHAIRMAN'S REPORT *for 2025*

The farming season of 2025 was challenging and a mixed bag for UNFS members both in regard to yields and grain quality. Coming off record dry weather in 2024 the first half of 2025 continued with a level of dry everyone would be happy not to experience again. Each season provides learning opportunities and last year was no different.

Our main Expo last year was run in conjunction with the Society of Precision Agriculture Australia (SPAA) at Melrose. It was a great success with a large turnout to listen to top presenters and see practical demonstrations. Lots of successful trials and events (highlighted in this compendium) were run during the year with a good mix of cropping, livestock and Natural Resource Management.

In 2025 we saw some staff changes with Deb retiring and Miffy moving onto new challenges. We wish Deb and Miffy all the best in their future endeavours. We welcome Tash, as Business Manager and Sarah as Project Officer in 2026 and look forward to what they can bring to UNFS. A big thank you also goes to Rachel and Jade for their continued high level of work.

Thank you to all the funding bodies and sponsors that provide the required funds for us to conduct successful and relevant trials, extension and field days for all our members. A big thank you also to our Operations Committee for giving their time and knowledge to provide insights from around the Upper North, helping keep UNFS relevant and locally focused.

If anyone would like a chat about what is happening at UNFS or would like to be involved I am always available.

All the best with season 2026.

Chris Crouch

UNFS Chair

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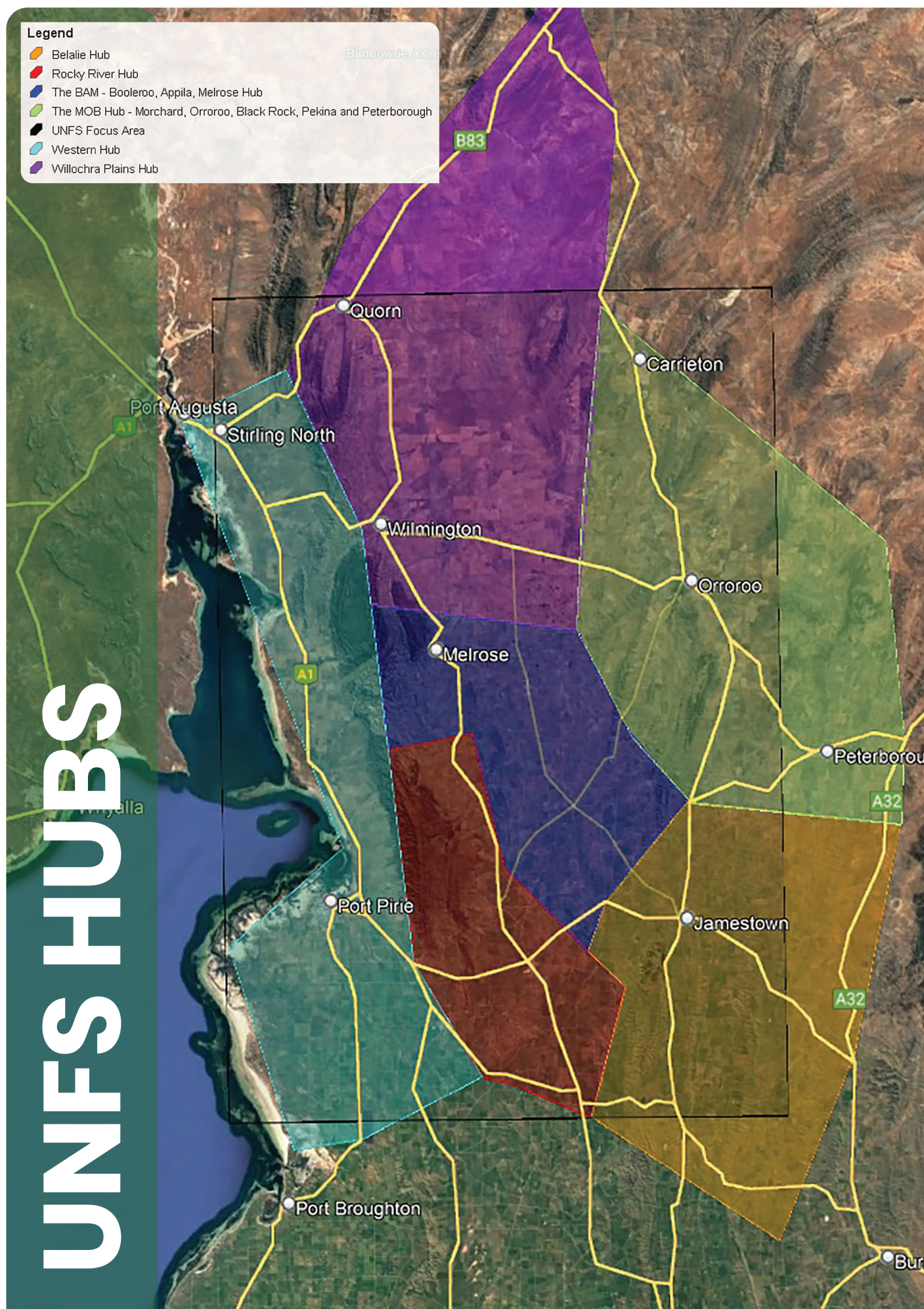
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- Belalie Hub
- Rocky River Hub
- The BAM - Booleroo, Appila, Melrose Hub
- The MOB Hub - Morchard, Orroroo, Black Rock, Pekina and Peterborough
- UNFS Focus Area
- Western Hub
- Willochra Plains Hub



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**LIVESTOCK
SA**

Barry Mudge Consulting
Trenrove Consulting
Evans Consulting

UNFS 2025 PROJECT LIST

UNFS Project #	Other Names/References	Full Name	Funding Source/Contact
104	Commercial Paddock	Fundraising for delivery of RD&E in UNFS Region	Northern Ag + Donations
231	Weather Station Network	Upper North Weather Station Network Upgrade Project	Northern and Yorke Landscape Board
245	Pulse Extension	RD&E to close the economic yield gap & maximise farming systems benefits from grain legume production in SA	GRDC via SARDI
246	Pasture Systems	Improved Pasture Management Systems	MLA
247	Lotsa Lambs	Lotsa Lambs - Improving Reproduction Success	MLA
254	Farming Systems	Enterprise Choice & Sequencing for profitability & sustainability	GRDC via Uni of Adelaide
255	National Risk Management Initiative - RiskWi\$e	Understand and improve risk-reward outcomes for Australian grain growers through participatory action research	GRDC via Hart FSG
257	Intercropping	Profitable and resilient pulse break crops in the Upper North - East and West of the Range	SA Drought Hub
259	De-Risking the Seeding Program	Reducing the risk of early/dry sowing through different management tactics in the decision making process	Australian Government Future Drought Hub / SA Drought Hub
261	Wild Dog and livestock productivity project	SA Best Practice Wild Dog Control and Productivity Network	PIRSA
264	Frost in the Upper North	Strategies for mitigating frost damage in the Upper North Region	SAGIT
265	Pulse Suitability	Building resilience - Break Crop Suitability Across Landscapes	SA Drought Hub
267	Summer Weed Control	Demonstrations of residual summer weed control for the Mid and Upper North, South Australia	GRDC

UNFS 2025 RESEARCH SITES





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mga.com AFSL: 244601



Thank you for your support during the 2025/26 harvest

BUNGE

This season our farmer customers:

- **delivered 5.5+ million** tonnes of grain to our South Australian and western Victorian sites
- broke our **daily receival records** at **5 sites** (Lock, Rudall, Cummins, Port Lincoln, Wolseley)
- produced high quality grain with **85% of wheat and barley** classified as **major grades**

Strong demand for grain from our network continues:

- **shipped 1.9 million** tonnes across **45+ vessels** to **23 countries** so far
- worked with **33 buyers** including **7 exporters** to connect farmers' grain with end users
- a further **4.1+ million tonnes shipping booked** for the rest of the season

all figures as at 31/01/26



THE 2025 SEASON IN THE UPPER NORTH

Author: Rachel Trengove

Following a Decile 1 growing season rainfall (GSR) in 2024 and below average summer rainfall, stored soil moisture across the Upper North was very low leading into the 2025 season (as seen at Booleroo – Figures 1 & 2).

The 2025 season was characterised by an exceptionally dry autumn, with minimal rainfall during March, April and May. Combined with limited subsoil moisture, this meant most crops were dry sown. The season break arrived in June, as reflected in rainfall data for Port Pirie (UNFS western side of the range – Figure 3) and Booleroo (UNFS eastern side of the range – Figure 4).

July rainfall was above average, and in some cases record-breaking, which significantly supported early crop growth and biomass accumulation. However, spring rainfall was below average, with dry conditions persisting through September and October.

Rainfall in November was variable across the region:

- In some areas, it interrupted harvest operations
- In others, it was timely for later crops, contributing to improved yield potential where crops remained green

2025 RAINFALL SUMMARIES:

Port Pirie

(Western side of the range)

Annual rainfall: **296mm**

(BOM Station number 021139)

Long term average: **346mm**

(BOM Station number 021043, closed since 2012)

Growing season rainfall (**GSR**): **228mm**

(BOM Station number 021139)

Equivalent to a Decile 5 (50th percentile) growing season over the past 100 years

Booleroo

(Eastern side of the range)

Annual rainfall: **324mm**

Long term average: **388mm** average

Growing season rainfall (**GSR**): **252mm**
(274mm average)

Equivalent to a **Decile 5 (50th percentile)** growing season over the past 100 years

2025 GROWING SEASON REPORTS FOR UNFS HUBS

Southern UNFS (Jamestown)

The 2025 season in the southern region was characterised by a late break and dry autumn, resulting in a second consecutive year of full dry sowing. Despite a four-week dry spell in September, strong winter rainfall allowed crops to persist until finishing rains arrived. The absence of spring frosts supported excellent yield potential, with canola, lentils, and wheat all performing strongly. Some farmers opted to cut wheat for hay based on low spring rainfall forecasts, with resulting gross margins proving to be worthwhile. Consecutive years dry sowing with no opportunity for knock downs has meant weed control remains a key focus.

Western UNFS

(Wandearah / Pt Germein)

The western region had a dry start with low subsoil moisture, and warm spring conditions, particularly north of Port Pirie, which limited yield potential. However, areas with stored soil moisture from 2024 achieved excellent results, underlining the importance of moisture carryover and summer weed control.

Late October/November rainfall was generally too late to benefit crops but the dry spring enabled high-quality hay production and pasture performance, exceeding expectations given the conditions. Dry sowing again proved to be a reliable strategy, with seasonal outcomes largely driven by pre-season soil moisture availability from rains in Nov/Dec 2024.

Northern UNFS
(Orroroo, Appila, Booleroo, Melrose)

The northern region had low rainfall in 2024, combined with a delayed seasonal break and very dry start in 2025 along with dust storms. Weed pressure and reduced pre-emergent herbicide performance were ongoing challenges, alongside grain quality downgrades due to high screenings and low-test weights. Livestock feed constraints were also an issue.

However, a record-breaking July rainfall event transformed the season, driving strong biomass production and setting up high-performing hay crops. Minimal harvest rain damage and strong crop recovery highlighted the region’s resilience, reinforcing that a late break can still deliver strong outcomes when supported by timely winter rainfall.

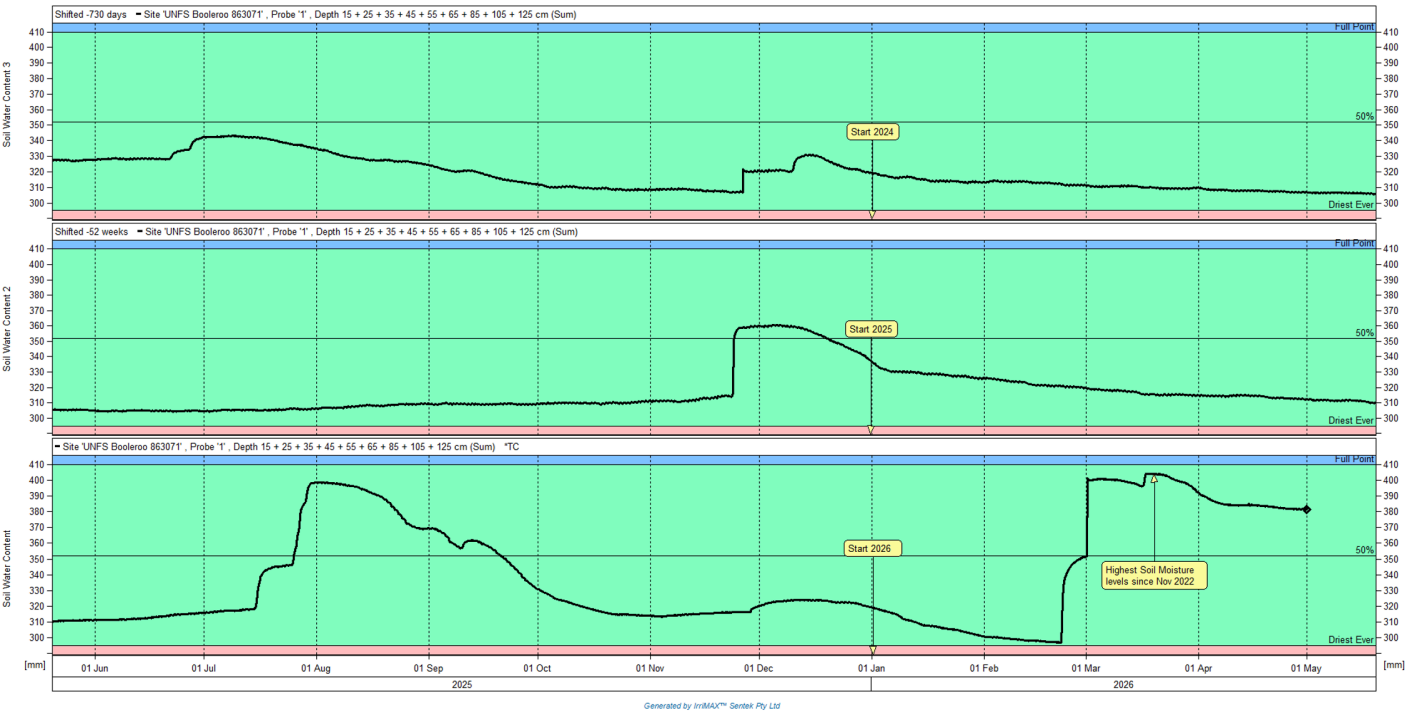


Figure 1. Soil moisture probe summed comparison at the Booleroo Weather Station field site. Data sourced from Agbyte.

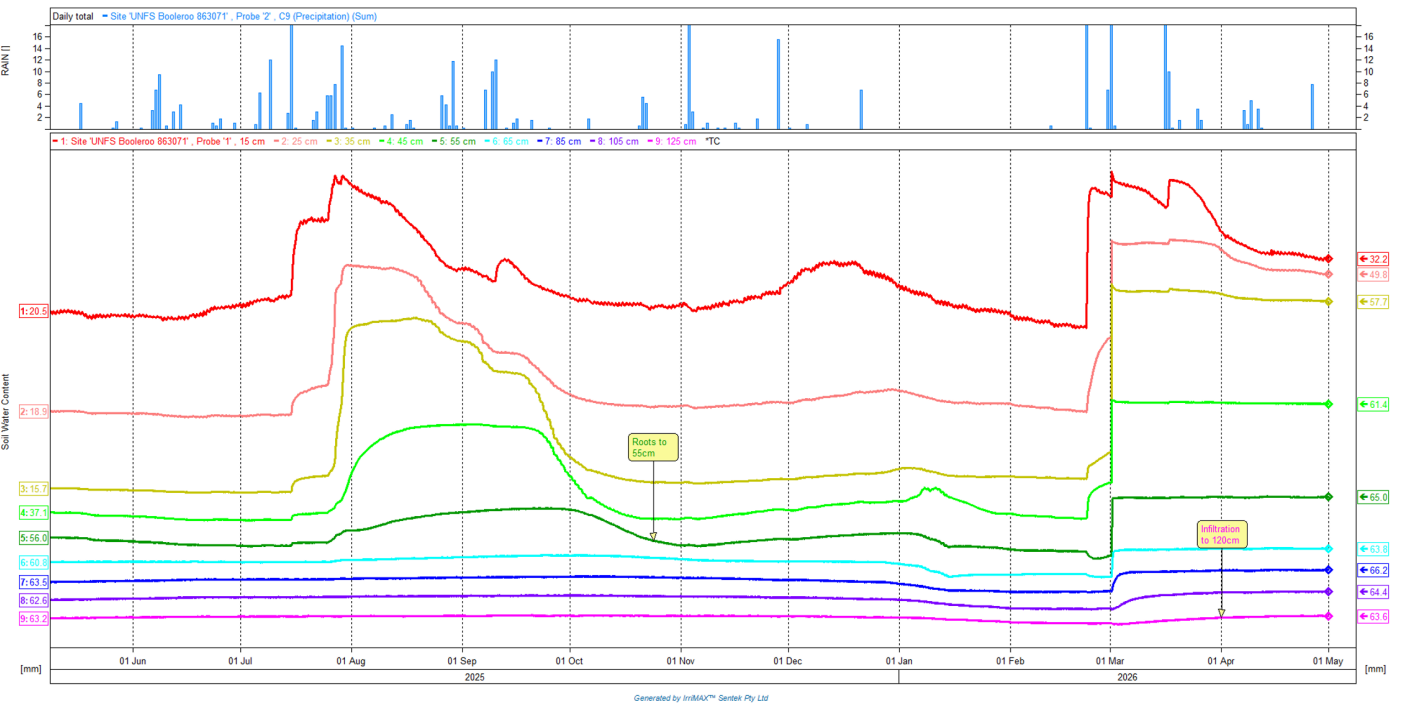


Figure 2. Soil Moisture Probe stacked graph 2025-2026, Booleroo Centre weather station. Data sourced from Agbyte.

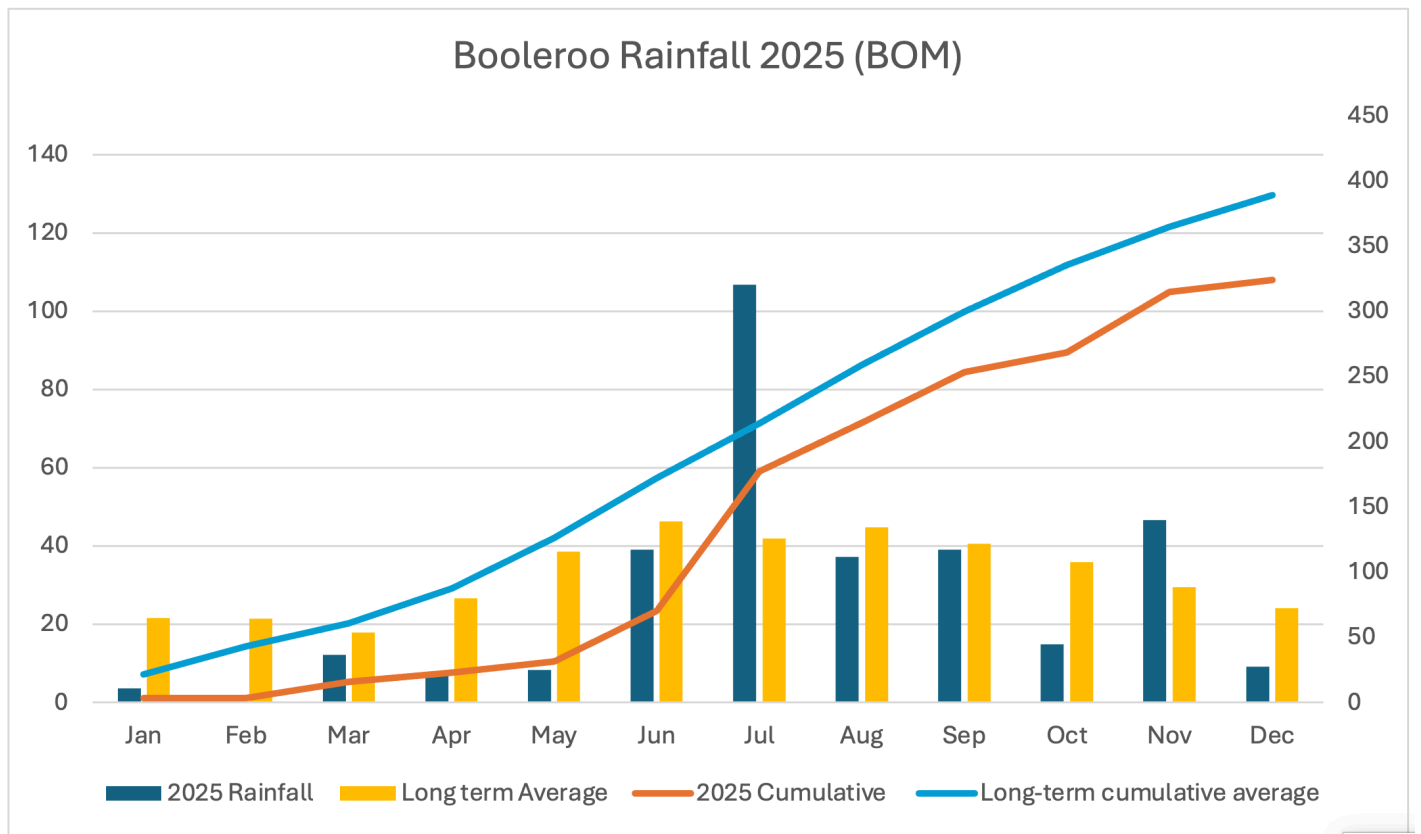


Figure 3. Booleroo rainfall graph for the 2025 season and long-term average rainfall. Data was sourced from the BOM.

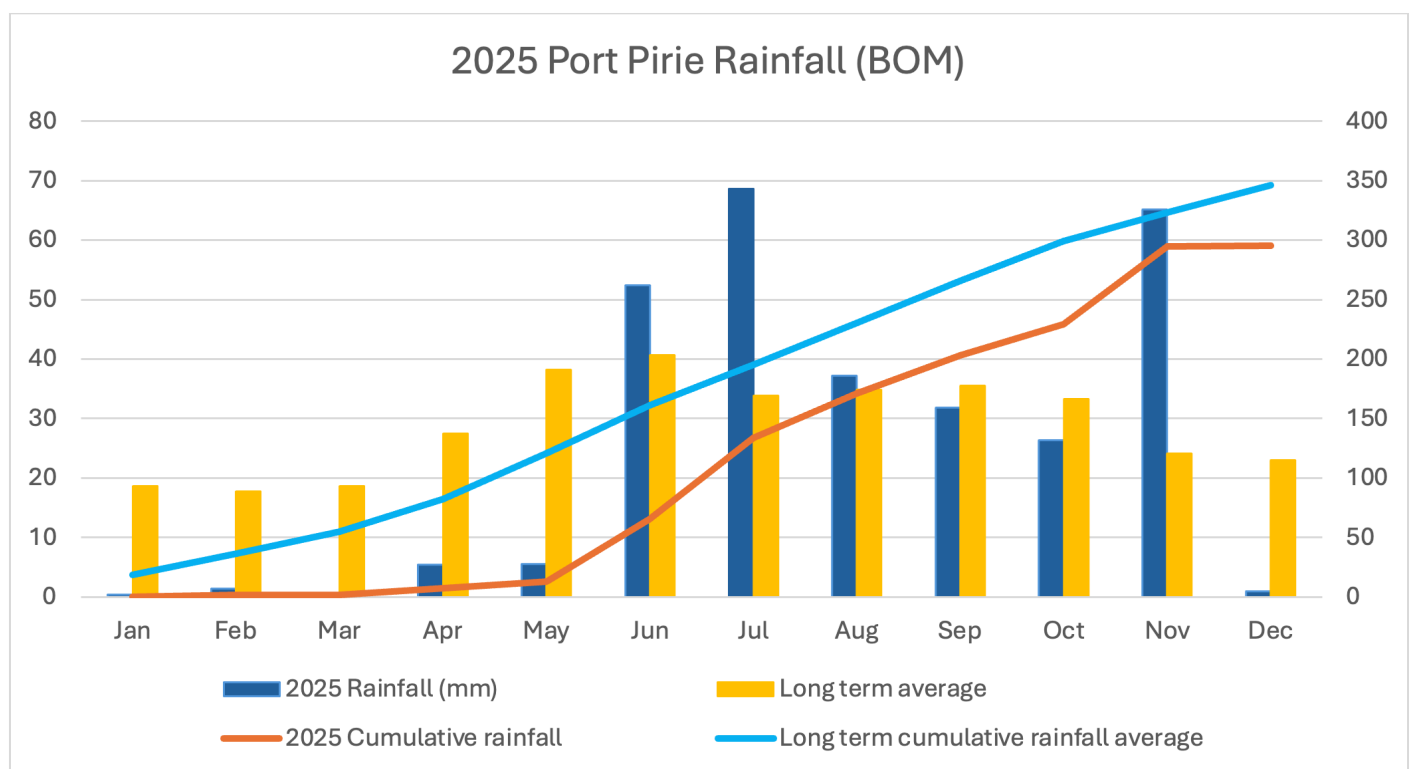


Figure 4. Port Pirie rainfall graph for the 2025 season and long-term average rainfall. Data was sourced from BOM Port Pirie Aerodrome (Station number 021139) and long term data was sourced from BOM Port Pirie Nyrstar (Station number 021043, closed since 2012)



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Want to Know More?



President Craig: 0498 020 418



jamestown@apex.org.au

Many hands make light work, but great friendships make it worthwhile.

UNFS 2025 COMMERCIAL PADDOCK REPORT

The Commercial Paddock continues to demonstrate the generosity of our community, with land, time, donations and resources supporting Upper North Farming Systems (UNFS).

Northern Ag has supported UNFS from the beginning, providing the paddock situated on the outskirts of Booleroo as an ongoing sponsorship. UNFS members manage all operations including sowing, spraying, spreading, harvesting, carting and grain sales, allowing the group to generate income independently of grants or funding programs.

This income stream helps UNFS support research and extension that may not attract external funding. We remain very grateful to Dustin Berryman and the Northern Ag team for their ongoing commitment and for enabling UNFS to raise funds through this paddock.

After the impact of the 2024 drought, and with no income generated from the Commercial Paddock, UNFS sought extra donations to help reduce the cost and burden carried by growers and other supporters who continually contribute in kind services to the site. We extend a huge thank you to the following groups for their generous donations in 2025:

- Jamestown Apex Club – \$5,000.
- Anonymous local family – \$5,000.
- Booleroo Centre Lions Club – \$500.
- Australian Grains Technologies (AGT) – donated 5T seed.

- Titan AG – donated chemical.
- Nufarm Australia – donated chemical.

Thank you also to the following farmers whose time, machinery and expertise were vital to the success of the Commercial Paddock during the 2025 season:

- Lambruk Ag Trust (Matt Nottle) – summer and broadleaf spraying, sowing and grain transport.
- David Clarke – sowing.
- Girdham Holdings – pre-emergence spraying.
- Wayne Rocke and Emma McSporren – reaping/harvest.
- The Walter Farm Trust – grain transport.
- Breezy Hill Precision Ag Services – grain transport.
- Brendan and Merridy Groves – grain transport.

In 2025/26, funds generated from the Commercial Paddock during 2025 are supporting the ongoing maintenance of the region's weather stations and the annual subscription fee for the Booleroo Weather Station. Funds will also be distributed to local and relevant trials within the Upper North region that benefit our members.

Northern Ag, our valued financial supporters, and our grower volunteers remain essential to sustaining the Commercial Paddock and enabling UNFS to continue delivering high quality engagement and trial activities across the region.

NORTHERN AG



**Growing
Together**



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UNDERSTANDING TRIAL RESULTS AND STATISTICS

Interpreting and understanding replicated trial results is not always easy. We have tried to report trial results in this book in a standard format, to make interpretation easier. Trials are generally replicated (treatments repeated two or more times) so there can be confidence that the results are from the treatments applied, rather than due to some other cause such as underlying soil variation or simply chance.

The average (or mean)

The results of replicated trials are often presented as the average (or mean) for each of the replicated treatments. Using statistics, means are compared to see whether any differences are larger than is likely to be caused by natural variability across the trial area (such as changing soil type).

The LSD test

To judge whether two or more treatments are different or not, a statistical test called the Least Significant Difference (LSD) test is used. If there is no appreciable difference found between treatments then the result shows “ns” (not significant). If the statistical test finds a significant difference, it is written as “ $P < 0.05$ ”. This means there is a 5% probability or less that the observed difference between treatment means occurred by chance, or we are at least 95% certain that the observed differences are due to the treatment effects.

The size of the LSD can then be used to compare the means. For example, in a trial with four treatments, only one treatment may be significantly different from the other three – the size of the LSD is used to see which treatments are different.

Results from replicated trial

An example of a replicated trial of three fertiliser treatments and a control (no fertiliser), with a statistical interpretation, is shown in Table 1.

Table 1 Mean grain yields of fertiliser treatments (4 replicates per treatment)

Treatment	Grain Yield (t/ha)
Control	1.32 a
Fertiliser 1	1.51 a,b
Fertiliser 2	1.47 a,b
Fertiliser 3	1.70 b
Significant treatment difference	($P \geq 0.05$)
$P < 0.05$ LSD	0.33

Statistical analysis indicates that there is a fertiliser treatment effect on yields. $P < 0.05$ indicates that the probability of such differences in grain yield occurring by chance is 5% (1 in 20) or less. In other words, it is highly likely (more than 95% probability) that the observed differences are due to the fertiliser treatments imposed.

The LSD shows that mean grain yields for individual treatments must differ by 0.33 t/ha or more, for us to accept that the treatments do have a real effect on yields. These pairwise treatment comparisons are often shown using the letter as in the last column of Table 1. Treatment means with the same letter are not significantly different from each other. The treatments that do differ significantly are those followed by different letters.

In our example, the control and fertiliser treatments 1 and 2 are the same (all followed by “a”). Despite fertilisers 1 and 2 giving apparently higher yields than control, we can’t dismiss the possibility that these small differences are just due to chance variation between plots. All three fertiliser treatments also have to be accepted as giving the same yields (all followed by “b”). But fertiliser treatment 3 can be accepted as producing a yield response over the control, indicated in the table by the means not sharing the same letter.

On-farm testing – Prove it on your place!

Doing an on-farm trial is more than just planting a test strip in the back paddock, or picking a few treatments and sowing some plots. Problems such as paddock variability, seasonal variability and changes across a district all serve to confound interpretation of anything but a well-designed trial.

Scientists generally prefer replicated small plots for conclusive results. But for farmers such trials can be time-consuming and unsuited to use with farm machinery. Small errors in planning can give results that are difficult to interpret. Research work in the 1930’s showed that errors due to soil variability increased as plots got larger, but at the same time, sampling errors increased with smaller plots.

The carefully planned and laid out farmer unreplicated trial or demonstration does have a role in agriculture as it enables a farmer to verify research findings on his particular soil type, rainfall and farming system, and we all know that “if I see it on my place, then I’m more likely to adopt it”. On-farm trials and demonstrations often serve as a catalyst for new ideas, which then lead to replicated trials to validate these observations.

The bottom line with unreplicated trial work is to have confidence that any differences (positive or negative) are real and repeatable, and due to the treatment rather than some other factor.

To get the best out of your on-farm trials, note the following points:

- Choose your test site carefully so that it is uniform and representative – yield maps will help, if available.
- Identify the treatments you wish to investigate and their possible effects. Don't attempt too many treatments.
- Make treatment areas to be compared as large as possible, at least wider than your header. • Treat and manage these areas similarly in all respects, except for the treatments being compared.
- If possible, place a control strip on both sides and in the middle of your treatment strips, so that if there is a change in conditions you are likely to spot it by comparing the performance of control strips.
- If you can't find an even area, align your treatment strips so that all treatments are equally exposed

to the changes. For example, if there is a slope, run the strips up the slope. This means that all treatments will be partly on the flat, part on the mid slope and part at the top of the

rise. This is much better than running strips across the slope, which may put your control on the sandy soil at the top of the rise and your treatment on the heavy flat, for example. This would make a direct comparison very tricky.

- Record treatment details accurately and monitor the test strips, otherwise the whole exercise will be a waste of time.
- If possible, organise a weigh trailer come harvest time, as header yield monitors have their limitations.
- Don't forget to evaluate the economics of treatments when interpreting the results. • Yield mapping provides a new and very useful tool for comparing large-scale treatment areas in a paddock.

The "Crop Monitoring Guide" published by Rural Solutions SA and available through PIRSA offices has additional information on conducting on-farm trials. Thanks to Jim Egan for the original article.

SOME USEFUL CONVERSIONS

Area

1 ha (hectare) = 10,000 m² (square 100 m by 100m)

1 acre = 0.4047 ha (1 chain (22 yards) by 10 chain)

1 ha = 2.471 acres

Mass

1 t (metric tonne) = 1,000 kg

1 imperial tonne = 1,016 kg

1 kg = 2.205 lb

1 lb = 0.454 kg

A bushel (bu) is traditionally a unit of volumetric measure defined as 8 gallons.

For grains, one bushel represents a dry mass equivalent of 8 gallons.

Wheat = 60 lb, Barley = 48 lb, Oats = 40 lb

1 bu (wheat) = 60 lb = 27.2 kg

1 bag = 3 bu = 81.6 kg (wheat)

Volume

1 L (litre) = 0.22 gallons

1 gallon = 4.55 L

1 L = 1,000 mL (millilitres)

Speed

1 km/hr = 0.62 miles/hr

10 km/hr = 6.2 miles/hr

15 km/hr = 9.3 miles/hr

10 km/hr = 167 metres/minute = 2.78 metres/second

Pressure

10 psi (pounds per sq inch) = 0.69 bar = 69 kPa (kiloPascals)

25 psi = 1.7 bar = 172 kPa

Yield

1 t/ha = 1000 kg/ha

Yield Approximations

Wheat 1 t = 12 bags 1 t/ha = 5 bags/acre 1 bag/acre = 0.2 t/ha

Barley 1 t = 15 bags 1 t/ha = 6.1 bags/acre 1 bag/acre = 0.16 t/ha

Oats 1 t = 18 bags 1 t/ha = 7.3 bags/acre 1 bag/acre = 0.135 t/ha

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AGRONOMY RESEARCH & EXTENSION



NGN DEMONSTRATIONS of RESIDUAL SUMMER WEED CONTROL for the MID & UPPER NORTH, SOUTH AUSTRALIA

AUTHORS:

Margaret Evans

Evans Consulting

Rachel Trengove

Upper North Farming Systems

FUNDED BY:

Grains Research and Development Corporation

PROJECT DURATION:

2024 – 2025

PROJECT DELIVERY ORGANISATIONS:

UNFS, Elders, AgXtra, Evans Consulting

applications during the fallow period. To ensure relevance to regional farming systems and to target local key summer weed species, the research and extension programs were designed in consultation with local growers and advisers.

AIMS

To support growers in making more informed decisions that improve weed control outcomes, reduce input costs, and maximise the conservation of soil moisture and nitrogen for following crops by improving:

- The efficiency and cost-effectiveness of summer weed control practices for grain growers in the Mid and Upper North of South Australia.
- Grower knowledge and confidence in using residual summer weed control options by combining local trials with targeted workshops and field days.

METHODS

Replicated trials at Baroota and Balaklava, and a demonstration at Melrose were conducted during the 2024/25 summer and 2025 cropping season (Table 1). Treatments compared a range of herbicide strategies (Table 2). Assessments were made for weed density, soil moisture and nitrogen, crop performance, and phytotoxicity effects.

Workshops with local and specialist presenters were developed to provide the latest information about herbicides, herbicide resistance and using the meso-net to ensure spraying conditions are optimal. Workshops were based around the field-site locations and run in conjunction with local grower groups – Nelshaby (Baroota site), Booleroo (Melrose site) and Balaklava (Balaklava site).

KEY MESSAGES

- Summer weed research is risky! No summer rain, no summer weeds!
- There was minimal summer weed germination across all sites, so there were no useful trial results.
- Future summer weed research should be implemented differently e.g. large plots, fewer treatments, lower crop density and more inputs from specialist weed researchers
- The workshops associated with the trial program were well-attended and generated a lot of discussion.
- The project reinforced the value of combining local research with targeted extension to support improved weed management decision-making and informed future research approaches.

BACKGROUND

Summer weed control is a major challenge for grain growers in the Mid and Upper North of South Australia, with increasing costs and complexity associated with repeated herbicide



Table 1. Details for the three sites used in this project.

	Baroota	Melrose	Balaklava
Location	Upper North	Upper North	Mid North
Cooperator	Matt Dennis	Andrew Walter	Kelvin Tiller
Main Focus Weeds	Button grass	Buckbush	Fleabane
	Potato weed	Melons	Melons
		Potato weed	
Other weeds present	Milk thistle	Caltrop	Milk thistle
		Wire weed	
Crop 2025	Bread wheat	Bread wheat	Lentils*
Crop 2024	Lentils	Vetch	Lentils
Plot Size (m)	4 m x 20 m	4 m x 20 m	3 m x 20 m
Replicates	4	1	4
Harvested 2025	Yes	Hand harvested	No
Row spacing		30 cm	

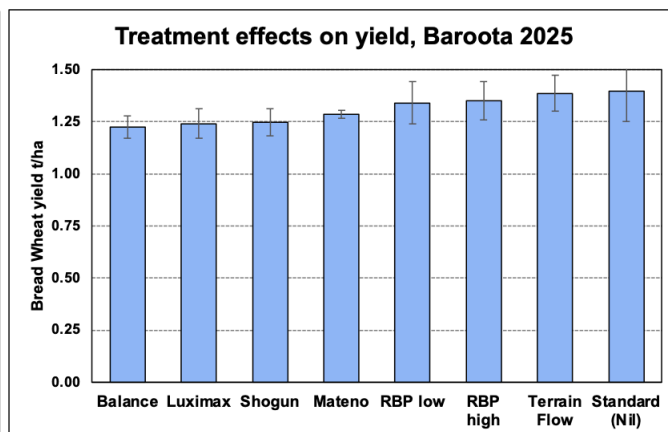
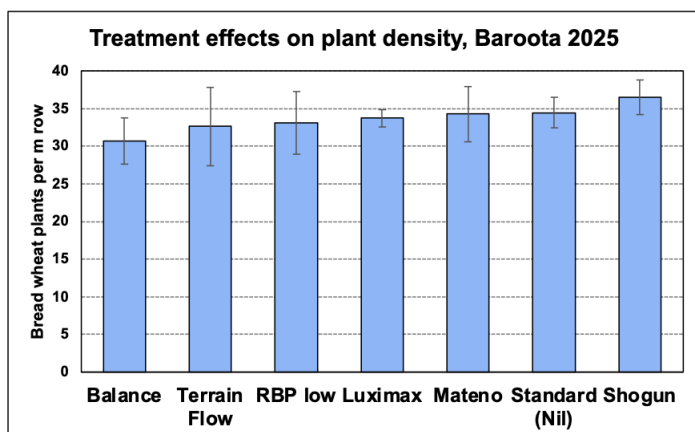
* Changed from bread wheat at the last minute due to herbicide residue concerns for a 2025 wheat crop - there were extremely dry conditions after in-crop herbicide application due to the 2024 bread wheat crop.

Table 2. Herbicide treatment details. Treatments were applied using a boomspray in fallow in 2024 at Baroota (21 November and 4 December) and Melrose (18 December) and were incorporated by sowing on 12 May 2025 at Balaklava. RBP = recommended best practice.

Baroota	Melrose	Balaklava	Herbicide treatment	Group
✓	✓		Balance® 750 WG @ 100 g ai/ha	27, (4), (9)
		✓	Besuto® 480 @ 100 g ai/ha	15
	✓		Lontrel™ Advanced @ 37.5 g ai/ha	4, (9)
	✓		Lontrel™ Advanced @ 112 g ai/ha	4, (9)
✓			Luximax® @ 375 g ai/ha	30, (4), (9)
✓			Mateno® Complete @ 400 g ai/ha + 100 g ai/ha + 66 g ai/ha	32, 15, 12, (4), (9)
		✓	Rustler® 500 SC @ 500 g ai/ha	3
		✓	Rustler® 500 SC @ 500 g ai/ha + Diuron® 900 WGD @ 500 g ai/ha	3, 5
		✓	Rustler® 500 SC @ 500 g ai/ha + Reflex® @ 240 g ai/ha	3, 14
		✓	Rustler® 500 SC @ 500 g ai/ha + Terrain® Flow @ 60 g ai/ha	3, 14
	✓		Sharpen® WG @ 24 g ai/ha	14, (4), (9)
✓			Shogun® @ 50 g ai/ha	1, (4), (9)
✓	✓		Terrain® Flow @ 139 g ai/ha	14, (4), (9)
		✓	Ultero® 900 WGD @ 1 kg ai/ha	25
✓			RBP low - Paraquat® 250 @ 200 g ai/ha + Garlon® 600 @ 48 g ai/ha	22, 4, (9)
✓			RBP high - Paraquat® 250 @ 400 g ai/ha + Garlon® 600 @ 48 g ai/ha + BS1000@0.5%	22, 4, (9)
	✓		RBP - Garlon® 600 @ 48 g ai/ha + Ally® @ 4.2 g ai/ha	4, 2
Applied with all the above treatments at these sites			Colex-D® @ 684 mL ai/ha	(4)
			Ultra® max @ 855 mL ai/ha	(9)
			Ammonium sulphate + vegetable oil ester @ 0.5% (e.g. Outright 770)	
✓	✓	✓✓✓	Untreated control	

FINDINGS AND DISCUSSION

The graphs below are an indication of the low summer rainfall and its effect on summer weeds. Due to the dry conditions, no treatment effects were seen on crop density, crop yield (see graphs page 22) or in-crop summer weed numbers which ranged from zero to about fifteen per plot at all sites.



For further information, the full GRDC final report for this project can be accessed via the Online Farm Trials website or the UNFS website under the Projects section.

ACKNOWLEDGEMENTS

Thank you to our project collaborators, Beth Humphris and Liam Bastian (Elders) AgXtra staff and Dr Marg Evans (Evans Consulting) for their valuable contributions to this project.

We also sincerely thank our trial site hosts - Kelvin Tiller (Balaklava), Matt and Brad Dennis (Baroota), and Andrew Walter (Melrose) - for their support and cooperation.

Finally, thank you to the farmers and advisors who participated in local focus groups and contributed to the design of the trial treatments.

This project received funding from GRDC.



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EARLY INSIGHTS *from* APPILA FARMING SYSTEMS TRIAL

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TAKE HOME MESSAGES

- Three systems achieved a higher cumulative gross margin than the Baseline system (vetch (simulated grazing)-wheat-barley). The 'more pulses' system (lentil-wheat), the 'hay' system (oat/vetch hay-wheat-wheat) and the 'risk-averse' system (wheat-barley-lentil) increased the cumulative gross margin relative to the Baseline by +\$236/ha, +\$94/ha and +\$147/ha respectively.
- Three-year cumulative gross margins were negative for all systems, largely reflecting the low production in two consecutive Decile 1 years (2023 and 2024), despite all systems returning a profit in 2025 (Decile 6).
- Dry conditions meant that soil water and nitrogen legacies following different crops were largely absent or did not persist between seasons; where a benefit from vetch was apparent entering 2024, poor establishment of vetch in 2023 limits confidence in the size of this effect. As a result, system performance largely reflected the gross margin of the individual crops within it, with little interaction between crops in the sequence.
- Realising the benefits of legumes, whether improving subsequent crop yields or reducing fertiliser requirements, is highly conditional on seasonal conditions.

BACKGROUND

The GRDC 'Farming Systems South' (FSS) project was established in 2023 to deliver new insights into the drivers of profitability and sustainability of cropping systems in the southern region, by identifying strategies that improve a range of performance metrics such as system gross margin (GM) and economic water use efficiency (\$WUE). As part of this program a farming systems field trial was established at Appila to evaluate system performance in the Upper North SA.

The Appila trial site, located in the low rainfall zone of the Upper North of South Australia, on a heavy red clay soil (Chromosol), is managed by Upper North Farming Systems (UNFS) under the advice of Agricultural Research & Consulting. Six systems are under investigation following consultation with UNFS and local agronomists and growers (Table 1), including four fully-phased systems, in which each crop in the sequence was grown in every year to avoid seasonal biases, and two adviser-led systems, where decisions on crop choice, end use and N management are made adaptively each year based on information available (e.g. soil tests, seasonal conditions). The baseline system represents common practice in the region. Assessments of soil water and N, soil-borne disease risk, weed pressure dynamics are made on an annual basis.

Table 1. Systems under investigation at the Appila FSS trial.

	System ID	System	Phased?
1	Baseline	Vetch (simulated grazing)* - Wheat - Barley	Yes
2	More pulses	Lentil - Wheat	Yes
3	Double break	Lentil - Canola - Wheat - Wheat	Yes
4	Hay	Oat (+Vetch) hay - Wheat - Wheat	Yes
5	Adviser-led	Wheat (2023) - Barley (2024) - Lentil (2025)	No
6	Adviser-led (risk-tolerant)	Canola (2023)- Wheat (2024)- Lentil (2025)	No

* Vetch management note: vetch was not grazed by livestock in 2023 or 2024 (insufficient biomass due to drought). In 2025, vetch was terminated with glyphosate (2 L/ha) at flowering (Z72), biomass was cut and removed to simulate grazing. This is not identical to farmer practice (extended grazing followed by spray-topping) but is the closest feasible simulation in a plot trial context.

SEASONAL CONDITIONS

Growing season rainfall (GSR) was Decile 1 in both 2023 (169 mm) and 2024 (121 mm), and Decile 6 in 2025 (254 mm) (Table 2). The 2024 season was the driest on record. As a result, crop yields were very low in 2023 and 2024, with wheat yields averaging 0.55 and 0.37 t/ha respectively, barley yields averaging 0.31 and 0.04 t/ha, and canola failing to produce a harvestable yield in both years. In 2025, average wheat and barley yields recovered strongly to 1.97 t/ha and 2.11 t/ha respectively. Lentil yields were highly variable (average 0.33 t/ha across harvested plots, range 0–1.53 t/ha), with seven of twelve lentil plots recording zero machine yield due to canopy collapse at late harvest, a harvest logistics issue rather than necessarily reflecting the agronomic yield of the crop (see Data notes). These yield outcomes are key drivers of the gross margin results described below.

SPATIAL VARIABILITY

Lentil and canola yields at this site are influenced by two site-specific factors unrelated to cropping system design, which should be considered when interpreting results.

Soil salinity varies markedly across the site in a mosaic pattern, causing random bare patches that are most pronounced in lentil and canola, and to a lesser extent in cereals. Soil electrical conductivity (ECe) at 0–10 cm measured at establishment in 2023 was 5.6 dS/m in Rep 1 and 2.5–2.6 dS/m in Reps 2 and 3. At ECe values of ~5.6 dS/m, lentil and canola establishment and growth are severely impeded, and this is consistent with Rep 1 recording the lowest lentil and canola yields across all systems in 2025. Salt tolerance at this site is estimated to rank as: Lentils < Canola < Wheat ≈ Oats < Barley.

In addition, weed pressure carried over from prior seasons suppressed lentil yields in 2025. A corrective in-crop herbicide program was applied, which reduced weed competition but also caused some additional yield suppression.

RESULTS

Soil water and nitrogen legacy effects were subtle and did not persist

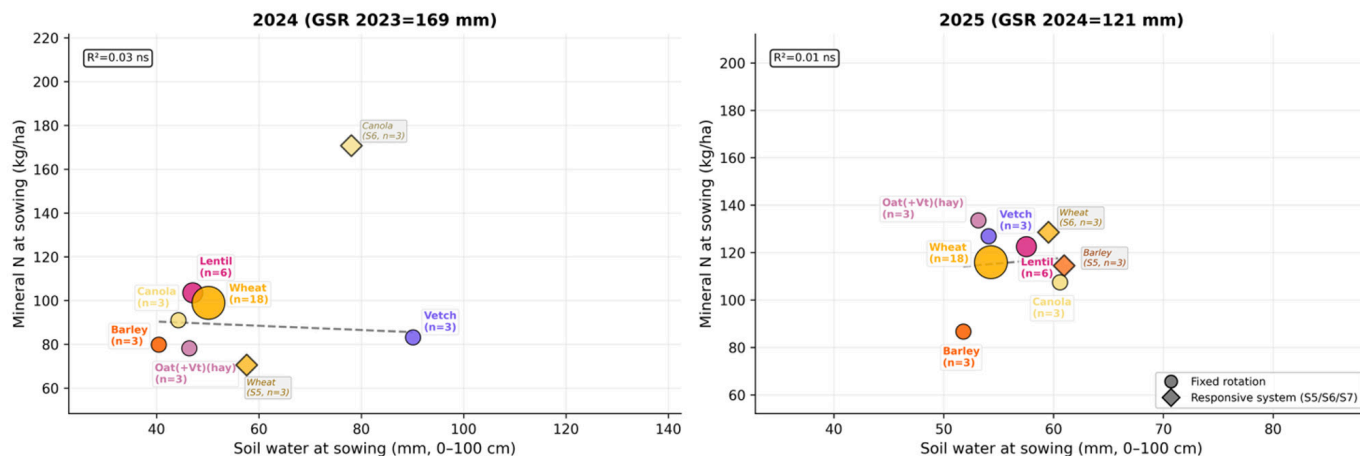


Figure 1. Total soil water versus soil nitrogen (0–100 cm) per previous crop in 2024 and 2025.

- A trend toward higher residual soil water was apparent following vetch entering 2024 (Fig 1A); however, vetch establishment was poor in 2023 due to low seed viability, meaning biomass was reduced and confidence in the size of this water benefit is limited. The terminal drought in 2024 depleted any water reserves. By the start of 2025, soil water had converged to similarly low levels across all previous crops (Fig 1B), meaning any vetch water legacy did not persist to influence 2025 wheat yields (Fig 2).
- Any crop legacies were effectively reset by the drought going into 2025 (Fig 1B), with the soil water following all previous crops converged to similarly low levels (50–60 mm total available water).
- Mineral N varied across previous crops, with nitrate N ranging from 50–60 kg/ha in 2024 (up to ~110 kg/ha following failed canola) and ~60 kg/ha in 2025. These amounts are sufficient to meet the N requirements of a wheat crop yielding ~2 t/ha, meaning residual N alone could have supported a reasonable crop in a low-rainfall year. The higher residual N following canola in 2024 reflects unused applied fertiliser, as canola failed to reach its yield potential.

Table 2. Key climate attributes at Appila, 2023–2025. Long-term mean GSR ~240 mm.

Attribute		2023	2024	2025
GSR	Total (mm)	169	121	254
	Decile (1–10)	1	1	6
Annual	Total (mm)	284	215	310
	Decile (1–10)	2	1	3

Wheat yield was not a function of crop sequence

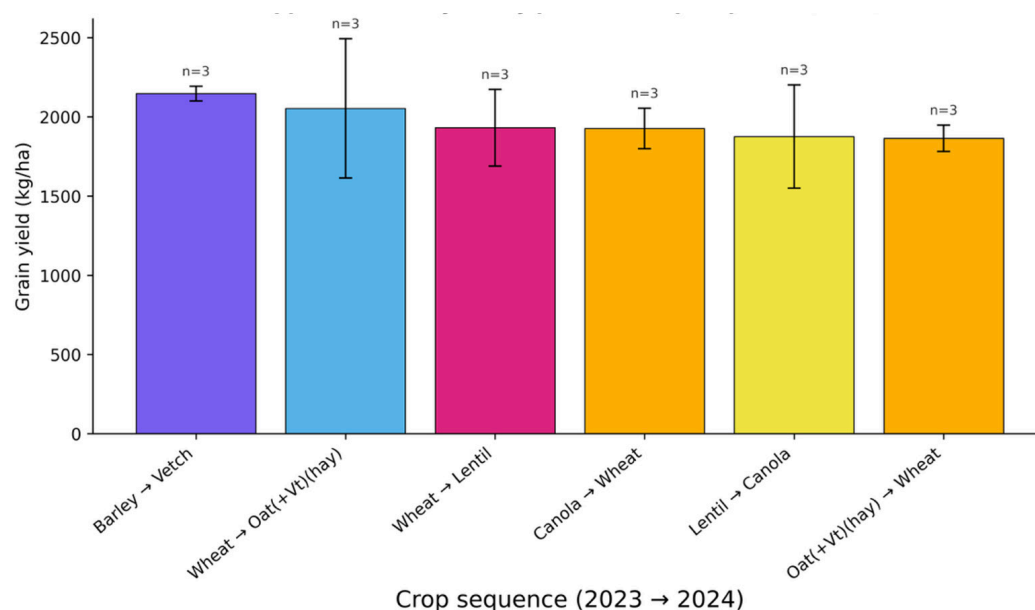


Figure 2. 2025 wheat yield by 2-year crop sequence (2023 > 2024).

- Wheat yields in 2025 showed no significant difference across preceding two-year crop sequences (Fig 2), though yields were slightly higher following barley-vetch, consistent with some residual soil water and N benefit from vetch.

System gross margins

- Three-year cumulative system gross margins (GMs) were negative for all systems. However, this reflects the sequence of two Decile 1 years (2023 and 2024) rather than inherent system design problems. With two poor years, no system could generate enough profit to offset losses.
- Three systems outperformed the baseline (S1, -\$324/ha cumulative): the more pulses system (S2, -\$100/ha), the risk-averse responsive system (S5, -\$177/ha) and the hay system (S4, -\$230/ha), all performing better in 2024 and 2025. The 2025 season (Decile 6, closer to average rainfall) is more informative for comparing system performance with cereal-based systems returning profits of +\$100 to +\$284/ha at the system level. Note: Figure 3 reflects estimated lentil yields for seven plots where machine harvest was not possible due to canopy collapse.
- Given lack of crop legacy effects due to seasonal conditions, the GM of each system largely reflected the sum of its component crop-year GMs, with little between-season interaction among crops in the sequence.
- Canola made a loss every year (GM -\$302 to -\$350/ha): zero harvestable yield in 2024 and 2025, and only ~78 kg/ha on average (range 0-110 kg/ha) in 2023. With average input costs similar to that of cereals at ~\$350/ha, canola is a high-risk proposition in this environment. Salinity-driven bare patches at this site (see note above) further reduce canola establishment and yield, contributing to its poor performance.
- Lentil GMs were mostly negative and highly variable within seasons. For example, in 2025, GMs ranged from -\$51 to +\$801/ha, despite lentil's average \$50/ha lower cost of production compared to cereals. Seven of twelve lentil plots recorded zero machine yield due to canopy collapse at late harvest, two plots in the phased systems (S2 Rep 1 and S3 Rep 1) and five of six plots in the adviser-led systems (S5 and S6). Estimated yields of 311-934 kg/ha were applied to all seven plots based on a regression of biomass at maturity versus machine yield (see Data notes).
- Cereals were the only crops to return a profit in any year, and only in 2025. At the crop level, wheat averaged ~+\$280/ha and barley averaged ~+\$230/ha in 2025, driving the positive system-level returns in S1, S2 and S4.
- The adviser-led systems (S5 and S6) were the worst performing systems when lentil yield estimates were not applied, driven by losses in both 2023 and 2024 before the lentil phase in 2025. In S5, barley in 2024 (the driest year on record) was the largest single driver of loss, averaging only 77 kg/ha across replicates with two of three plots recording zero yield (mean GM -\$309/ha). In S6, canola in 2023 averaged only 90 kg/ha against input costs of \$398/ha (mean GM -\$336/ha). Once estimated lentil yields are applied in 2025, S5 recovers substantially to -\$177/ha cumulative, second only to S2, highlighting how quickly system rankings can shift when a single season goes well. S6 improves less dramatically (-\$438/ha cumulative), as the canola failure in 2023 was simply too large a deficit to recover from across the three-year period, even with a positive lentil year in 2025. This underscores that three years of data, particularly when two are Decile 1, is insufficient to draw firm conclusions about the relative merit of adviser-led versus phased systems.
- Managing downside losses in the two dry seasons to less than \$150 per ha proved to be an important contributor to an improved three-year cumulative gross margin.

Appila — Cumulative gross margin over 3 years
Bars: per-year mean GM ± SE | Triangles: 3-year cumulative GM

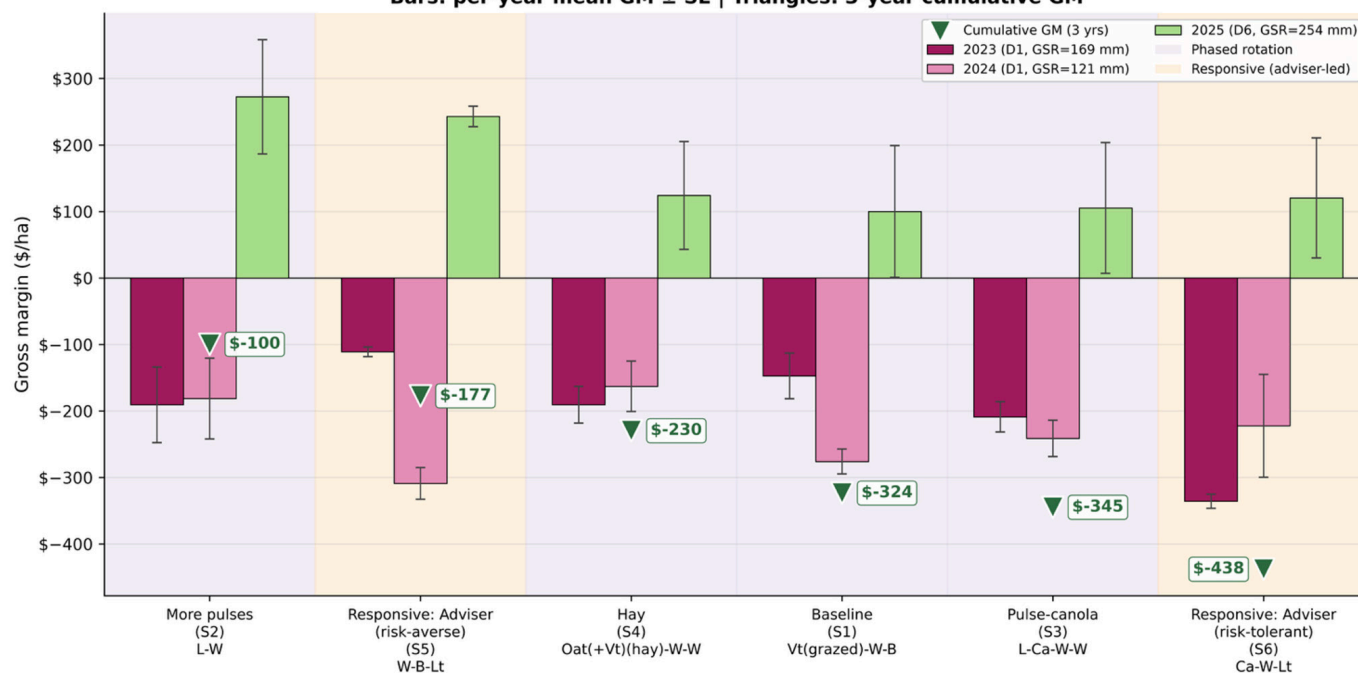


Figure 3. Three-year gross margins by system over the period 2023–2025. System gross margins for S1 (Baseline) include an imputed grazing revenue for the vetch phase, calculated from measured plot biomass multiplied by \$0.18/kg DM. Vetch was not grazed by livestock in any year; revenue was imputed to reflect the intended treatment. S4 (Hay) oat + vetch hay revenue was calculated using a hay price of \$0.252/kg DM.

DATA NOTES

Several lentil plots in 2025 recorded zero machine yield, likely reflecting late harvest and canopy collapse rather than true agronomic failure. Where zero yields were recorded, indicative yield estimates were derived from a regression of machine yield on biomass at maturity; given the moderate fit and associated uncertainty, these values should be interpreted with caution.

ACKNOWLEDGEMENTS

GRDC for funding 'Farming Systems South' (UOA2212-003RTX). AgXtra for assistance with trial management.



RISKWi\$E

NATIONAL RISK MANAGEMENT INITIATIVE

FUNDED BY:

GRDC

PROJECT DURATION:

2023 – 2028

PROJECT DELIVERY ORGANISATIONS:

UNFS, Hart Field Site Group,
Barry Mudge Consulting,
CSIRO (National Project Lead)

KEY FINDINGS

- There was no significant interaction between nitrogen rate & plant density in either the red or green zones.
- Increasing nitrogen did not significantly improve grain yield in the Red Zone (high frost risk) of the paddock, suggesting a low probability of recovering nitrogen investment under high frost risk conditions.
- Increasing plant densities improved yield in the Red Zone, suggesting this is a more reliable strategy to buffer against reduced production under high frost risk conditions than increasing nitrogen rates.
- Plant density did not consistently influence yield in the Green Zone (low frost risk) of the paddock, showing that seasonal constraints can limit upside returns and increase the risk of over-investment.
- Growers should consider not just the potential upside of increasing inputs such as nitrogen, but also the probability of achieving that return under different risk scenarios.
- In high-risk frost environments, conservative or alternative strategies (e.g. increasing plant density) may provide more reliable outcomes.

- In low frost-risk environments, the benefit of increasing nitrogen inputs or plant densities might be limited by seasonal constraints.

BACKGROUND

RiskWi\$e (the National Risk Management Initiative), is a 5-year national initiative running from 2023 to 2028. The targeted outcome for the initiative is that 80% of grain growers can articulate their production management decisions in terms of probability of upside returns (reward) offset against the associated downside risks.

As part of RiskWi\$e the UNFS is focusing on frost, which poses considerable challenges in the Upper North region of South Australia. Upper North crops are vulnerable to frost damage throughout the growing season, resulting in reduced yields. Past experience and research show that relying solely on planting longer-season varieties (with delayed flowering) to mitigate frost risks is not always a reliable management tactic.

Recent research interstate (Biddolph et Al. 2020) has demonstrated that reducing nitrogen and seeding rate to half of farmer practice can reduce frost severity and duration but not frost damage. Further, reducing seeding rate to half grower practice did not reduce frost damage, grain yield or gross income, but weed competition was compromised. In the event of receiving frost damage, under nil and light frost (<20% yield loss) the application of increased nitrogen rates increased yield and gross margin and under moderate frost (20–60% yield loss) increasing nitrogen increased yield and gross margin or had no effect depending on frost timing. Under severe frost (>60% yield loss) increasing nitrogen did not increase yield enough to improve gross margin. In frost prone landscapes maintaining normal grower practice of seeding rate and nitrogen for local yield potential gave the greatest financial return without frost, some financial

advantage with moderate frost and, most importantly, was never worse off with severe frost.

Based on conflicting experiences, a comprehensive strategy incorporating established research findings accumulated over several years must be tested through local validation trials and expanded upon.

AIMS

1. Quantify the effectiveness of nitrogen rates and plant density for reducing yield losses due to frost damage.
2. Equip Upper North growers with practical and effective strategies to minimize frost risks and foster a deeper understanding amongst them regarding the underlying causes of frost damage specific to the region.

METHOD

The trial was co-located with the frost trial at Jamestown, allowing the impact of nitrogen rate and plant density on yield losses due to frost damage to be explored. Treatments were applied in both the Red Zone (high frost risk) and in the Green Zone (low frost risk) at the site.

Treatments were:

- Plant densities – 80 and 200 plants per m².
- Nitrogen rates – 0, 50, 100, 200 and 300 kg/ha.

A split-plot trial design with 3 replicates was used. Each whole plot consisted of a single plant density, with sub-plots assigned to different nitrogen rates. This design allowed evaluation of multiple nitrogen rates under different plant densities while controlling spatial variability and ensuring robust statistical analysis. Statistical support and analysis provided by SN Stats (Sharon Nielsen). The bread wheat variety Calibre was sown on 2nd July 2025.

RESULTS AND DISCUSSION

Increased nitrogen inputs did not give higher yields in the Red Zone (frost-prone), but the higher plant density did. There was limited response to increased nitrogen or to plant density in the Green Zone (low/no frost), probably because moisture was a limiting factor during grain filling in 2025.

In the Red Zone (frost-prone), there were no obvious effects of increasing nitrogen rate on yield, but the higher plant density (200/m²) generally produced higher yields than the lower plant density (80/m²) (Figure 1). There was no interaction between nitrogen and plant density, although at 200 plants/m², there was a small trend toward slightly lower yields as nitrogen rates increased.

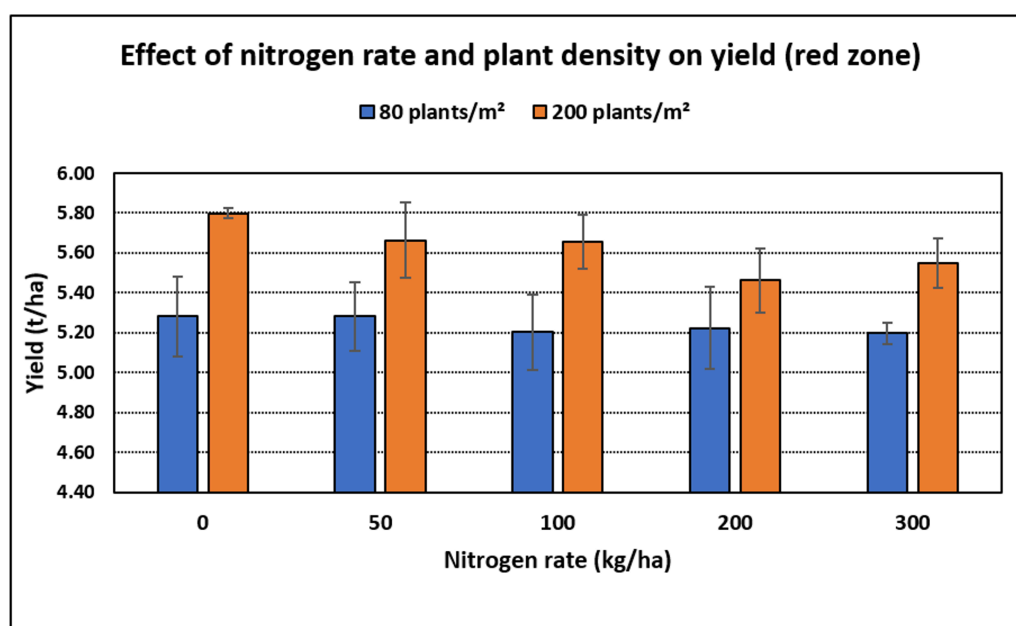


Figure 1. Effect of nitrogen rate and plant density on yield in the frost-prone Red Zone (error bars represent $\pm$ SE)

These results suggest that under high frost risk, crop performance is more strongly driven by plant establishment and survival than by nitrogen inputs. Frost events likely limited conversion of additional nitrogen into yield, reducing the effectiveness of higher nitrogen rates. Increasing plant density may provide a level of risk mitigation by improving head number and compensatory growth following frost damage. Increasing plant density may also provide additional hay yield in the event of a frost event causing significant grain yield loss.

In the Green Zone (low/no frost), there were no significant effects of plant density, nitrogen rate, or their interaction on yield (Figure 2). A small trend of increased yield with increased plant density was measured, though not significant. This lack of response suggests that environmental factors such as seasonal moisture availability, were more limiting than nitrogen or plant density. As a result, increasing inputs did not translate into

increased yield. Excess nitrogen (200 and 300kg/ha) tended to be lower yielding than nil at both plant densities, and lower yielding than 50 and 100kg/ha application rates. In 2025 the Green Zone became moisture constrained likely leading to a limiting of grain yield at excess levels of applied nitrogen.

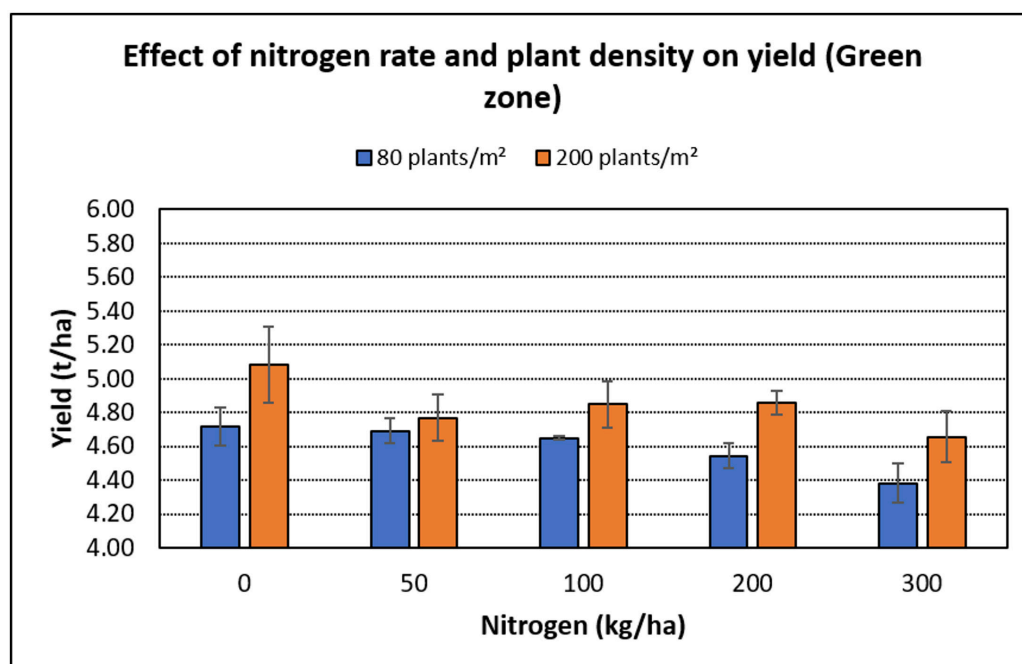


Figure 2. Effect of nitrogen rate and plant density on yield in the low/no frost Green Zone (error bars represent $\pm$ SE)

ACKNOWLEDGMENTS:

A big thank you to Pete Kitschke and family for hosting the frost trial and N trial on their farm this season.

We also thank Dr Margaret Evans and Craig Davis for their assistance and support with the project.

RiskWi\$e

– the National Risk Management Initiative

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Government of South Australia
Department of Primary Industries
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TRENGOVE
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PRINCIPAL PARTNER



NATIONAL PROJECT LEAD



DE-RISKING THE SEEDING PROGRAM

Project Overview



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FUNDED BY:

Australian Government Future Drought Fund / SA Drought Hub

PROJECT DURATION:

2023 – 2026

PROJECT DELIVERY ORGANISATIONS:

UNFS & Agricultural Consulting and Research

decisions. To address these challenges, Upper North Farming Systems (UNFS) established a series of replicated trials near Port Pirie/Wandearah and a farmer-scale demonstration site near Booleroo in 2025. This research program aimed to extend previous UNFS work delivered under the AgEx-led “De-Risking the Seeding Program”, which was constrained in 2024 due to extremely dry seasonal conditions.

The 2025 replicated trial program (Port Pirie/Wandearah) investigated interactions between seeding opener design and herbicide safety, time of sowing in dry saline soils, and the performance of alternative seeding systems under dry sowing conditions. The 2025 Booleroo demonstration site focused on practical comparisons of pre-emergent herbicide programs and seeding systems under commercial farming conditions.

ACKNOWLEDGEMENTS

This project received funding from the Australian Government’s Future Drought Fund. We sincerely acknowledge this support. We also thank the Johns family from Port Pirie for their ongoing collaboration and contribution to the trials and Matt Nottle and David Clarke for their contribution to seeding the commercial paddock demonstration at Booleroo.

multiple nitrogen rates under different plant densities while controlling spatial variability and ensuring robust statistical analysis. Statistical support and analysis provided by SN Stats (Sharon Nielsen). The bread wheat variety Calibre was sown on 2nd July 2025.



PROJECT SUMMARY

This project was undertaken to help growers make informed decisions around dry and early sowing strategies under increasingly variable seasonal conditions. The aims were to maximise seed germination, and to improve both financial and environmental resilience. The project is linked to a broader set of “De-Risking the Seeding Program” initiatives being undertaken across southern Australian agricultural regions through AIREP, NSS, MPF, HART and MSF.

Consecutive dry seasons across the Upper North of South Australia have increased uncertainty around crop establishment, herbicide safety, seeding system performance, and sowing timing

TRIALS AND DEMONSTRATIONS

Four further articles in this Compendium provide information about the 2025 research program:

- 1. Seeding Opener x Herbicide Interaction trial** (barley “super site”, Port Pirie)
- 2. Barley Time of Sowing (TOS) in Dry Saline Soil trial** (barley “super site”, Port Pirie)
- 3. Kelly Disc Chain Seeding System Comparison trial** (barley “super site”, Port Pirie)
- 4. Pre-emergent Herbicide x Variety x Seeding System demonstration** (Booleroo)

DE-RISKING *the* SEEDING PROGRAM

Trial 1: Seeding Opener × Herbicide Interaction Trial

(barley “super site” at Port Pirie)

AUTHORS:

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Rachel Trengove

Upper North Farming Systems

LOCATION:

Western Side of the Ranges at Wandearah (–33.2769882 S; 138.0457620 E), on Byron and Leighton Johns property.

TAKE HOME MESSAGES

Findings are based on data from a single site and season so it is important to note that the outcomes may vary in different seasons as well as under different soil types and management practices.

- Seeding opener selection does matter when pre-emergent herbicides are applied, particularly where the herbicide has a high-risk of reducing plant establishment.
- Crop establishment was better using Root Boot openers (which reduced the risk of seed contact with herbicide-treated soil) than when Atom Jet openers were used.
- There was no difference in yield between the opener types where no herbicide or the lower-risk herbicide was applied, but yield was lower for the Atom Jet opener where the higher-risk herbicide was applied.

AIM

The aim was to assess whether seeding opener type could improve establishment and yield in the presence of lower-risk and higher-risk pre-emergent herbicides on a soil prone to surface crusting and transient salinity.

METHODS

A dry seeding “super site” (3 trials at the same site) was established on a heavy red clay loam soil (EC^{1:5} 1.6 in the top 10 cm; classified as moderately saline). This soil is common in the region and has known constraints associated with poor crop establishment, including surface crusting risk and transient salinity. This allowed crop establishment strategies to be tested under realistic dry and early sowing pressures.

Treatments were sown to Commodus barley using a small-plot seeder with 10-inch tine spacing. Sowing speed was approximately 8 km/hr, with uniform sowing depth and a seeding rate of 75 kg/ha. Plots were 1.5m by 9.5m and there were 3 replicates.

This trial compared two seeding opener types, Root Boot and Atom Jet (Figure 1):

- Root Boot openers: create some under-seed tilth and place seed on a ledge in paired rows approximately 50 mm apart. This can help separate seed from herbicide-treated soil.

Atom Jet openers: place seed at the base of the furrow in a “skid-seed” configuration. They are often praised for their simplicity and consistent seed placement, but do not create under-seed tilth or spread seed as wide as Root Boot openers.

Two herbicide treatments were applied pre-emergent and compared with an untreated control across both opener types:

- Overwatch® (label rate) – lower-risk.
- Sakura® (wheat label rate) – higher-risk, **off-label for barley**.

Plant establishment (plants/m²) and grain yield (t/ha) were measured. Statistical analysis was undertaken using Fisher’s LSD (P = 0.05)

RESULTS AND DISCUSSION

Plant establishment (Table 1) was lower for the Atom Jet than for the Root Boot opener in both herbicide treatments. This is likely to be due to the Root Boot’s ability to ‘tuck’ seed onto a ledge beneath the soil surface, reducing the risk of contact with herbicide-treated soil if soil is thrown into the furrow by adjacent trailing points.

And, although not significantly different, was slightly lower in the nil treatment.

There was no difference in yield between the opener types where no herbicide or the lower-risk herbicide (Overwatch®) was applied (Table 1). Lower yield was seen for the Atom Jet opener where the higher-risk herbicide (Sakura®) was applied.

These findings are important because herbicide crop safety has become increasingly critical during consecutive dry sowing seasons where rainfall activation patterns are less predictable.



Figure 1. Atom Jet Opener and Root Boot Paired Row Opener

Table 1. Plant Establishment and Grain Yield.

Seeder	Herbicide	Av. Plants per m2	Yield (t/ha)
Root Boot	Nil	83.8 a	4.47 a
Atom Jet	Nil	74.6 ab	4.42 a
Root Boot	Sakura®	83.3 a	4.29 ab
Atom Jet	Sakura®	68.3 b	4.03 b
Root Boot	Overwatch®	87.8 a	4.42 a
Atom Jet	Overwatch®	69.5 b	4.22 b

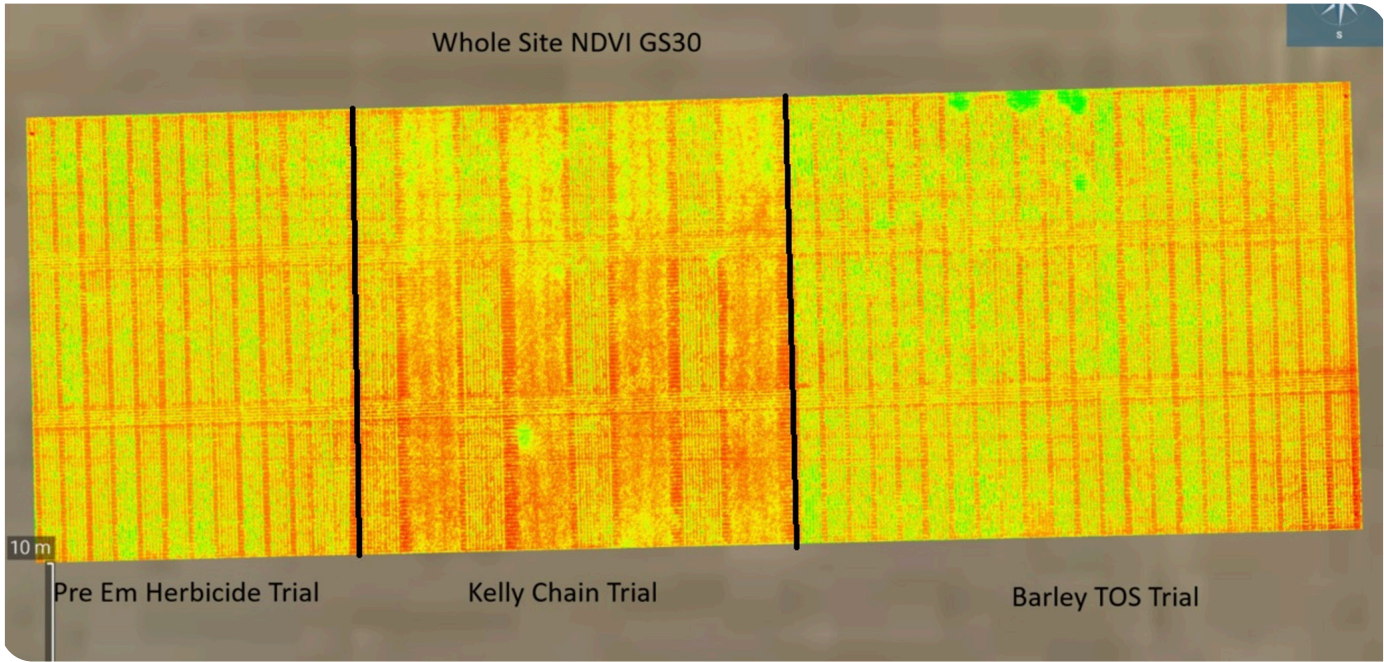
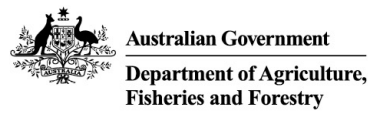


Figure 2. Wandearah trial site (3 trials) – NDVI at Growth Score (GS) 30.

ACKNOWLEDGEMENTS

This project received funding from the Australian Government’s Future Drought Fund. We sincerely acknowledge this support and thank the Johns family from Port Pirie for their ongoing collaboration and contribution to the trials.



This program received funding from the Australian Government’s Future Drought Fund

DE-RISKING *the* SEEDING PROGRAM

Trial 2: Barley Time of Sowing (TOS) in Dry Saline Soil trial (barley “super site” at Port Pirie)

AUTHORS:

Stefan Schmitt

*Agricultural Consulting &
Research*

Rachel Trengove

Upper North Farming Systems

LOCATION:

Western Side of the Ranges at Wandearah (–33.2769882 S; 138.0457620 E), on Byron and Leighton Johns property.

TAKE HOME MESSAGES

Findings are based on data from a single site and season so it is important to note that the outcomes may vary in different seasons as well as under different soil types and management practices.

- Barley seed tolerated sitting in dry, moderately saline soil for more than six weeks prior to the season break with no impact on crop establishment. Results may differ if seed is sown into partially moist saline soil and begins to imbibe moisture prior to the seasonal break.
- Slight reductions in early vigour were observed in the earliest sowing timings, but these differences were small and unlikely to affect yield under the conditions experienced in 2025.
- A small statistical increase in NDVI occurred with later sowing dates, although the differences were minor and not visually apparent in the field.
- Establishment improved where barley was sown into a slightly moist seedbed following a small rainfall event (5 mm) shortly before the seasonal break, probably due to improved seed–soil contact and more consistent seed depth due to sowing into more friable soil.

AIM

To determine whether prolonged exposure of dry seed in saline soil influences:

- Crop establishment
- Early vigour
- Canopy development under field conditions

METHODS

A dry seeding “super site” (3 trials at the same site) was established on a heavy red clay loam soil (EC^{1:5} 1.6 in the top 10 cm; classified as moderately saline). This soil is common in the region and has known constraints associated with poor crop establishment, including surface crusting risk and transient salinity. This allowed crop establishment strategies to be tested under realistic dry and early sowing pressures.

Treatments were sown using a small-plot seeder with 10-inch tine spacing. Sowing speed was approximately 8 km/hr with uniform sowing depth and a seeding rate of 75 kg/ha. This ensured comparability across treatments and reduced variability associated with machinery performance. Plots were 1.5m by 9.5m and there were 3 replicates.



Figure 1. Sowing the barley time of sowing trial

Commodus barley was sown (Figure 1) weekly from the 9th of April until just prior to the seasonal break in June to assess whether crop establishment and early vigour were affected when seed remained dry in moderately saline soil for an extended period.

Seed remained in a dry seedbed throughout the treatment period, with no germination until the season break in June.

Monitoring activities included:

- Plant establishment counts (plants/m²).
- NDVI at GS30 as an indicator of early crop vigour.
- Visual crop assessments.

Statistical analysis was undertaken using Fisher's LSD ($P \leq 0.05$).

RESULTS AND DISCUSSION

Barley seed remained in dry soil from the earliest sowing date on the 9th of April until the seasonal break in June (more than 6 weeks). No relationship was observed between the duration seed remained in the soil and crop establishment.

Later sowing dates had marginally greater canopy density at GS30 (Table 1, Figure 2), than the earliest sowing date. This difference was small, not visually apparent in the field and would be unlikely to improve yield. However, it does suggest there was a minor vigour penalty from seed sitting in the soil ungerminated for such a long duration.

Establishment (Table 1) improved where barley was sown into a slightly moist seedbed following a small rainfall event (5 mm) shortly before the seasonal break. The small amount of moisture present improved seed–soil contact and consistency of seed depth.

Table 1. Plant Establishment and Crop Vigour.

Sowing date	Establishment (Plants per m ²)	Crop vigour (NDVI at GS30)
9 April	52 a	0.407 a
15 April	66 a	0.428 ab
22 April	57 a	0.420 ab
2 May	60 a	0.442 bc
8 May	61 a	0.441 bc
19 May	62 a	0.457 c

Means followed by the same letter within a column are not significantly different (Fisher's LSD, $P \leq 0.05$).

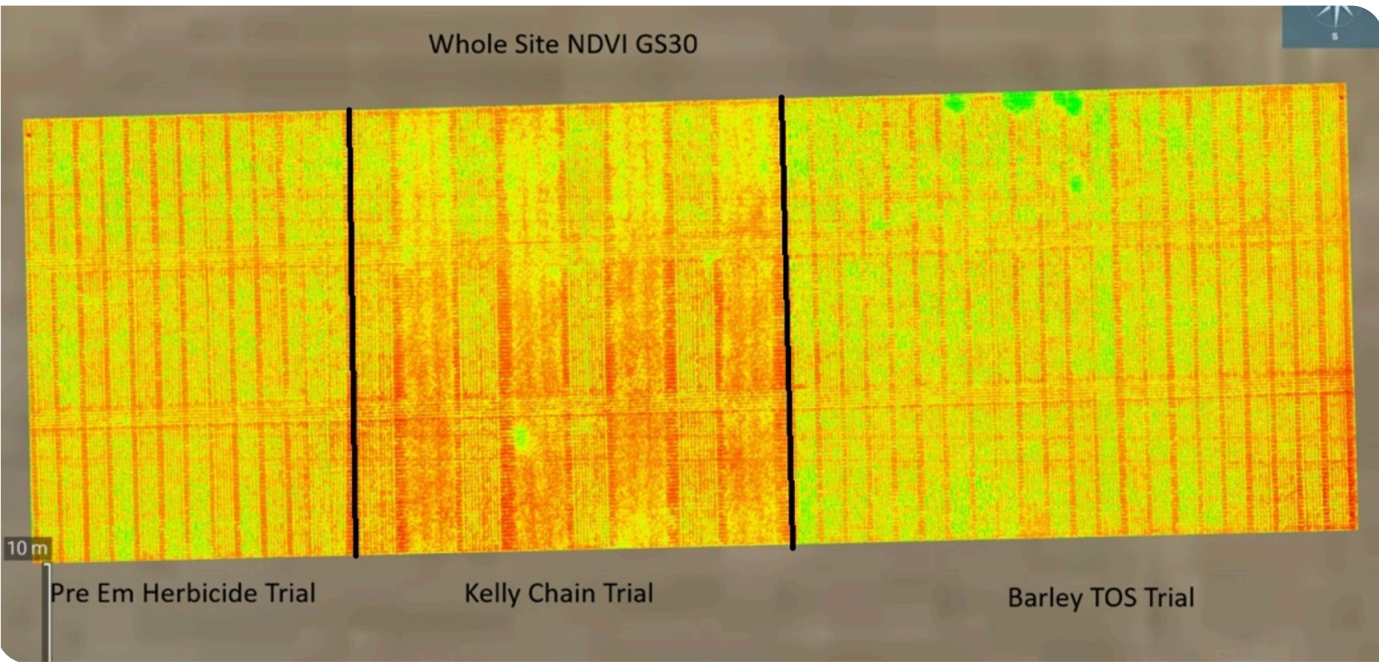


Figure 2. Wandearah “super site” (3 trials) – NDVI at Growth Score (GS) 30.

ACKNOWLEDGEMENTS

This project received funding from the Australian Government’s Future Drought Fund. We sincerely acknowledge this support and thank the Johns family from Port Pirie for their ongoing collaboration and contribution to the trials.



This program received funding from the Australian Government’s Future Drought Fund

DE-RISKING *the* SEEDING PROGRAM

Trial 3: Kelly Disc Chain Seeding System Comparison trial (barley “super site” at Port Pirie)

AUTHORS:

Stefan Schmitt

*Agricultural Consulting &
Research*

Rachel Trengove

Upper North Farming Systems

LOCATION:

Western Side of the Ranges at Wandearah (–33.2769882 S; 138.0457620 E), on Byron and Leighton Johns property.

TAKE HOME MESSAGES

Findings are based on data from a single site and season so it is important to note that the outcomes may vary in different seasons as well as under different soil types and management practices.

- Alternative shallow incorporation systems may not improve establishment on crust-prone soils in seasons where crusting does not occur.
- The expected advantage of surface sowing on a crust-prone soil was not observed in this trial as there was no surface crusting at germination in 2025.

- Improved crop safety was seen when the knife-point press wheel system was used where pre-emergent herbicides were applied due to the greater separation of seed from herbicide-treated soil when compared with the Kelly Chain system.

AIM

The aim was to assess whether surface spreading and shallow incorporation using a Kelly Chain could improve crop establishment on a soil prone to surface crusting

METHODS

A dry seeding “super site” (3 trials at the same site) was established on a heavy red clay loam soil (EC^{1:5} 1.6 in the top 10 cm; classified as moderately saline). This soil is common in the region and has known constraints associated with poor crop establishment, including surface crusting risk and transient salinity. This allowed crop establishment strategies to be tested under realistic dry and early sowing pressures.

Treatments were sown to Commodus barley at a rate of 75 kg/ha. Two establishment systems were compared:

- Surface-spread barley incorporated using a Kelly Disc Chain (Figure 1).
- Barley sown using a knife-point press wheel seeding system.
- Assessments were qualitative and included:
- NDVI at GS30 to assess crop vigour and canopy development.
- Visual assessments of emergence and crop uniformity.

No formal analysis was undertaken.

RESULTS AND DISCUSSION

In the absence of herbicides there was no clear advantage to either system regarding crop establishment (Table 1). It was thought that shallow surface sowing with the Kelly Chain may improve establishment by reducing the chance of surface crusting above the seed. Anecdotally, surface crusting only occurs after heavy rain at germination on the very low organic matter areas of paddocks with this soil type. The break to the season saw steady rainfall and crusting was not observed in this year.

When herbicides were applied the plot seeder performed better as indicated by NDVI assessments at GS30 (Table 1; Figure 2). This was due to improved separation of seed from herbicide-treated soil compared with the spread-and-incorporate approach of the Kelly Chain system.

Table 1. Results Summary

Seeding system	Herbicide applied	NDVI (GS30)	Observations
Kelly Disc Chain (surface spread + incorporation)	No	Similar	No clear difference in establishment
Knife-point press wheel seeder	No		
Kelly Disc Chain (surface spread + incorporation)	Yes	Lower	Herbicide-treated soil mixed with seed
Knife-point press wheel seeder	Yes	Higher	Better separation of seed from herbicide-treated soil



Figure 1. Kelly Engineering's – Kelly Chain sowing barley at Wandearah in 2025. Note barley is broadcast prior to the chain pass using an onboard hopper and air distribution system

DISCUSSION

In the absence of herbicides there was little difference between seeding systems.

The expected advantage of surface sowing on a crust-prone soil was not observed in this trial. However, when pre-emergent herbicides were applied the knife-point press wheel system provided improved crop safety by allowing greater separation of seed from herbicide-treated soil.

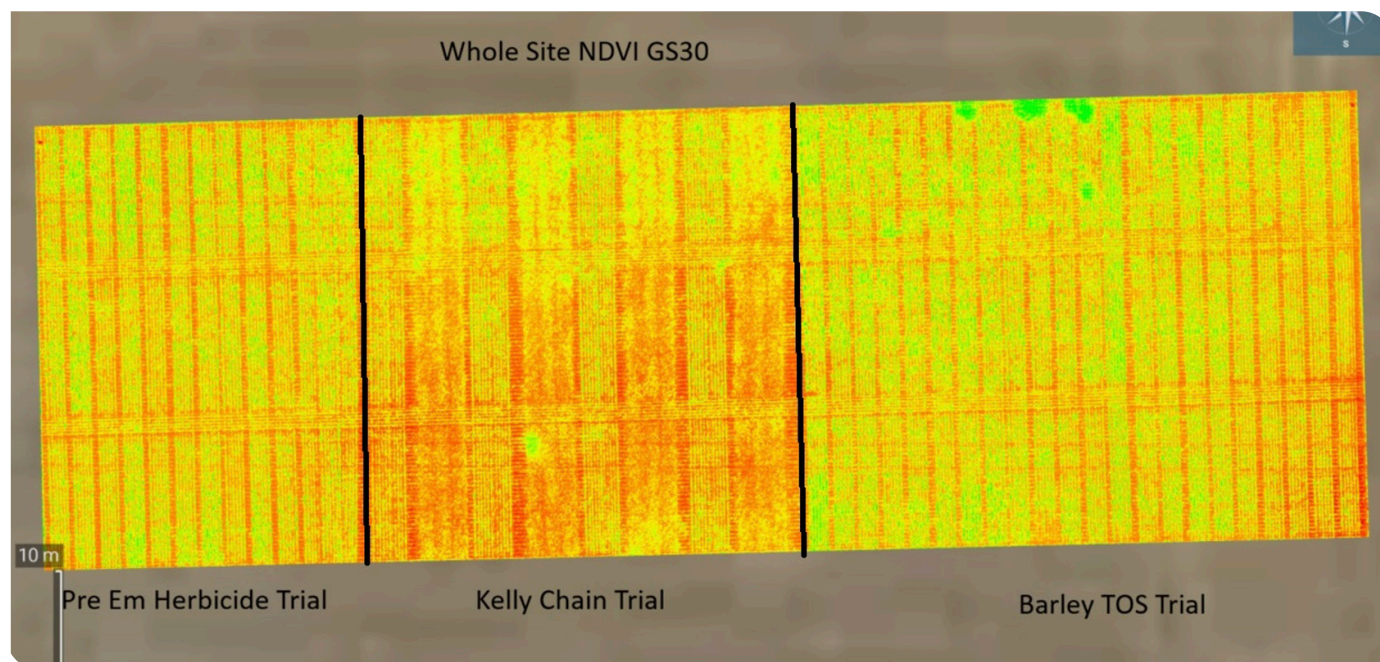


Figure 2. Wandearah trial site (3 trials) – NDVI at Growth Score (GS) 30

ACKNOWLEDGEMENTS

This project received funding from the Australian Government's Future Drought Fund. We sincerely acknowledge this support and thank the Johns family from Port Pirie for their ongoing collaboration and contribution to the trials.



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This program received funding from the Australian Government's Future Drought Fund

DE-RISKING *the* SEEDING PROGRAM

Demonstration: Pre-emergent Herbicide x Wheat Variety x Seeding system (Booleroo Centre)

AUTHORS:

Stefan Schmitt

Agricultural Consulting & Research

Rachel Trengove

Upper North Farming Systems

LOCATION:

The commercial paddock,
Booleroo Centre (–32.87281 S;
138.34560 E)

As a demonstration site, data collection was intentionally limited and no formal yield measurements or statistical analysis were undertaken. The focus was on qualitative and observational metrics rather than replicated measurement.

Monitoring activities included:

- Visual assessments of crop emergence, vigour, and uniformity across treatments
- Observations of herbicide response, including any signs of crop phytotoxicity
- Plant establishment notes recorded during key growth stages

RESULTS

No visual crop phytotoxicity symptoms were observed in any herbicide treatments. Wheat emerged and established without any discernible negative herbicide effects across treatments, indicating strong herbicide crop safety under the 2025 seasonal conditions. This outcome was particularly important in the context of two consecutive dry seeding seasons, where herbicide safety and crop damage risk were a key concern for growers.

TAKE HOME MESSAGES

- No visible crop phytotoxicity was observed across any herbicide treatment combinations, which increased grower confidence in the crop safety of commonly used pre-emergent herbicide programs during a second consecutive dry sowing season.
- Slightly improved emergence and establishment was observed with the hybrid disc seeder compared with the tine seeder.

AIM

To provide growers with a practical, local site at which to visually assess herbicide programs and seeding system performance under dry sowing conditions.

METHODS

Six pre-emergent herbicides (Treflan®, Avadex®, Sakura®, Luximax®, Matino Complete®, and Overwatch®) were assessed across three wheat varieties (Shotgun, Tomahawk, Calibre) to provide information on varietal response under early sown conditions. All treatments were dry sown using two seeding systems – tine (Figure 1) vs hybrid disc (Figure 2) to allow visual comparison of crop establishment and early vigour across establishment methods.



Figure 1. Sowing the Booleroo demonstration site – air drill/tine seeder



Figure 2. Sowing the Booleroo demonstration site – hybrid disc seeder

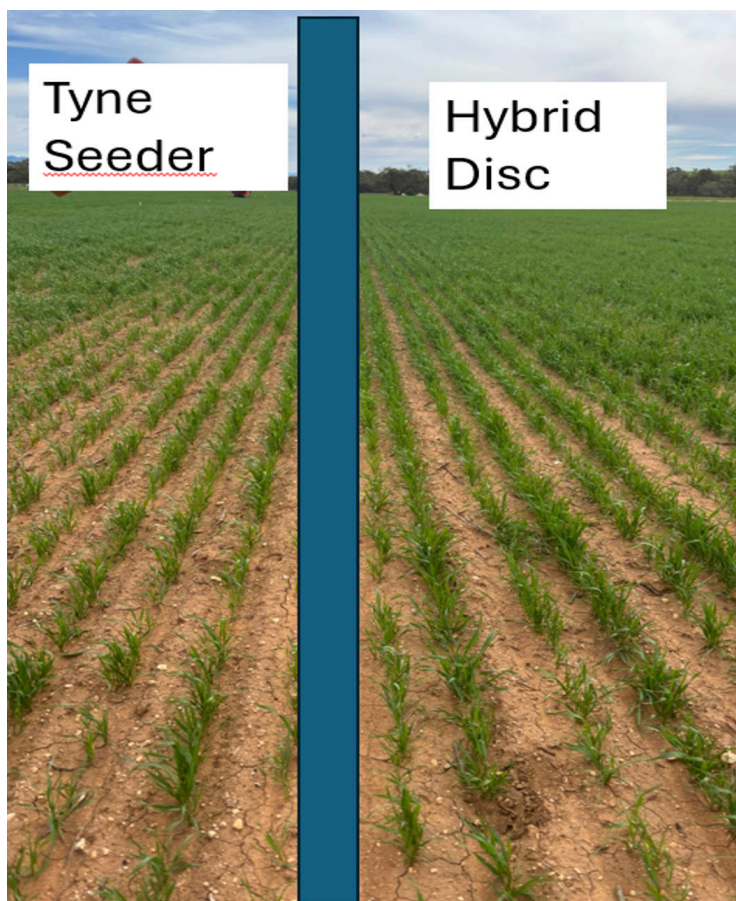


Figure 3. Crop establishment – tine vs hybrid disc seeder

Subtle differences were observed between seeding systems. The hybrid disc seeder showed slightly improved crop emergence and early establishment compared with the tine seeder, particularly under dry, late sowing conditions (Figure 3). This was observed as more uniform emergence and marginally stronger early vigour in hybrid disc sown strips during early crop establishment assessments.

ACKNOWLEDGEMENTS

This project received funding from the Australian Government's Future Drought Fund. We sincerely acknowledge this support and thank the Johns family from Port Pirie for their ongoing collaboration and contribution to the trials.



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BREAK CROP SUITABILITY ACROSS LANDSCAPES

Lentils on variable soils



THE PROJECT

This project “Break Crop Suitability Across Landscapes: Stage 2” was funded by the SA Drought Hub. A multi-regional approach was led by Upper North Farming Systems (UNFS) in partnership with Agricultural Innovation and Research, Eyre Peninsula (AIR EP). Case Studies spanning three farming groups and four node regions were delivered in 2024-2025.

BACKGROUND:

Managing break crops has long been a balancing act for growers in the Upper North and surrounding regions. Break crop options offer significant benefits (e.g. price potential, nitrogen fixation, cereal diseases, fertility & grass weed control), but their success is highly dependent on seasonal conditions (e.g. frost risk) and landscape variability (e.g. soil type, water holding capacity). Other risks include limited end-use markets, fragile stubble and reduced ground cover. In low rainfall and variable environments, this makes break crop selection and subsequent management complex.

AIMS:

To improve the understanding of break crop performance across Upper North landscapes and support more informed decision-making by identifying where and how break crops could be best positioned within farming systems.

KEY FINDINGS

- ▶ At Spalding, the highest grain yield was attained from sites that exhibited modest soil fertility (nitrogen, phosphorus, potassium) and yield was not correlated to subsoil salinity & soil boron, even though these constraints were present. Excess sodicity (and subsequently very low exchangeable calcium at depth) produced the lowest yielding site. The soil with the highest phosphorus & nitrogen status was the lowest grain yield – confirming other constraints appear present in this zone.
- ▶ At Melrose the lowest yield correlated to a low soil phosphorus and a marginal zinc status.
- ▶ Biomass (represented as hay yield) was correlated to grain yield at Melrose, but not at Spalding.
- ▶ Soil nitrogen balance can vary significantly with biomass & grain yield.
- ▶ Whilst some variation in soil pH, soil sulphur & trace elements levels existed across the sites, these were not correlated with grain yield.

WHAT WAS DONE?

Three focus points representing areas of different productivity, soil type and stubble load were identified within a single paddock at each of Melrose and Spalding (in the Upper North of South Australia).

At each focus point, the following were assessed:

- ▶ Soil parameters (0-10cm; 10-30cm; 30-60cm) pre-sowing and post-harvest.
- ▶ Crop establishment and growth:
 - ◊ NDVI measurements to indicate crop vigour.
 - ◊ Mid-flowering cuts to assess crop growth/hay yield potential.
 - ◊ Harvest index cuts to determine yield and grain quality.
 - ◊ Stubble assessments.
- ▶ Economics of production (provided by Pinion Advisory).

CASE STUDY *at Spalding*

GROWER:

Eric and Judith, Damien and Ruth, Ben and Fiona and their children farm together as “Sommerville Partners”.

SOIL TYPE:

Brown grey clay loam, 5–30% gravel.

GROWING SEASON RAINFALL:

298mm.



Sommerville Partners

THE SOMMERVILLE PARTNERS ENTERPRISE:

Historically, canola has been the primary break crop due to its reliability and fit within the system. Recently there has been a shift toward exploring legumes to diversify break crop options and reduce nitrogen fertiliser inputs.

A range of legumes have been trialled, including faba beans, chickpeas and lentils. Faba beans have shown potential, particularly for N contribution, but present logistical challenges due to seed size and machinery requirements. Chickpeas (Kabuli types) have similar machinery issues and are susceptible to grain cracking, both being issues which limits their suitability for the enterprise.

Overall, lentils (cv. Thunder in 2025) are becoming an important part of the break crop mix, complementing canola and hay within a system designed to balance profitability, weed control, and soil improvement.

OBSERVATIONS AND DISCUSSION:

In this investigation of lentil adoption across the landscapes in the Upper North there are a range of variations in soil data exhibited. At Spalding the starting nitrogen, phosphorus, potassium, sulphur, organic carbon, subsoil pH, sodicity & exchangeable calcium all varied widely between the sites.

Site C was the highest grain yielding site, which also had the lowest preharvest biomass (and subsequent hay yield).

This site exhibited moderate levels of nitrogen, sulphur & organic matter, high phosphorus and potassium. At depth it had moderate to high sodicity, moderate exchangeable calcium and was strongly alkaline. In contrast site A & B were the lowest yielding sites (with insignificant yield variation) exhibiting wide ranging nitrogen, phosphorus, organic matter, sodicity and exchangeable calcium (at depth).

Soil pH was not a significant driver of grain or hay yield at Spalding, although there was no significant variation in surface pH and no constraining acidity present.

Biomass prior to harvest (hay yield) appeared poorly correlated to soil test parameters and similarly was not well correlated to grain yield at Spalding. This metric demonstrates some zones would suit a hay salvage where terminal drought or frost put grain yield at risk.

Comparing starting (pre-sowing) soil nitrogen levels with post-harvest measurements, there are significant differences in how the zones nitrogen balance have changed. The highest yielding zone (site C) had a drop in measured soil nitrogen levels, as did the lowest yielding zone (site B). Site A had the lowest starting nitrogen level and was relatively low yielding but had a significantly higher nitrogen change by the end of the study. Understanding of nitrogen fixation processes, nutrient removal and other loss factors like leaching are likely important in explaining these differences across the zones.

Table 1. Key soil test parameters and final hay and grain yield at Spalding.

Pre-sowing	Focus point A	Focus point B	Focus point C
Nitrogen (kg/ha)	Low (~35)	High (~96)	Moderate (~66)
Phosphorus (Colwell, ppm)	Low (25)	Very high (88)	High (57)
Potassium	Moderate	High	High
Organic carbon	Low	Moderate	Moderate
Sulphur	High	High	Moderate
pH (30cm–60cm)	Slightly alkaline	Strongly alkaline	Strongly alkaline
Sodicity (30–60cm)	Not present	High	Moderate–High
Exchangeable Calcium (10–30cm)	High (84%)	Low (36%)	Moderate (49%)
Harvest and post-harvest	Focus point A	Focus point B	Focus point C
Nitrogen change (kg/ha)	+60	-14.4	-21.6
Hay yield (t/ha)	3.82	3.75	3.16
Grain yield (t/ha)	2.22	2.15	2.48

THE BOTTOM LINE:

Comparing the economics, there are opportunities for hay or grain, which is a useful management tool when frost or terminal dry conditions may risk a grain harvest. Residual nitrogen value varied widely across the sites, meaning future crops (eg canola, cereals) will likely respond very differently to applied nitrogen. This metric demonstrates value in zone soil testing for residual nitrogen after legumes in the Upper North region.

Table 2. Economic comparison of lentil grain and hay systems for the focus points (courtesy Pinion Advisory)

Gross margin comparisons (courtesy of Pinion Advisory)	Lentils at Spalding		
	Focus point A	Focus point B	Focus point C
Grain yield (t/ha)	2.22	2.15	2.48
Grain gross margin (\$/ha)	\$754	\$714	\$904
Value (± \$/ha) of nitrogen remaining after grain harvest for 2026	\$35	-\$24	-\$37
Hay yield (t/ha)	3.82	3.75	3.16
Hay gross margin (\$/ha)	\$843	\$819	\$617
Cost of nitrogen removal from hay compared to grain (\$/ha)	-\$132	-\$130	-\$109
Cost of potassium removal from hay compared to grain (\$/ha)	-\$171	-\$168	-\$142

CASE STUDY *at Melrose*

GROWER:

Andrew and Lydia
Walter

RAINFALL (GS):

207mm

SOIL TYPE:

Brown-grey Clay loam,
15-30% gravel



Walter Family

THE WALTER ENTERPRISE:

Pulse choices are generally limited for this enterprise, as seasonal conditions and lower rainfall typically restrict the viability of alternatives such as faba beans. Field peas present marketing and delivery challenges, while vetch is less suitable due to the absence of livestock. As a result, lentils are considered as one of the more resilient and practical pulse options.

Lentils were sown into a paddock following a previous lentil crop to evaluate performance under a tighter rotation and to better understand the implications of back-to-back lentil production.

OBSERVATIONS AND DISCUSSION:

Continuing the interrogation of soil metrics at the Melrose location, significant variations were found with soil test levels of starting nitrogen, phosphorus (and phosphorus buffering index (PBI)), zinc and sodicity and boron levels at depth. The highest yielding site (Focus Point A) had significant sodicity at depth, elevated boron levels, but importantly had adequate available phosphorus and zinc levels. The lowest yielding site (site B) demonstrated high starting nitrogen, low available phosphorus (with the highest PBI) and marginal zinc levels. Comparatively to the highest yielding site, the lowest had no sodicity or boron constraints.

Soil pH was not a significant driver of grain or hay yield at Melrose, although there was no acidity found in surface (0-10cm) samples.

At Melrose, biomass prior to harvest (demonstrated as hay yield) correlated closely to grain yield. This is a common correlation in biomass constrained environments, indicating that enhancing lentil biomass could be a key driver to improving grain yield at Melrose.

Comparing starting (pre-sowing) soil nitrogen levels with post-harvest measurements there are minimal differences in how the zone's nitrogen balance has changed. In the comparison at Melrose, N balance across the study was inversely correlated to grain (and hay) yield. The highest yielding plot resulting in the smallest increase in soil N. This may indicate that the Melrose site had more even nodulation across the zones, even with significant biomass (hay yield) variation, and that grain removal was the significant factor affecting residual soil N levels.

Table 1. Key soil test parameters and final hay and grain yield at Spalding.

Pre-sowing	Focus point A	Focus point B	Focus point C
Nitrogen (kg/ha)	Low (~35)	Moderate (~88)	Low (~33)
Phosphorus (Colwell, ppm)	Adequate (39)	Low (19)	High (60)
PBI	High (98)	High (113)	Moderate (57)
Sodicity (30cm–60cm)	High ^	Nil	Moderate ^
Boron (30cm–60cm)	Elevated	Moderate	Elevated
Zinc (DTPA, ppm)	Adequate (0.81)	Marginal (0.77)	Adequate (0.88)
Harvest and post-harvest	Focus point A	Focus point B	Focus point C
N change (kg/ha)	+13	+40	+23
Hay yield (t/ha)	3.60	2.01	2.79
Grain yield (t/ha)	1.70	1.39	1.54

THE BOTTOM LINE AND DISCUSSION:

Comparing the economics for Melrose, the direct correlation with biomass (hay yield) versus grain yield indicates visual assessment of biomass could be useful in predicting grain yield, and allow simpler assessment of hay versus grain comparisons. Residual nitrogen after lentils at Melrose was less variable than at Spalding with the highest grain yield resulting in the lowest increase in carry forward nitrogen, and subsequently less residual N value.

Table 2. Economic comparison of lentil grain and hay systems for the focus points (courtesy Pinion Advisory)

Gross margin comparisons (courtesy of Pinion Advisory)	Lentils at Melrose		
	Focus point A	Focus point B	Focus point C
Grain yield (t/ha)	1.7	1.39	1.54
Grain gross margin	\$455	\$277	\$363
Value (± \$/ha) of nitrogen remaining after grain harvest for 2026	+\$22	+\$68	+\$39
Hay yield (t/ha)	3.6	2.01	2.79
Hay gross margin	\$767	\$223	\$490
Cost of additional nitrogen removal from hay compared to grain	-\$124	-\$69	-\$96
Cost of additional potassium removal from hay compared to grain	-\$161	-\$90	-\$125



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In particular, we thank the Sommerville family (Spalding) and Walter family (Melrose), for providing demonstration sites, contributing valuable insights, and supporting the demonstration implementation throughout the season.

We also acknowledge the input and technical support of Pinion Advisory, particularly in the economic analysis, and the contribution of grower groups including AIREP and SARDI Minnipa Ag Centre for their collaboration and shared learnings across regions.

This work was supported by Upper North Farming Systems, with contributions from staff and project partners involved in trial design, data collection, and extension activities.

Finally, we thank all advisors, researchers, and growers who contributed their time, knowledge, and feedback to support the delivery of this project.

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FROST MITIGATION STRATEGIES for the Upper North



FUNDED BY:

South Australia Grains Industry
Trust (SAGIT)

PROJECT DURATION:

2024-2027

PROJECT DELIVERY:

UNFS, Agricultural Consulting &
Research

PRELIMINARY MESSAGES

- Frost risk is about duration, not just minimum temperature. Even when minimum temperatures were similar, longer time below 2°C in high-risk areas caused greater yield impact.
- Know your paddock zones – within-paddock variability matters. Small landscape differences (low frost risk vs high frost risk) led to large differences in frost exposure.

PROJECT SUMMARY

Frost poses a significant production risk across the Upper North of South Australia as there is a narrow optimal flowering window. This means growers must balance the risk of frost in August and early September against the likelihood of heat and moisture stress from late September onwards. This makes it difficult to align flowering with favourable conditions, particularly when aiming to maximise yield through early sowing.

While strategies such as selecting longer season varieties or later flowering types are commonly used to mitigate frost

risk, seasonal variability means these approaches are not always reliable in avoiding frost exposure. For this reason, interactions between cereal type, varietal maturity and time of sowing for managing frost risk were investigated in the Upper North.

AIM

To provide growers in the Upper North with information about the effectiveness of different strategies to reduce yield losses from frost events.

METHODS

The 2025 trial was located at Jamestown. A high frost risk Zone (Red) and a low frost risk Zone (Green) were selected within one paddock to allow comparison of treatments within and between each Zone. Stevenson screen loggers (ibuttons) were used to measure temperature in each Zone at soil surface and canopy height. Cereal type (bread wheat, barley, oat), varietal maturity (very slow to quick) and two times of sowing (early season and main season) were compared in three replicates in each Zone.

RESULTS AND DISCUSSION

Analysis of data has not yet been completed, making it difficult to discuss the results in a meaningful way at the time of publishing the UNFS Trial Compendium. Once data analysis and interpretation are completed, a full article will be uploaded to the UNFS website.

ACKNOWLEDGEMENTS

Thanks to the following – SAGIT and GRDC for funding; Stefan Schmitt (Agricultural Research & Consulting) for site setup, data collection and trial operations; Mick Faulkner for technical input and advisory support throughout the season; and special thanks to Peter Kitschke for generously providing the paddock and offering ongoing in-kind assistance and local knowledge.



GRDC
GRAINS RESEARCH
& DEVELOPMENT
CORPORATION



EARLY SOWING OPPORTUNITIES for LOW RAINFALL ENVIRONMENTS of SOUTH AUSTRALIA



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KEY MESSAGES

- Dry conditions before and after sowing reduced establishment and grain yield from the earliest sowing timing (April 1) at Appila.
- Later sowing timings (28 April and 27 May) produced the highest lentil yields at 1.59 t/ha and 1.35 t/ha, respectively.
- Seasonal conditions and sowing timing had a greater impact on lentil performance than varietal differences

WHY DO THE TRIAL?

Growers across low rainfall regions are increasingly looking at lentil crops as part of their farming systems. However, there is limited information on how management practices such as early sowing perform in these environments.

Previous research at Warnertown, SA showed that early sowing and establishment could increase faba bean yield by 20% or more compared with conventional sowing times

(Bruce et al. 2022). While lentil responses were more variable and, in some cases, negative depending on the season.

The current project aims to test how early sowing of lentil and faba bean performs across a wider range of low rainfall environments in SA. This report focuses on a lentil trial established at Appila, with other project sites located at Lameroo and Waikerie.

HOW WAS IT DONE?

The trial was established at Appila (~33.0107567, 138.435462) on a loam to clay loam soil. The trial investigated the responses of three sowing times and three lentil varieties (Table 1). The trial was sown with a knife-point press wheel system on 250 mm row spacing and sowing depth of 25 – 30 mm.

Table 1. Lentil time of sowing trial and treatment details, Appila 2025.

Appila rainfall:	286 mm annual 233 mm GSR (Apr–Oct)	Lentils:	PBA Kelpie GIA Thunder GIA Leader
Sowing dates:	TOS 1 – 1 April TOS 2 – 28 April TOS 3 – 27 May	Seeding rate:	120 plants/m ²
		Fertiliser:	MAP + Zn @ 100 kg/ha

There was a very dry start to the Appila growing season, with less than 15 mm recorded across both April and May. This site experienced a late season break with 13 mm rainfall on 8 June. Given the dry conditions, the first sowing date was irrigated with 18 mm of water immediately after sowing. The second and third time of sowing were both irrigated with 18 mm on the 28th of April.

Due to seed contamination issues with PBA Kelpie, the grain yield data presented in this report only includes the lentil varieties GIA Thunder and GIA Leader.

RESULTS AND DISCUSSION

Time of sowing

The earliest establishment timing resulted in lowest grain yield, on average 0.32 t/ha, which was a significant reduction (76–80%) compared to the second and third time of sowings (Figure 1). This was most likely driven by poor crop establishment following low soil moisture at sowing and the delayed seasonal break with very little rainfall received between seeding and early June.

Plant numbers declined throughout the season for lentil established in early April. Initial counts taken 28 days after sowing ranged from 82 plants/m² for PBA Kelpie to 106 and 123 plants/m² for GIA Leader and GIA Thunder, respectively (Table 2, Photo 1). By 57 days after sowing average plant numbers had fallen to 40 plants/m² and by late June (86 days after sowing) averaged just 7 plants/m².

The second (late April) and third (late May) time of sowings produced the highest grain yields at 1.59 t/ha and 1.35 t/ha, respectively (Figure 1).

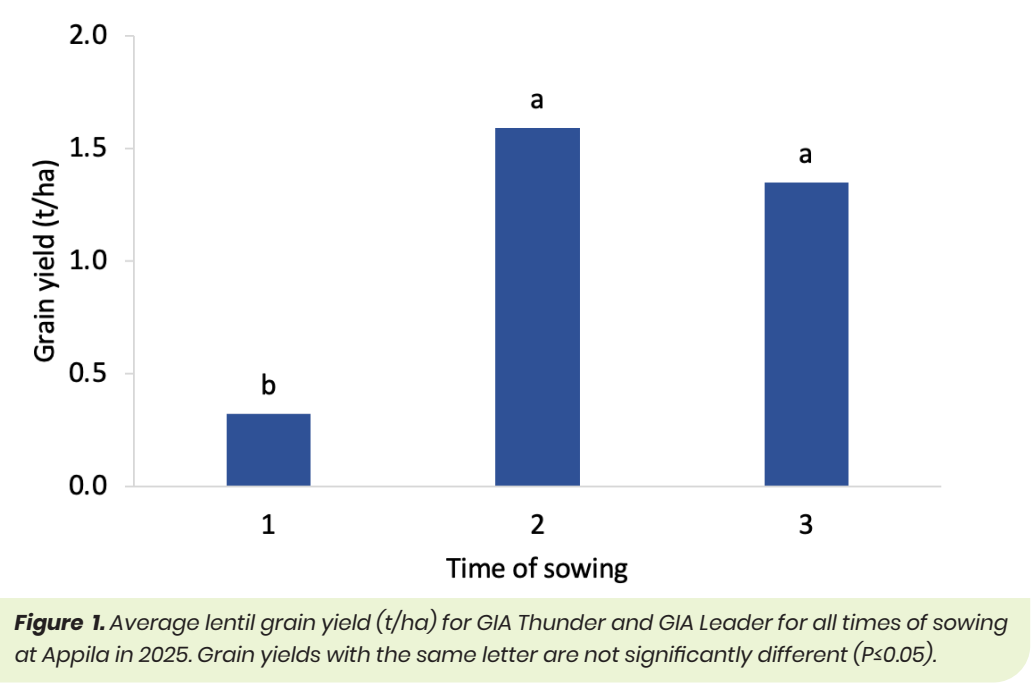


Table 2. Lentil plant establishment counts for all varieties and times of sowing across a number of assessment dates at Appila, 2025.

	Plant establishment (plants/m2)			
	28 April	27 May	25 June	8 July
TOS 1 (1 April)				
GIA Leader	106	29	5	
GIA Thunder	123	52	11	
PBA Kelpie	82	40	5	
TOS 2 (28 April)				
GIA Leader		106		
GIA Thunder		98		
PBA Kelpie		105		
TOS 3 (27 May)				
GIA Leader			82	104
GIA Thunder			51	116
PBA Kelpie			65	90



Photos. GIA Thunder lentil sown at TOS 1 (left) TOS 2 (middle) and TOS 3 (right) at Appila, SA. Images taken on 15th August 2025.

There was no interaction between sowing time and variety ($P = 0.989$). There were also no significant varietal differences observed in grain yield between GIA Leader and GIA Thunder in 2025. Averaged across sowing times GIA Leader yielded 0.96 t/ha, while GIA Thunder yielded 1.21 t/ha (Figure 2).

These results indicate that under the seasonal conditions experienced, establishment timing had a greater influence on grain yield than varietal differences. The findings highlight the importance of matching sowing opportunities with available soil moisture and the seasonal outlook in lower rainfall environments.

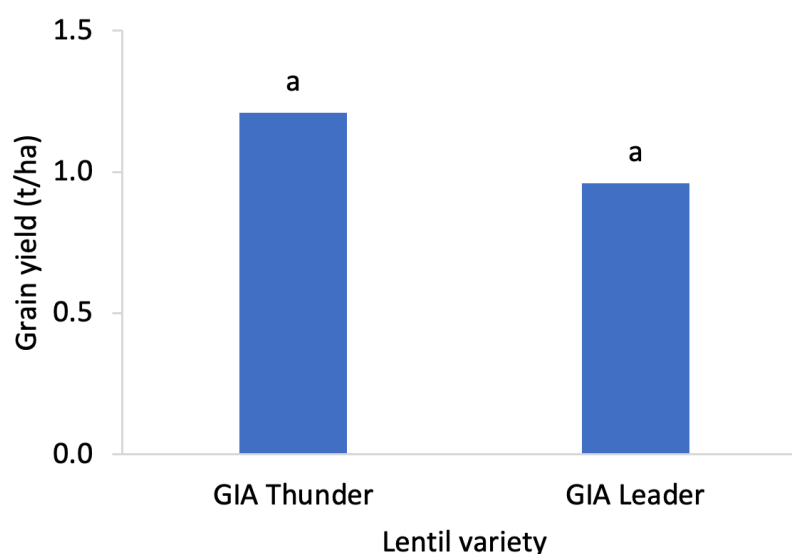


Figure 2. Average grain yield across 3 TOS for both lentil varieties at Appila in 2025.

ACKNOWLEDGEMENTS

The research undertaken as part of this project is made possible by the significant contributions of growers through both trial cooperation and the support of the GRDC project MSF2410-001RTX, the authors would like to thank them for their continued support.

REFERENCES

Bruce D, et al. (2022). Frost mitigation in pulses and early sowing opportunities for lentil and faba bean. GRDC Updates Adelaide 2022.

MANAGING MEDIC PASTURES AFTER DROUGHT

AUTHORS:

David Peck & Lee Bartlett

SARDI

Annual medic pastures provide high quality and high protein feed to livestock and fix nitrogen which lifts the yield and protein levels of the following crops. A long-term drought project is searching for annual medic genotypes that are better able to handle droughts. The research question is “do annual medic accessions collected from climates similar to low rainfall areas of South Australia in 2030–2050 outperform current cultivars?”.

While genotypes have the potential to increase medic drought resilience, the focus of this article is how to manage your

medics after a drought. Sites are located at Black Rock and Palmer.

Annual medics are grown in rotation with grain crops, with the medics grown every two, three or sometimes four years. Medics regenerate from soil seed reserves and need to have suitable levels of hardseededness (seed dormancy) to persist through 1–3 years of cropping.

The number of medic plants that regenerate is dependent on the size of the soil seed pool and the hardseededness levels. In drought years, less seed is added back into the soil seed pool. After a drought year, consider bringing a paddock back into medic sooner than usual. If you usually practice 1:2 rotations, you can do 1:1 rotations. After a wet year, you can lengthen the rotation.

Early in the growing season, medic paddocks can be monitored for plant numbers and allocated as Poor (< 200 plants per m²), OK (200–500 plants per m²) or High (> 500 plants per m²) production paddocks. This can be done by observation (Figure 1) or by counting the number of plants in a small quadrat (e.g. 0.1 m² – multiply by 10 to get plants/m²).

In average and wet years, when demand for feed is lower, the Poor and OK paddocks can be managed for increased seed set. Strategies to consider include: 1) best practice use of herbicides to minimise competition; 2) reduce grazing from first flowering onwards; 3) delay spray topping. Increasing the seed set in the Poor and OK paddocks will improve their subsequent performance and hence the farming systems benefit they provide.



Poor Regeneration



OK Regeneration



High Regeneration

ACKNOWLEDGEMENTS

Funding was from the Australian Government's Future Drought Fund. We thank Tom Kuerschner for hosting the Black Rock trial and UNFS for assisting us in extension of the project.



Australian Government
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Fisheries and Forestry



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SA DISCOVERY FARMS

CLOSING THE ECONOMIC YIELD GAP *and* MAXIMISE FARMING SYSTEMS BENEFITS *from* GRAIN LEGUME PRODUCTION *in* SA

AUTHORS:

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Rachel Trengove
Upper North Farming Systems

FUNDED BY: GRDC

PROJECT DURATION:
2021 – 2027

DEMONSTRATION:
Synergy between inoculant rates and DAP rates for lentil production

BACKGROUND

The rapid expansion of lentils as a break crop in dryland farming systems of South Australia (SA) has helped increase nitrogen in soils. Legume capacity to fix nitrogen is dependent on the number of active nodules. Amongst the most important factors influencing nodulation (and so nitrogen fixation) and grain production in lentils are inoculant and fertiliser rates.

Understanding the interaction of DAP fertiliser rates and inoculant rates on grain yield of lentils is important for increasing the sustainability of grain legume systems.

METHODS

Eight demonstration strips (no replication) were used to quantify effects of different rates of inoculant and DAP application on lentil production within one paddock near Melrose in the Upper North of SA. Demonstration strips were seeder width and the length of the paddock. The paddock was cropped to lentils the previous year in 2024. The 2025 lentil crop was sown on 24th May 2025.

Five biomass cuts were taken per demonstration strip on 24th September, oven-dried at 40°C and weighed to assess crop biomass accumulation. At maturity, ten harvest index cuts were taken per demonstration strip on 5th November, dried at 40°C, biomass yield was determined and samples were threshed to determine whole grain weight, from which grain yield (t/ha) was calculated.

RESULTS & DISCUSSION

Some trends can be seen in the data (Figure 1), but it is difficult to make recommendations based on these results, particularly as the 2025 growing season had limited rainfall (especially during grain filling).

What is clear is that comprehensive research is needed to quantify the effects of inoculant and DAP rates on legume production within paddocks in dryland farming systems. Understanding within-paddock variability in responses would improve decision making for the whole paddock.

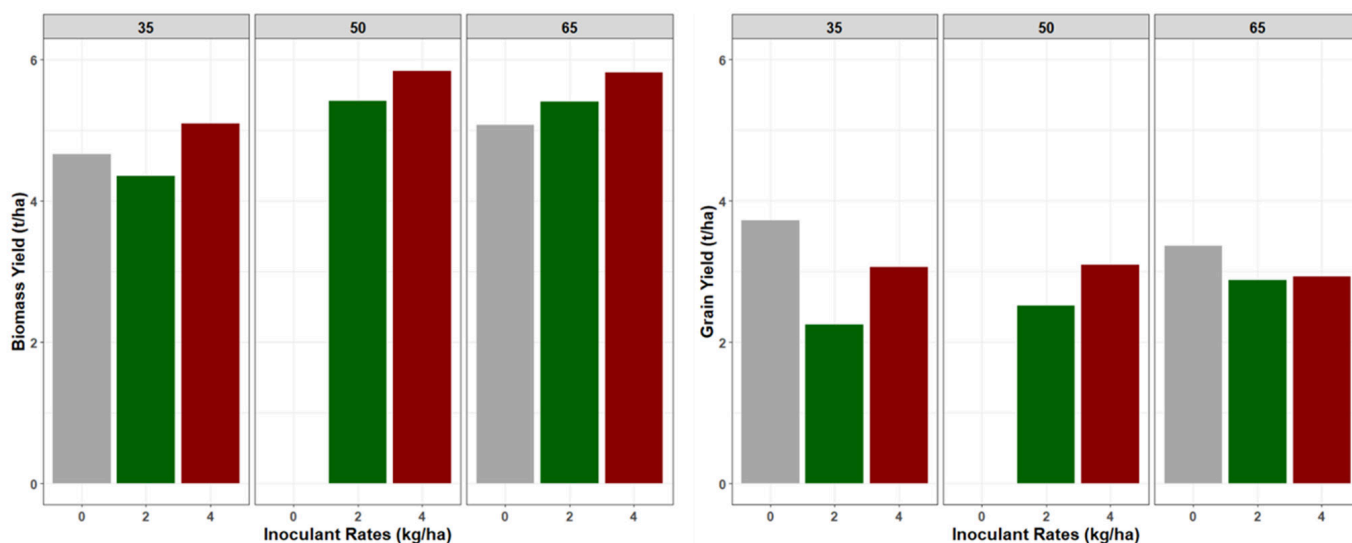


Figure 1. Effect of inoculant and DAP rates on biomass accumulation (LHS) and grain yield (RHS) of lentils.

Thank you to the Walter family from Melrose for their contribution in hosting and seeding this demonstration site on behalf of UNFS.



UNFS 2025 EVENT SUMMARY

Date	Event	Location	Participants	Details	Event Funded By:
February					
5	AWI Sticky Beak Day	JP Carey's Farm – Booleroo Centre	25	- Ben White, Kondinin Group – sheep yard design - Nathan Scott, Achieve Ag Solutions – flock structure, ewe condition scoring - Deb Purvis, Purvis Agri Finance – Farm finance	AWI Extension
10	RiskWiSe in the Upper North Workshop	Orroroo – Commercial Hotel	30	Guest speakers: - Barry Mudge - Dr Peter Hayman, SARDI - Dr Kenton Parker, CSIRO. – Interactive discussion on climate and profitability of farming around Goyder's line.	GRDC
15	Appila Coffee & Donut Morning	George Park, Appila	100	Organised by Simon Malcolm of Simon Malcolm Productions, with a mission to “create novel opportunities for people to gather where they live, to nurture community and conversation”.	PIRSA – Connecting Communities Grant
17	SA Regional Brain Reset Tour	Jamestown Aerodrome	40	- Allan Parker, a Behavioural Scientist from Peak Performance Development. - The workshop delved into the neural pathways that govern our thoughts and behaviours. - Offered tools for a Calming Brain Reset.	- N&Y Landscape Board - GRDC (RiskWiSe project)
27	Tools for Tough Seasons	Melrose Hall	10	- Facilitated by Women Together Learning (WoTL), on behalf of Ladies on the Land. - Presenters, Toni Duka and Felicity Turner - Provided women in farming practical tools to navigate tough farming seasons and manage stress, and - Strategies to support personal wellbeing and business decision making.	WoTL
March					
6	Nelshaby Pre-Seeding Meeting	Napperby Tennis Club	26	- Stefan Schmitt of Agricultural Consulting & Research (AC&R) shared trial results from the de risking seeding program and discussed strategies for controlling spiny emex in lentils. - Bron Stedall from Pinion Advisory delivered an Agrisilience masterclass focused on strengthening communication within farming families to support teamwork and cohesion.	- Livestock SA - AgRi-Silience - SA Drought Fund - PIRSA - GRDC

UNFS 2025 EVENT SUMMARY

Date	Event	Location	Participants	Details	Event Funded By:
March					
26	Financial Literacy Workshop	Orroroo Commercial Hotel	15	- Facilitated by Paige Cross of Cross Country Management. - Provided participants with essential financial tools to budget, plan and grow for smarter farming.	Livestock SA – AgRi-Silience Program
26	RiskWiSe in the Upper North Workshop	Wilmington Hotel	10	Guest speakers: - Barry Mudge - Dr Peter Hayman, SARDI - Interactive discussion on the implications of climate risk on cropping systems in the lower rainfall areas of the Upper North.	GRDC (RiskWiSe project)
April					
1	Seeder Set Up Day	Booleroo Centre Sporting Complex	57	Guest Presenters: - Brett Asphar, an independent machinery specialist. - Michael Eyres of Field Systems Australia - Jess Koch of Breezy Hill Precision Ag - Local agronomists. - The workshop covered seeder setup, crop establishment, soils, precision ag mapping and seeder demonstrations.	- N&Y Landscape Board. - SA Drought Hub. - PIRSA.
June					
25	Fertiliser Workshop & Crop Walk	Nurom	25	Guest Presenters: - Wayne Pluske of Equii discussed fertiliser effectiveness with a focus on profitability. - Stefan Schmitt of AC&R facilitated the crop walk and provided updates on trials and the de-risking the seeding project.	- SA Drought Hub - GRDC
July					
26	E-Games	Booleroo Centre Institute	40	- Organised by Simon Malcolm, Simon Malcolm Productions. - A night of video games, food & fun for our youth. "Keep talking & stay connected".	PIRSA Community Grant

UNFS 2025 EVENT SUMMARY

Date	Event	Location	Participants	Details	Event Funded By:
August					
14	UNFS & SPAA Grain Automate Expo	Melrose	90	- UNFS Annual Expo, delivered in partnership with SPAA and facilitated by Ed Scott (FSA), featuring a strong lineup of industry expert presenters. - The day showcased new machinery and technology in action. - VRT implementation and zoning processes. - Verge Ag Launch Pad demo. - Autonomy, AI & Data. - Precision Ag in Practice: Precision weed management and so much more.	- GRDC - SPAA - Sponsors – MGA, Flinders Machinery, NAB, O'Dea Farm Finance & Bunge
26	Header Set up Day	Durrant's Farm – Huddleston	90	- Facilitated by Brett Asphar, an independent machinery specialist. - The workshop gave growers practical, machine-specific tips to cut harvest losses, boost efficiency and outputs, prevent harvester fires and calibrating harvester technology.	- N&Y Landscape Board - SA Drought Hub
September					
3	Stock Yard Design & Low Stress Stock Handling	Hall's Sheep Yards – Jamestown	34	Guest Presenters: - Brett Asphar, an independent machinery specialist. - Michael Eyers of Field Systems Australia - Jess Koch of Breezy Hill Precision Ag - Local agronomists. - The workshop covered seeder setup, crop establishment, soils, precision ag mapping and seeder demonstrations.	- N&Y Landscape Board. - SA Drought Hub. - PIRSA.
23	MLA PDS Workshop – Boost your productivity with smarter pasture and grazing management	Don Bottrall's Shearing Shed, Appila property, Caltowie	20	- Facilitated by Cam Nicolson of Nikon Rural Services - The workshop covered pasture growth basics and feed budgeting essentials	- MLA - N&Y Landscapes Board
24	2025 Informal Crop Walk & UNFS AGM	Laura	10	- Crop walk with Michael Eyres of Field Systems Australia, looking at abiotic seedling stress in dry conditions trial. - UNFS Annual General Meeting.	UNFS

UNFS 2025 EVENT SUMMARY

Date	Event	Location	Participants	Details	Event Funded By:
September					
26	UNFS & Nelshaby Ag Bureau Western Crop Walk & Sticky Beak Day	Bus Trip – Nurom, Baroota, Warnertown	30	- A bus trip, crop walk and farm visits covering key agronomy and technology discussions. - Lentil agronomy updates and wheat variety trial comparisons. - Soil management through deep ripping and seeder technology. - Tour of CLM Quarry. - RiskWiSe update from Stefan Schmitt, - Michael Zwar of AgTech Services presented on drone-based weed detection. - The future of AI and decision making with James Venning and Andrew Walter.	- GRDC – RiskWiSe - SA Drought Hub - O'Dea Farm Finance
October					
7	Booleroo (Eastern) Crop Walk	Booleroo	13	- Facilitators and Agronomists Jeff Braun & Michael Brougham led the crop walk. - Appila lentil trial update delivered by Penny Roberts of MSF. - Discussions on wheat varieties and lentil agronomy; soil and stubble management and fertiliser strategies. - Visits to the NVT site & Commercial Paddock trial site. - De-risking the Seeding Program with Dave Clarke and Matt Nottle.	- GRDC – RiskWiSe - SA Drought Hub
9	Jamestown Crop Walk	Jamestown, Washpool, Spalding, Hacklins Corner	16	- Facilitator and Agronomist, Craig Davis of Crop Consulting Services. - Insights into lentil agronomy, nutrition and soil constraints. - RiskWiSe – the risks and rewards of lentil growing in the Upper North. - Plant breeding company representatives showcased new wheat, barley and canola varieties. - Frost trial site data.	- GRDC – RiskWiSe - SA Drought Hub
November					
13	Infant First Aid Training	Jamestown RSL	16	- Organised and hosted by Ladies on the Land. - Two first aid sessions delivered by Karyn from Head2toes, focusing on infant and child emergency response.	PIRSA Community Grant

2025 UNFS EXPO

Interest in AgTech was on full display at our UNFS's annual Expo. This year we collaborated with the Society of Precision Agriculture (SPAA) and the Grains Research and Development Corporation (GRDC) as part of their Grain Automate roadshow.

However, this Expo had UNFS flair and style with local farmers Jess Koch and Joe Koch speaking about their experiences attending the same event in Esperance, WA. Melrose farmer Andrew Walter (Wai) also spoke, detailing autonomy, AI, and data, and the questions around what it is, what it does and where it's headed in the future.

We considered ourselves especially lucky to have Edward Scott (a UNFS Operations committee member) as our facilitator. Ed is fantastic at creating energy in the room., asking questions, prompting for more information and keeping the conversation casual while simultaneously thought-provoking.

Outdoor demonstrations involved Michael Zwar (AgTech Services) exhibiting his drone used in drone-based weed detection and mapping, Andrew Sargent discussing the SwarmBot by SwarmFarm, and Upper North local Jordy Kitschke (Flux Robotics) presenting his rover robot that autonomously

traverses paddocks and removes weeds mechanically.

Lunch was kindly catered for by National Australia Bank (NAB), and involved lots of friendly discussions about the morning, gratefully, in the warmth of the sunshine.

After lunch Richard Copper (NAB) talked through the financial measures of AgTech and grain trade generally in relation to the current foreign affairs and political climate.

Local Bute grain grower James Venning then presented about his own data-informed experiences with AgTech, and the very first steps he took to get started. James, a numbers guy, also spoke about how the use of tech has assisted in improving economics on his own farm.

A panel session between James, Jordy, Andrew and Michael discussing all topics AgTech, big and small ended the official event.

Did the attendees of the day have a good time? It appeared they did, as many stayed past the official event close time to continue chatting about the day and what they were going to do differently on their own farms.



Jordy Kitschke speaking with Ed Scott

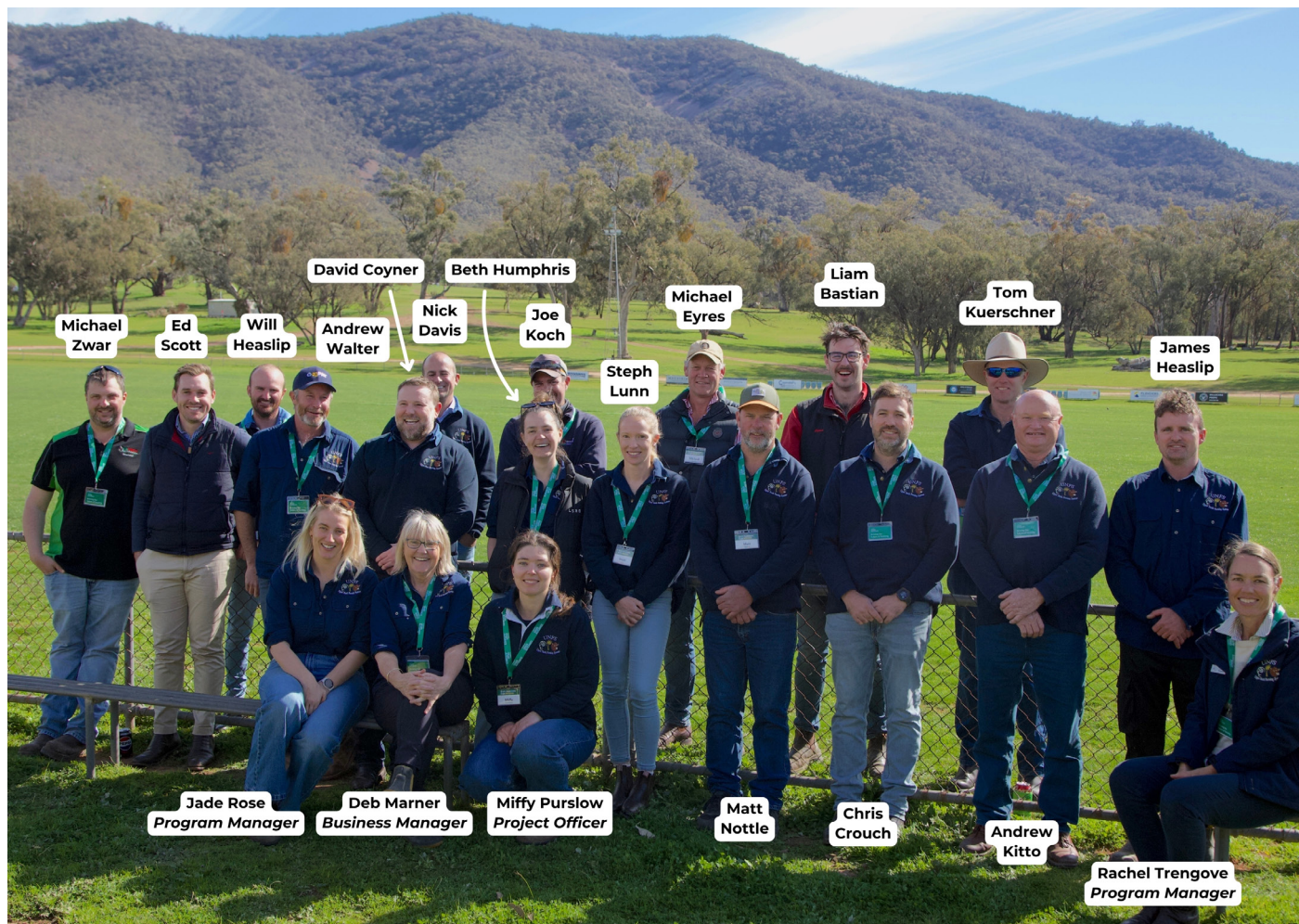


Andrew Sargent (left) speaking with **Ed Scott** (right) about SwarmFarm Robotics' SwarmBot (machine pictured behind)



Michael Zwar (left) speaking about drone based weed control





Upper North Farming Systems **staff** and **strategic board**



Andrew Walter presenting about 'what is autonomy and data, what does it do and where is it going?'



Jess (left) and **Joe Koch** (right) speaking about their experiences and learnings from the Grain Automate event in Esperance, WA.



UNFS HEADER SETUP DAY



Upper North Farming Systems (UNFS) hosted a Header Set Up Workshop on 26th August at Greg Durrant's farm near Georgetown, with Brett Asphar, Independent Machinery Specialist, leading the day and providing insights into optimising their harvest operations.

The workshop featured a range of machines, with New Holland, John Deere and Case IH headers and two MacDon header fronts on-site. A big thank you to the Durrant family for hosting, Robert Price and Hamish Klemm for providing their headers, and Chris Bazley from Primary Sales for supporting the day.

The goal is simple: improve header performance, keep grain in the box, maintain quality, and capture weed seeds—ultimately leading to better returns per hectare.

Brett emphasised the importance of understanding your machine and measuring adjustments, not guessing. As he explained:

- *"You've got to know your machine."*
- *"The cheapest accessory for your header is a loss pan."*
- *"Every header is unique – even if you run 3 identical headers, they will run differently."*
- *"The target is to achieve a set up that is forgiving."*

Brett showed growers how to measure and adjust settings to significantly cut losses, ensuring more grain makes it to storage or market. The workshop, funded by the SA Drought Hub and the Northern & Yorke Landscape Board, provided practical advice for reducing harvest losses, improving weed seed control, and enhancing harvest efficiency.

Brett's key takeaway's for header setup:

1. **Loss testing** – Always use loss pans or drop trays. Test after every change.
2. **Concave settings** – Ensure your concave is square. Start looser than your factory settings, only reduce clearance when necessary.
3. **Spike rasp bars** – (If applicable) Consider upgrading from ~8 to 28–34 bars for better threshing and reduced rotor loss
4. **Machine-specific checks:**
 - ◇ Fan speed: just high enough to lift chaff, not grain.
 - ◇ Rotor speed: higher for green/heavy crops, lower for dry/light grain, slower than book recommendations.
 - ◇ Sieves: Wider than book recommendations, small adjustments matter – too wide = loss, too tight = overload.
5. **Seasonal adjustments** – Adapt to conditions: reduce fan speed in dry crops, increase rotor speed and rasp bars in green/strawy crops, and always re-set and re-test when changing varieties.

Brett's golden rule: Adjust one setting at a time, measure and then re-check.

Author: Rachel Trengove

Funding: Northern & Yorke Landscape Board and SA Drought Hub



This program received funding from the Australian Government's Future Drought Fund



This event is supported by the Australian Government through funding from the Natural Heritage Trust under the Climate-Smart Agriculture Program and delivered for the Northern and Yorke Landscape Board, a member of the Commonwealth Regional Delivery Partners panel.





AWI EXTENSION STICKY BEAK DAY

with a focus on yard design and changes for an even better sheep business



UNFS hosted an Australian Wool Innovation (AWI) Extension Sticky Beak Day at JP Carey's farm at Booleroo Centre in February 2025.

Ben White from the Kondinin Group, discussed various sheep yard design options and their benefits. Nathan Scott of Achieve Ag Solutions offered guidance on making informed flock structuring decisions and a hands-on masterclass in condition scoring ewes.

BEN WHITE – SHEEP YARD DESIGN

Ben White, an agricultural engineer with knowledge of sheep yard design, shared tips for creating yards that

benefit both operators and sheep. His key messages emphasised that yards should be functional, low-stress environments for animals, and tailored to the operator's needs.

Key takeaways included:

- **Fit for Purpose Yards:** Yards should be practical, ensuring ease of operation and low-stress handling for sheep.
- **Yard Covering Considerations:** Yard covers must be wide enough to avoid shadows in the main working areas, which can cause sheep to baulk.

- **Site Selection:** Pay attention to soil type and slope to ensure proper drainage and avoid creating muddy conditions. Sheep are naturally inclined to run uphill and into the wind, so as a rule of thumb, designing yards to suit this behaviour can improve efficiency. That said, there are examples where a slight downhill gradient can work.
- **Lead Up Race:** A lead up race is vital for smoothly integrating a sheep handler into existing yards. Ideally constructed with blank panels and in a curved shape leading into the race, it should not be too wide – especially for those working alone, as it can prevent sheep from turning back.
- **Mid-Race Gates:** These are particularly useful when working with smaller sheep like lambs.
- **Design for Flexibility:** A bugle design remains a good option, and integrating inter-pen diamonds into the yard design can work well. Personal access gates strategically placed will reduce unnecessary climbing and should swing in the direction the sheep are moving. Also, consider rollers at angled pinch points to keep sheep moving.
- **Make changes:** Don't be afraid to get the angle grinder out and make changes if your yards are not working well for you.
- **Design is fundamental:** when investing in upgrading existing yards or erecting new yards, it's a good idea to go and look at yards on operations on a similar scale.
- **Be there when sheep are running through the yards:** ask questions of the operator about what has worked well and what they would change if they had their time to design their yards again.

NATHAN SCOTT – CONDITION SCORING (CS).

Nathan's session highlighted the key benefits and positive impacts of CS, including:

- o Joining results
- o Lamb survival
- o Lamb growth rates through lactation
- o Overall ewe health

For optimal results, producers should aim for a condition score of 3 for single-bearing ewes and 3.3 for multiple-bearing ewes. The best time to condition score ewes is during other handling activities such as weaning, pre-joining, pregnancy scanning, and lamb marking.

Nathan encouraged producers to make a habit of checking CS of ewes each time sheep are in the yards

rather than adding it as a separate task. Condition scoring is your friend as it helps you to avoid surprises!

Nathan guided participants through a hands-on condition scoring session, helping attendees to better understand the nuances of scoring ewes accurately. Participants were asked to assign coloured pegs to ewes in a race, based on their condition scores, sparking great discussion and learning.

Nathan set out to have producers talking in 0.1 of a condition score increments to achieve greater accuracy, which he successfully achieved during his session. If you work in 0.1 of a CS increment, and you are a couple increments different to the next person, then the outcomes won't be dramatically different in the sheep. If you work in whole, or half CS increments, and you are a couple of increments different to the next person then the results could be dramatically different within the sheep's performance.

Nathan's quick pointers were to start with finger tips touching the spine. If you can feel the spine at all – the ewe has to be under CS 4, if can't feel the spine – the ewe is over CS 4. If the ewe is under condition score 4, then it is important to be able to accurately identify her actual condition score. Determining whether a ewe is above or below CS 3 is a crucial skill as being below CS 3 can have a dramatic impact upon her health and performance.

How to condition score – a guide from Nathan:

- Finger tips on the spine – can you feel her spine easily?
- Feel down over the top of the short ribs feeling the shape of that fat and muscle.
- Feel the end of the ribs – can you feel them easily? Can you push between them.

Condition scoring scale:

Developed by Nathan Scott (Achieve Ag Solutions) to help producers better understand the method of condition scoring in smaller increments. The scale is based on information provided by the Lifetime Wool Project.

Condition Score	Description
2.3	Little cover over the top of short ribs. Just possible to feel each rib through muscle on top of short ribs. Ends of ribs are easily felt and possible to push between them
2.5	Heavily concaved shape muscle/fat between spine and end of ribs. Ends of short ribs can be felt and possible to push between them
2.7	Concave shape muscle/fat between spine and end of ribs, but with some cover over the top of short ribs. Ends of ribs can just be felt, but with some cover over them.
3	Good cover over top of short ribs, with a flat shape from beside the spine to the end of the short ribs. Ends of ribs are well covered, with individual ribs only just being able to be felt.
3.3	The start of a convex shape to muscle/fat over top of short ribs. Ends of short ribs well covered, difficult to feel individual ribs.
3.5	Convex shape indicating good cover of muscle and fat over top of short ribs. Ends of ribs very well covered
3.7	Fully rounded cover over short top of ribs. Only just able to feel spine.
4	Spine is now disappearing. Difficult to feel at all. Very round all over

A ewe below CS 2.3 is far too skinny and presents significant animal health and performance challenges. Above CS 4 a ewe is too fat, scores are incredibly difficult to differentiate and being above CS 4 provides little practical benefit in terms of outcomes. That is about as much as you need to know outside of the descriptions above.

The Sticky Beak events were proudly supported by funding from the Australian Government's Future Drought Fund, the

Government of South Australia, Livestock SA, and Australian Wool Innovation Extension SA.

Thank you to UNFS members, JP and Nic Carey for hosting the day. UNFS Hosts Successful AWI Extension Sticky Beak Day at JP Carey's Farm

Author: Rachel Trengove

Funding: AWI Extension



CLIPLEX STOCK YARD DESIGN & LOW STRESS STOCK HANDLING



Sheep producers from across the district gathered at Eldena, north of Jamestown, on Wednesday 3rd September for the UNFS Clipex Stock Yard Design and Low Stress Stock Handling Workshop, hosted by Tim and Lisa Hall.

The day was facilitated by Tom Austin, (Clipex Solutions Specialist and a Kelpie breeder from Elfinvale Stud Kelpies). Tom combined sharing his expertise in yard design with a hands-on demonstration of working dog training and opened the workshop by posing an important question: *"Is upgrading sheep yards an investment or a cost?"*

While acknowledging the upfront expense, he stressed that well-designed facilities should be seen as a long-

term investment that delivers efficiency, reduced labour and improved animal welfare. Tim Hall, reflecting on his own experience building a new shearing shed and yards, reinforced this message: *"Planning is the long bit. Once you pull the trigger, it's quick to execute. The planning is essential to get it right, to set up for success."*

Tom highlighted that good yard design is about working with sheep behaviour - using flight zones and pressure points so stock feel they have an escape route. Curves, well-placed gates, and efficient race design all improve sheep flow, while modifications to existing yards can make a big difference without major expense. Tom emphasised that yards capable of being worked effectively by just one person and one dog are

achievable - reducing stress, labour and animal injury.

The synergy between yards and working dogs was explored by Tom, who encouraged producers to view their dogs as farm assets, not tools. He stressed the need for bonding, consistent training and small amounts of daily attention. He outlined his philosophy: a great dog is the product of genetics, environment, and opportunity. The ideal balance is around 60% “eye” and 40% “bark.” Foundation training (building trust, control, and basic commands) sets the stage for advanced skills like casting, driving and pen work.

Participants were treated to a live demonstration with a young, untrained pup, where Tom showed how to create an environment for success. Using a small group of quiet sheep in a rectangular yard, Tom explained the principle of “*pressure on, pressure off*”. He demonstrated simple techniques, such as using a garden rake to apply pressure when needed. The key - ensuring the pup learned to circle stock from behind rather than cutting between handler and sheep.

The clear take-home message was: well-designed yards combined with a well-trained dog can transform farm efficiency.

The workshop was delivered by Upper North Farming Systems in conjunction with the **Productivity and Predator Control Network**, funded by PIRSA, MLA and Livestock SA, with support from Clipex. A big thank you goes to **Tom Austin for travelling from Victoria**, and to **Tim and Lisa Hall and Hayden Hillman** for hosting the day.

Author: Rachel Trengove

Funding: PIRSA, MLA, Livestock SA



This workshop is run in conjunction with Productivity and Predator Control Network funded by PIRSA, MLA & Livestock SA.

SEEDER SET UP WORKSHOP



Upper North Farming Systems kickstarted April with an exciting 50-person attendance to our Seeder Set Up event held at the Booleroo Centre Sporting Complex. This event was extremely relevant to the unfortunate dry season of 2024 and the predicted dry season in 2025.

Farmers, agronomists and industry staff travelled from across the region to learn more about dry sowing, and to listen to presentations from soil scientist Michael Eyres (Field Systems), precision ag expert Jess Koch (Breezy Hill Ag), and the main speaker, machinery expert Brett Asphar (Specialised Ag). Three seeders were brought in

by local farmers. Single tyne (Matt Nottle), double tyne (Joe Koch) and hybrid disc (David Clark).

The morning began with an egg and bacon roll, followed by Michael Eyres delivering a presentation about how understanding and managing soil conditions, from structure and biology to sampling methods and seeder set up, can drive better planting performance and ultimately improve crop outcomes.

Following on from Eyres was Precision Ag expert Jess Koch who spoke to the audience about how to approach

variable rate fertiliser decisions after a dry season. Her talk focused on making the most of the maps and data you already have and being smart about where and how much phosphorus to apply.

After Michael and Jess's presentation, attendees moved outside to observe the three seeder set ups on display and listen to in-depth information about each seeding rig from their owners.

Brett Asphar, the extremely knowledgeable machinery expert, then spoke to the crowd about everything to do with the mechanics and functionality of seeding and the endless possibilities of seeder set up dependent on circumstance.

Soil conditions and seeder set up:

1. **Soil testing needs a mindset shift:** Don't just test soil to work out fertiliser rates – look more deeply at how soil will perform under seasonal stress. It's about understanding how soil and plant interactions shape yield potential, not just inputs.
2. **Good soil management covers more than nutrients:** Things like pH, salinity, texture, compaction,

porosity and even soil biology all play a role. A successful crop starts with managing the whole soil environment, not just nutrients.

3. Soil sampling methods matter:

How and where you sample, whether in layers, pooled from multiple spots or near the surface, can change what the results tell you. Match your sampling approach to your management goals!

4. Seeder setup affects soil throw and seedbed quality:

Field results from the Pocket Buster showed that increasing seeder speed from 7 to 10 km/h gave a 12% boost in inter-row soil throw and improved the spread of fine and coarse soil in the furrow, helping create a better seedbed.

Variable rate fertiliser decisions:

1. **Not every paddock needs the same rate** – In areas that consistently underperform due to salt or other issues that can't be fixed with more fertiliser, consider cutting back in those zones. That saved fertiliser can be put to better use elsewhere.

2. **Use what you've got** – Good old-fashioned observation can help you break paddocks into useful zones even if you don't have detailed yield maps or tools like satellite imagery, soil colour etc.

3. **Super low or no fertiliser?** Trust your tests – On paddocks with strong soil P levels, Jess gave examples where growers used little to no starter fertiliser with good results. This only works when you know your numbers and understand your soils.

4. **Start simple** – If you're new to variable rate or running low-input crops like pulses, don't overcomplicate it. Going with a basic blanket rate can be a conscious and effective decision.

5. **Strip trials pay off** – Doing small test strips is a low-risk way to test different rates. You don't need special gear, and the results can give you confidence to fine-tune your approach in future seasons.

Author: Miffy Purslow

Funding: N&Y Landscape Board, PIRSA, SA Drought Hub



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Australian Government



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and Regions

MLA PRODUCER DEMONSTRATION SITE UNFS IMPROVED PASTURE MANAGEMENT SYSTEMS WORKSHOP

Boost Your Productivity with Smarter Pasture & Grazing Management



In September 2025, farmers joined Cam Nicholson (Nicon Rural Services), alongside local producers Alison Henderson and Andrew Cootes, for a practical workshop supporting the current MLA PDS project with UNFS. The project finishes this year and aims to improve pasture management in the Upper North by demonstrating better pasture options and showing how understanding Food On Offer, feed budgeting and the use of remote-sensing tools can lift livestock productivity.

Alison, who is hosting one of the PDS demonstration sites, compared mixed versus single-species pastures. She is exploring the use of mixed pastures, rotational grazing

and containment feeding when needed to achieve greater soil cover and maintain sheep condition year-round.

Andrew's participation in a Grazing for Profit course and involvement with the Mid North Grasslands Group influenced his decision to trial an intensive rotational grazing system. He originally subdivided his non-arable hills country into small 4–5 ha paddocks, but over time it became clear that sheep consistently grazed out the north and west slopes first—highlighting the importance of aspect and the need to adjust fence lines.

Andrew has since moved several fences. To achieve effective cell grazing, he has found he needs around 200 DSE stocking density with long rest periods – essentially exclusion for most of the year. While higher stocking rates haven't been achieved yet, the system has delivered better groundcover and a lift in higher-quality native grasses, rather than low-value species such as geranium and nutgrass which tend to dominate under set-stocking. However, the past two very low-rainfall years have pushed the whole system backwards despite good management.

CAM'S KEY MESSAGES

1. Pasture Growth

Fertiliser is hugely important for pasture production, but to get maximum value from nutrients, leaf management is critical. As Cam explains, "fertiliser grows fat leaves,

not fast leaves." Leaf emergence is driven by soil and temperature, while leaf "fatness" depends on nutrient availability. Grazing management is also vital to allow plants time to grow adequate leaf area between grazing's. "You are wasting your time if you don't let the leaves grow."

He emphasised the importance of soil testing, given fertiliser is often the biggest cost and can be the limiting factor in pasture productivity. "Designing an optimal grazing system relies on understanding patterns of growth of different species."

Cam noted that the variability or range of pasture growth from year to year is more useful for management decisions than long-term averages: "We need to understand the system we have to set up to manage variability – Get the daily pasture growth rate graph (see Figure 1 for an example), then build the system around it."

Appila – medics, annual ryegrass, 90% fertility, 10.7 DSE/ha, 37% utilisation

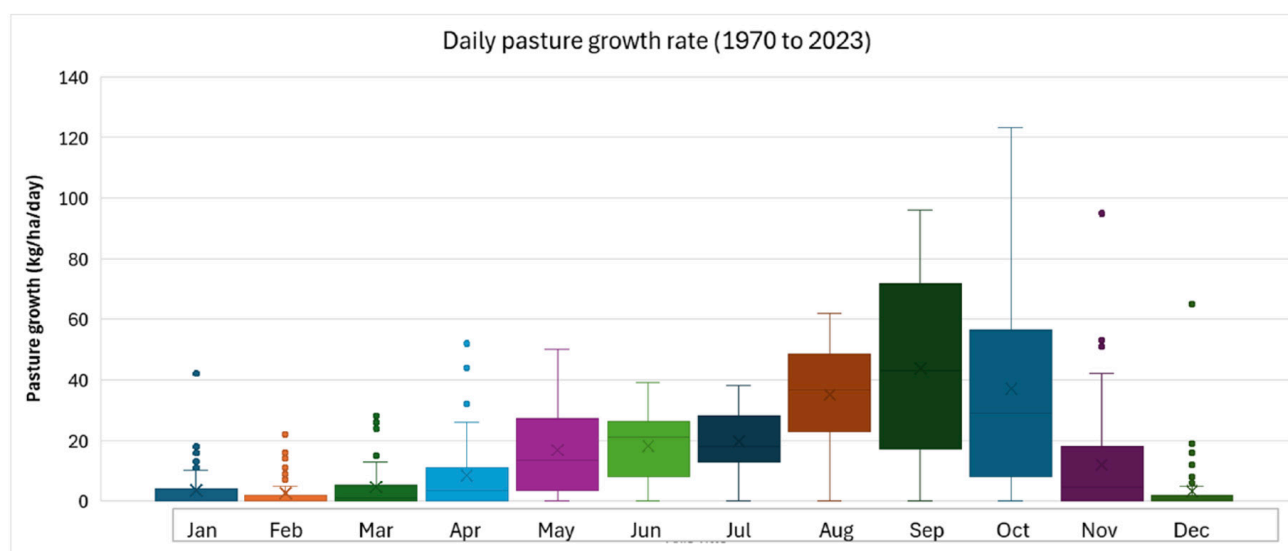


Figure 1. Daily pasture growth rate graph for Appila (averages over 53 years). Lines above and below the boxes for each month show the variability.

2. Grazing Stubbles

Stubbles can play an important role in filling a feed gap in mixed farming systems, but their grazing value has declined due to improved weed control and modern header setups. Cam encouraged growers to assess paddocks before grazing. Sheep perform well while grain and green pick (such as crop regrowth and weeds) remain, but once these disappear, livestock quickly lose condition.



3. Grazing Crops

Cam sees significant potential for grazing crops intended to be taken through to grain in selected paddocks in the Upper North. “It’s another piece in the whole farm supply of feed year-round.” Grazing crops can also delay crop maturity by 7–10 days, helping shift flowering out of frost-risk periods. Consistent grazing across all plants is essential; uneven grazing leads to uneven maturity, creating harvest challenges.

Cam noted the need to apply an additional 20–30 kg nitrogen to replace removed biomass. He also highlighted examples from WA where large mobs graze crops for 7–10 days before rotating, supported by staggered sowing dates. While not suited to every paddock, Cam sees real opportunity in grazing crops in this region strategically, allocating paddocks with matched sowing dates and winter varieties.



4. Summary Quotes

“We really need to think about the whole farming system – it’s a very complicated system.”

“We manage risk as farmers, so it’s really important to understand the volatility and ignore the averages for good decision-making.”

“We are constantly compromising certain parts of a grazing system, but the art of a good grazing system is minimising the compromise to maximise production – there are a lot of moving parts.”

Author: Rachel Trengove

Funding Body: MLA/ Northern & Yorke Landscape Board



2026 Recommended Varieties

Wheat



AGT-Colt^Φ **New**



AGT-Rio^Φ **New**



AGT-Shotgun^Φ



AGT-Tomahawk CL Plus^Φ

Barley



AGT-Bunyip IA^Φ **New**

Durum



AGT-Banker^Φ **New**

Canola



AGT-Insurgent TT^Φ **New**

Lupin



AGT-Rosemont^Φ

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