SA Drought Hub Technical Report

Demonstration of key management practices for the success of dry and early sown crops – building on results from 2024

PROJECT LEAD: Mallee Sustainable Farming

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PROJECT SUMMARY

Data collected from Mallee farmers continues to show that they preference flexible, evidence based and soil-responsive decision making. And while profit and business resilience are the top-rated success measures for seeding decisions, establishment and timing (sown on time and even germination) ranks as a close second.

This project continued work from 2024, investigating longer coleoptile barley varieties and extended it to 2 additional sites (Bowhill and Waikerie). A third site (Lameroo) was also added to investigate planting depth responses of grain legumes. Conditions across all three of the sites were less than ideal in 2025, with decile 1 to 2 summer rainfall and up to decile 3 growing season rainfall. A key aspect to the decile 3 growing season rainfall was late breaks, with as little as 12mm falling across April and May.

Low soil moisture, combined with low crop residues (as result of a difficult finish to the 2024 season) and a high frequency of wind events meant that soil drift caused problems at the Lameroo and Waikerie sites in particular.

Despite the difficult conditions, more local information across a range of conditions and soils continues to be collected to build a better understanding of the risks and rewards of planting depth decisions.

EXECUTIVE SUMMARY

Flexible, evidence-based soil responsive decision making requires continued investment in practical trials. These trials guide the development that creates corporate knowledge on the downside risks and upside reward of sowing innovations, across seasons and soil types.

Season 2025 proved a very difficult season for demonstrating success with sowing depth trials. Sites at Lameroo (grain legumes) and Waikerie (barley and wheat) were negatively impacted by increased sowing depth.

Low subsoil moisture from decile 1 summer rainfall plus a very late break to the 2025 growing season meant that overall crop establishment was low. When emerging from depth (80 mm), without the advantage of access to subsoil moisture, crop establishment was generally impeded.

Non-wetting sands at Bowhill, however, showed the opposite, with higher crop establishment achieved, earlier in the season, at greater sowing depths. Notably, these advantages in early crop establishment also translated to grain head fill and subsequently yield improvement.

PROJECT BACKGROUND AND OBJECTIVES

This Project "Demonstration of key management practices for the success of dry and early sown crops – building on results from 2024" - begun with three trial sites across the NSW, Vic and SA Mallee. Finding from those sites in 2024 were summarised as follows:

NSW:

- wheat emerged successfully after early deep sowing irrespective of coleoptile length
- early-sown crops emerged faster, developed more biomass, and impressed farmers with their vigour
- due to frost and drought, final yields were similar across all sowing dates (1.2-1.4 t/ha), but in a normal year the early sown crop would likely have yielded best.

SA:

- shorter coleoptile barley varieties like Maximus CL emerged successfully from deeper sowing
- no adverse impacts from different pre-emergent herbicides (due to dry year)
- deeper sowing of barley into subsoil moisture led to better biomass and yields, irrespective of coleoptile length.

Victoria:

- wheat emerged successfully after early deep sowing irrespective of coleoptile length
- no adverse impacts from different pre-emergent herbicides (likely due to dry year)
- possible slight advantage arose from deeper sowing.

The researchable question of the demonstrations remained the same across three different demonstration sites in 2025:

- can crop establishment be advanced by earlier and deeper sowing, into moisture, in Mallee soils?

With the low summer rainfall and subsequent depleted subsoil moisture experienced at the commencement of sowing in 2025, the demonstration sites provided an opportunity to investigated the impediments of deep sowing when conditions are considered to be unfavourable to the practice.

METHODOLOGY

Bowhill

Soil type: non-wetting sand

Paddock History: 2024 Fallow 2023 Barley

Agronomic controls:

- Fertiliser at sowing - MAP+Flutriafol 100Kg
- Pre- em herbicides:
  - Boxer Gold (IBS) 2L/ha
  - Avadex (IBS) 2L/ha
  - Crucial (PSPE) 1.5L/ha
  - Pyrinex (PSPE) 750mL/ha

Sowing date: 7 May 2025, experimental plot seeder. Harvest date: 8 December 2025

Trial Design:

TrialRows	ExperimentalRows		Bay 1	Bay 2	Bay 3	
1	B	Buffer				
2	1	>80	Commodus	Calibre	Titan	
3	2	40	Commodus	Calibre	Titan	
4	3	20	Titan	Calibre	Commodus	1
5	4	>80	Calibre	Commodus	Titan	
6	5	20	Commodus	Calibre	Titan	
7	6	40	Calibre	Commodus	Titan	2
8	7	40	Titan	Commodus	Calibre	
9	8	>80	Commodus	Calibre	Titan	
10	9	20	Calibre	Titan	Commodus	3
11	B	Buffer				

Crop Assessments undertaken:

- 05/6, 17/6, 16/7 – Plant Establishment
- 05/6, 17/6, 16/7, 4/9 – Phenology scoring

Commodus>80 29 July 2025



Commodus_20 29 July 2025



Bowhill trial site on 27 August 2025:



<u>Waikerie</u>

Soil type: Sand to sandy loam (90-95cm).

Paddock history: 2024: Fallow.

Agronomic controls:

- Fertiliser at sowing - MAP+Flutriafol 100Kg
- Pre-em herbicides:
  - Boxer Gold 2L/ha
  - Avadex 2L/ha

Sowing Date: 6 May 2025, experimental plot seeder. Harvest date: 6 December 2025

Trial design:

			Bay			
TrialRow	ExperimentalRows	MainPlot	1	2	3	
1	B	Buffer - Barley				Rep
2	1	20	Commodus	Titan	Calibre	
3	2	40	Calibre	Titan	Commodus	
4	3	>80	Calibre	Titan	Commodus	1
5	4	20	Commodus	Titan	Calibre	
6	5	>80	Titan	Commodus	Calibre	
7	6	40	Titan	Commodus	Calibre	2
8	7	40	Calibre	Titan	Commodus	
9	8	20	Commodus	Calibre	Titan	
10	9	>80	Calibre	Titan	Commodus	3
11	B	Buffer - Barley				

Crop Assessments undertaken:

- 05/6 – Germination
- 18/8, 2/9 – Establishment
- 18/8, 2/9, 24/9 – Phenology scoring

Waikerie trial site 17 July 2025:



Waikerie trial site on 18 August 2025



<u>Lameroo</u>

Soil type: Sand (10cm) over clay

Paddock History: 2024 Wheat (cut for hay) 2023 Lentil

Sowing Date: 1 April 2025, experimental plot seeder.

Agronomic controls:

- Fertiliser at sowing - MAP+Flutriafol 50Kg
- Pre-em herbicides:
    - Diuron 300 g/ha
    - Avadex Xtra 1 L/ha
    - TriflurX 1 L/ha

Sowing Date: 1 April 2025, experimental plot seeder. Harvest date: Not harvested

Trial design:

TrialRows	ExperimentalRows	Buffer			
1	B	MainPlot (Seeding Depth)	Bay 1	Bay 2	Bay 3
2	1	80	GIA Thunder	PBA Kelpie	PBA Hallmark
3	2	20	PBA Hallmark	GIA Thunder	PBA Kelpie
4	3	40	PBA Hallmark	GIA Thunder	PBA Kelpie
5	4	80	PBA Kelpie	PBA Hallmark	GIA Thunder
6	5	40	PBA Hallmark	GIA Thunder	PBA Kelpie
7	6	20	PBA Hallmark	GIA Thunder	PBA Kelpie
8	7	20	PBA Hallmark	PBA Kelpie	GIA Thunder
9	8	80	GIA Thunder	PBA Hallmark	PBA Kelpie
10	9	40	PBA Hallmark	PBA Kelpie	GIA Thunder
11	B	Buffer			

Crop Assessments undertaken:

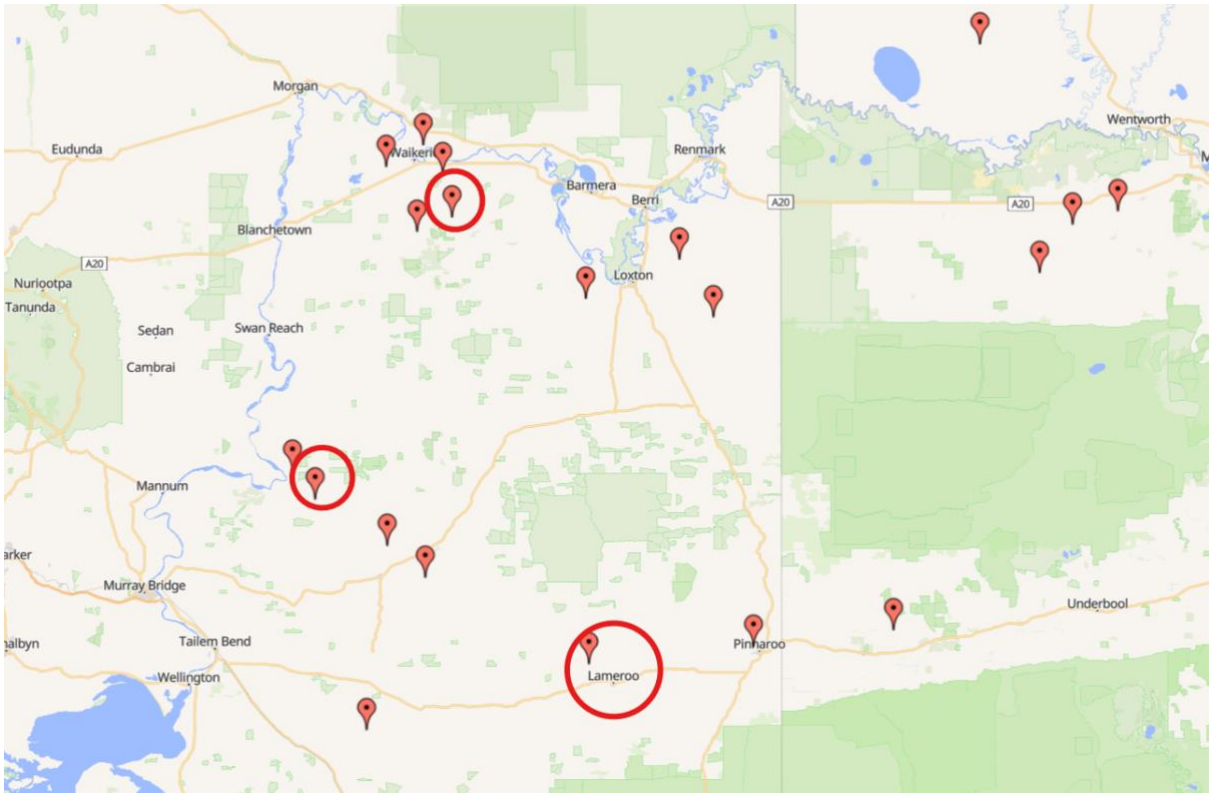
- 17/7, 30/7, 21/8, 2/9 – Plant Establishment
- 30/7, 21/8, 2/9, 15/9 – Phenology scoring

Lameroo Trial Site – 17 July 2025



LOCATION

Site # and name	Latitude (decimal degrees)	Longitude (decimal degrees)	LGA
Lameroo – Andrew Hunt	-35.36156828317365	140.36030013695287	Southern Mallee DC
Waikerie – Tim Paschke	-34.29372	140.00197	DC Loxton Waikerie
Bowhill – James Stephens	-34.9615314	139.4845777	DC Karoonda East Murray



RESULTS

Bowhill and Waikerie - Expanding and extending last year's barley 'Derisking the seeding program' trial to two new areas

In 2024, MSF worked with Brown's Well Ag Bureau to demonstrate the benefits of sowing longer coleoptile barley varieties deep on light soils. In this 2025 project, the experiment was repeated at the Bowhill and Waikerie, albeit with Titan (moderate coleoptile) replacing Maximus (not available for purchase in 2025) in a comparison to Commodus. The two varieties were sown using plot-scale equipment, with sowing happening at three sowing depths, with three replications at the two sites and compared to Calibre wheat.

Waikerie

The Waikerie site experienced decile 3 growing season rainfall of 109mm in 2025. Figures from the SILO – Australian Climate Data show a very dry start to the Waikerie growing season, with less than 10mm recorded across both April and May. From June to 30 September 2025, 90mm of rain was recorded. The growing season conditions followed a decile 3 summer rainfall of 48.9mm of rain.

In addition to the decile 3 growing season rainfall conditions, the 2025 growing season was dominated by serious wind erosion events, leading to furrow infill, sand drift at the site, and interruptions to crop establishment.

Plant establishment

Plant establishment was assessed on 18.08.2025 and was then rechecked two weeks later. In both assessments, seeding depth had an impact on plant establishment (p= 0.030 and p=0.035 respectively). At both times of assessment, the shallow (20 mm) seeding depth had greater plant numbers than the deeper (80 mm) treatment (Figure 1). It is important to note that even at the highest plant establishment numbers of 50 plants/m2 this was well below the target plant density of 130 plants/m2; demonstrating the attrition of viable seed and seedlings due to the poor seasonal conditions.

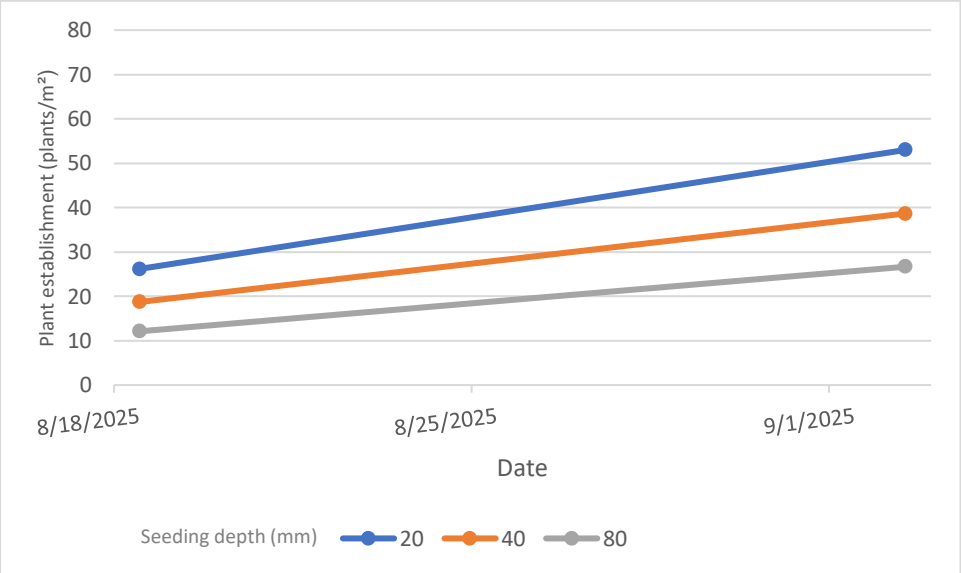


Figure 1. Waikerie plant establishment (plants/m^2) over time.

Variety also had an impact on plant establishment in both assessments (p= 0.003 and p=0.004 respectively). Commodus barley had a higher plant establishment than the other varieties at both assessment timings (Table 1).

Table 1. Waikerie average plant establishment (plants/m²), 02.09.2025 (final assessment).

	Average plant establishment (plants/m²)		
	Commodus	***Titan***	***Calibre***
All treatments	*49*	*35*	*34*
20mm SD	*57*	*49*	*53*
40mm SD	*48*	*32*	*37*
80mm SD	*44*	*24*	*11*

Grain yield

Seeding depth impacted grain yield (p=0.016), with the shallower treatments of 20 mm and 40 mm having higher grain yields (1.02 t/ha and 0.83 t/ha, respectively) than the 80 mm seeding depth (0.36 t/ha). There was no impact of variety on grain yield (Table 2).

Table 2. Waikerie average grain yield (t/ha), 06.12.2025.

	Average grain yield (t/ha)		
	Commodus	***Titan***	***Calibre***
All treatments	*0.83*	*0.65*	*0.72*
20mm PD	*1.03*	*0.82*	*1.20*
40mm PD	*0.92*	*0.91*	*0.64*
80mm PD	*0.55*	*0.20*	*0.32*

Bowhill

Similar to Waikerie, summer fallow rainfall was low at 43mm (decile 1) at Bowhill (SILO site 25040). Growing season rainfall for 2025 totalled 141mm and was decile 2.

The SILO site at Tailem Bend (Woodlands), south of the trial site, recorded growing season rainfall of 185mm (decile 2). Summer rainfall was decile 1 (41mm), like the Bowhill SILO site.

The Tailem Bend and Bowhill SILO weather stations were roughly equidistant from the site.

Wind erosion at the Bowhill site was less prevalent than at the Waikerie site in 2025.

Plant establishment

Plant emergence was monitored over time at this site due to the staggered emergence pattern. As expected, plant establishment trended upwards over time (p= <0.001). Interestingly, there were differences in plant establishment over time when comparing the seeding depths (p=0.024). At the time of the first establishment count (05.06.2025) the 80 mm seeding depth had greater plant numbers (35 plants/m^2) than the 20mm seeding depth (15 plants/m^2); the 40 mm treatment was in between the other two treatments and not significantly different to either of them (26 plants/m^2). At the time of the second establishment count (17.06.2025) the same pattern was seen between the treatments (Figure 2). At the time of the third establishment count (16.07.2025) the 20 mm treatment had reached a similar number of plants established as the other treatments. This establishment pattern that demonstrated an advantage in establishment from deeper sown treatments contrasts the results from the Waikerie site. It is hypothesised this difference is due to the non-wetting nature of the soil at this site, potentially resulting in preferential water flow to the deeper seeding depths.

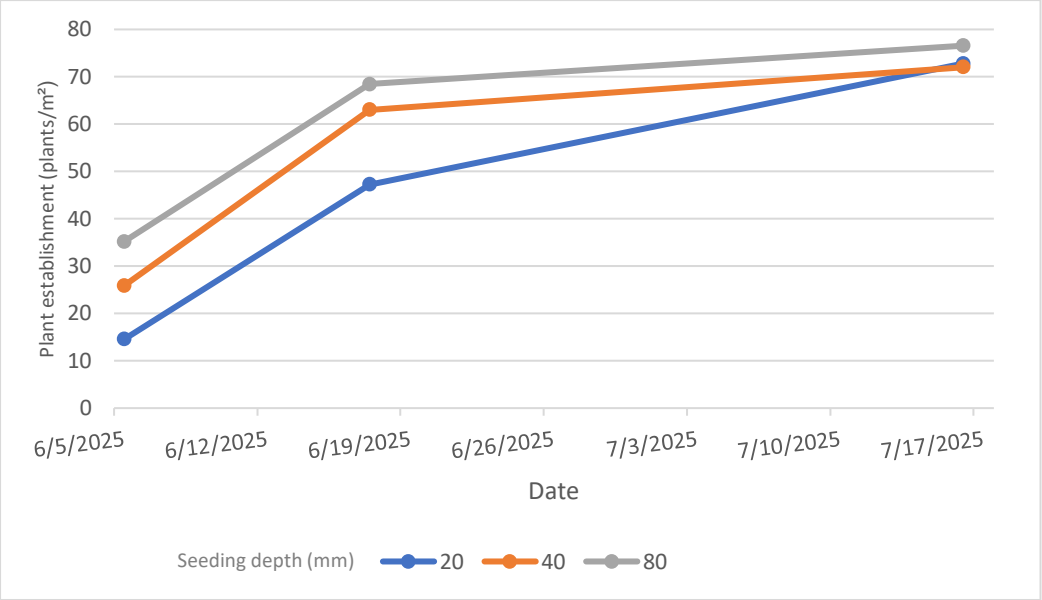


Figure 2. Bowhill plant establishment (plants/m^2) over time.

Grain yield

Seeding depth impacted grain yield (P<0.001), with the shallow seeding depth of 20 mm yielding less than the 40 mm and 80 mm sown treatments (Table 4). There was also an impact of variety on grain yield (P=0.008), with Calibre wheat yielding less than Titan and Commodus barley (Table 4).

Table 4. Bowhill average grain yield (t/ha), 08.12.2025.

	Average grain yield (t/ha)		
	Commodus	**Titan**	**Calibre**
All treatments	*3.52*	*3.58*	*3.12*
20mm PD	*2.18*	*2.42*	*2.31*
40mm PD	*4.18*	*4.28*	*3.39*
80mm PD	*4.21*	*4.04*	*3.67*

Lameroo - sowing depth trial with lentils.

Lentil were a new addition to the derisking seeding depth of sowing trials in the Mallee of South Australia in 2025. This demonstration trial focused on optimising sowing depth for lentil in the Lameroo area. The trial involved planting GIA Thunder, PBA Hallmark and PBA Kelpie at depths of 20mm, 40mm and 80mm.

SILO rainfall data for Lameroo recorded summer rainfall at Decile 2, with 60mm received. Growing season rainfall was decile 3 at 200mm. Similar to Waikerie, early-season rainfall was low at less than 12mm across the months of April and May.

The Lameroo site, like Waikerie, was also subject to wind erosion and deposition in 2025 resulting in impacts on crop emergence, establishment, and plant survival.

Plant establishment

Plant emergence was monitored over time at this site. In contrast to what would normally be expected, plant establishment trended downwards (p= <0.001), with poor final plant establishment. This reflected significant wind damage causing furrow infill, shearing off of plants, and damage to stems and leaves. There was an impact of seeding depth on plant establishment (p<0.001*).* The 20mm seeding depth had greater plant establishment (43 plants/m^2) than the 40mm and 80mm seeding depths (26 plants/m^2 and 11 plants/m^2, respectively), the 40mm seeding depth plant establishment was also considered significantly different to the 80mm treatment

Overall, in this season that experienced a very late season break, dry sowing resulted in poor germination with plant numbers well below the target of 120 plants/m^2. Additionally, there was a disadvantage in deep sowing in this situation.

Table 5. Lameroo average plant establishment (plants/m²) for each variety by seeding depth from the final plant assessment, 02/09/2025.

	Average plant establishment (plants/m²)		
	GIA Thunder	PBA Hallmark	PBA Kelpie
All treatments	30	24	26
20mm SD	43	33	45
40mm SD	29	18	23
80mm SD	9	13	8

Grain yield

This trial was not harvested due to poor plant numbers as a result of wind damage.

CONCLUSION

2025 was a difficult season in the South Australian Mallee. Low summer rainfall and a late break to the growing season, which in total only achieved decile 3 rainfall, made for conditions that were generally not favourable to sowing at depth.

Non-wetting sands at Bowhill were however an exception. At this site the improved performance of crop establishment and yield is considered to be related to the non-wetting inter-rows shedding water into the furrows. Within the furrow, soil disturbance at greater than 20mm appears to have created enough mixing to offset some of the water repellent nature of the top soil and thus improved infiltration of moisture into the profile.

On the basis of the data from Bowhill, albeit only being for a single season, there is potential benefit in the use of planting at depth to manage the non-wetting nature of the sandy soil. When compared to options such spading to address the top soil impediment, planting at depth offers significant cost savings. For earlier sowing at depth, the preference would obviously be to sow into good soil moisture.

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