2023 Trial Reports

UOA2105-013RTX – Development and extension to close the economic yield gap and maximise farming system benefits from grain legume production in South Australia.

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Cover image: Sunset over a lentil crop, north of Brinkworth, 2023. Photo credit: Sarah Day

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LOXTON

SITE SUMMARY

The 2023 season started with a full profile of soil water following 280 mm of rainfall falling from October 2022 to March 2023. Follow up rainfall in April and May provided adequate moisture for timely seeding on the 10-11th of May (Figure 1). A total of 35 mm was received in June, which was 40% more than the long-term average for that month, however, the rest of winter and early spring was very dry. Climatic conditions were particularly harsh during the flowering and pod-fill period for lentils, with less than 5 mm of rainfall received in September coupled with periods of high maximum temperatures during this month (Figure 2). Consequently, lentil yields varied from 0.75 on the clay loam soil type to just 0.2 t/ha on the deep sand. Chickpeas were only grown on the clay loam soil and yields were approximately 0.5 t/ha. Chickpea yields were assisted by 15 mm of rainfall falling at the start of October, which coincided with pod-fill.

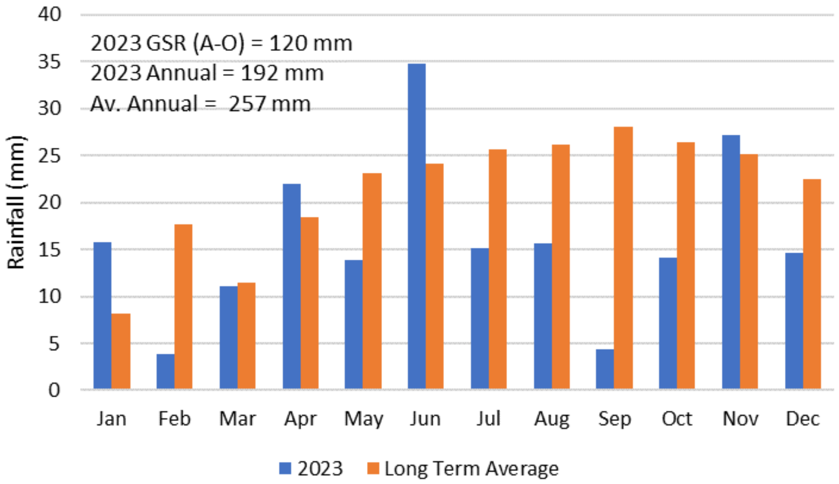

Figure 1. Monthly rainfall recorded at Loxton in 2023 compared to the long-term average rainfall at the Loxton Research BOM site (#024024).

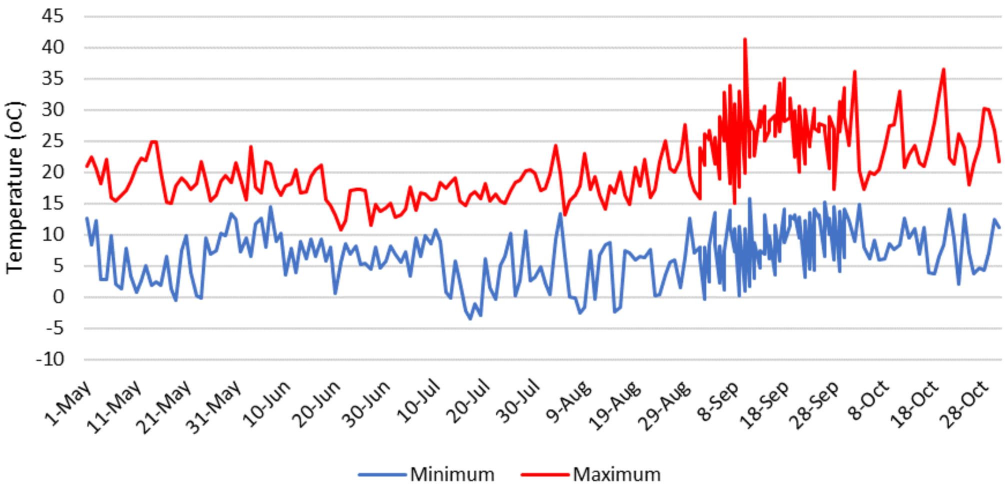

Figure 2. Minimum and maximum temperature (°C) recorded during the growing season at the Loxton Research BOM site (#024024).

Table 1. Soil properties for the sand soil type at the Loxton hub trial site, 2023.

Depth (cm)	NH_3-N	NO_3-N	P (mg/kg)	K	S	OC (%)	EC (dS/m)	pH ($CaCl_2$)	pH (H_20)
0-10	14	1.9	14	243	3.6	0.53	3.4	7.6	8.2
10-30	2.6	<1.0		169	2.7		2.1	8.1	8.7
30-60	1.5	<1.0		156	<2.5		2.2	8.0	8.7

60-90	1.3	<1.0		230	<2.5		2.2	8.3	9.3	
90-120	1	<1.0		370	3.2		4.1	8.3	9.6	

Depth	Cu	Fe	Mn	Zn	B	Exc Ca	Exc Mg	Exc K	Exc Na	Exc Al
(cm)			(mg/kg)					(cmol/kg)		
0-10	0.2	4.9	6.5	1.0	0.4	5.4	1.2	0.6	0.05	<0.02
10-30					0.8	20.0	1.3	0.4	0.06	<0.02
30-60					0.9	20.6	2.2	0.4	0.08	<0.02
60-90					2.3	20.0	4.7	0.6	0.82	<0.02
90-120					6.5	18.7	5.4	0.9	2.19	<0.02

Table 2. Soil properties for the clay loam soil type at the Loxton hub trial site, 2023.

Depth (cm)	NH_3-N	NO_3-N	P (mg/kg)	K	S	OC (%)	EC (dS/m)	pH ($CaCl_2$)	pH (H_20)	
0-10	31	1.3	16	549	5.1	0.72	2.4	7.7	8.3	
10-30	2.4	<1.0		360	3.3		1.3	8.0	8.9	
30-60	1.2	<1.0		394	6.4		3.4	8.2	9.7	
60-90	1.7	<1.0		472	15		4.7	8.3	9.8	
90-120	2.6	<1.0		443	24		4.7	8.2	9.8	

Depth	Cu	Fe	Mn	Zn	B	Exc Ca	Exc Mg	Exc K	Exc Na	Exc Al
(cm)			(mg/kg)					(cmol/kg)		
0-10	0.45	3.7	7.2	0.7	0.8	15.8	1.5	1.4	0.07	<0.02
10-30					1.8	24.5	4.3	0.9	0.89	<0.02
30-60					9.9	20.2	6.8	1.0	3.86	<0.02
60-90					21	18.9	5.4	1.2	5.15	<0.02
90-120					22	18.7	4.6	1.1	5.12	<0.02

NUTRITION X DEEP RIPPING IN LENTIL AND BARLEY ACROSS MULTIPLE SOIL TYPES

Authors: Michael Moodie, *Frontier Farming Systems*

Aim: To evaluate the grain yield response of lentils and barley to deep ripping and nutrition (phosphorus and trace elements) across soil types commonly encountered in Mallee paddocks.

Methodology:

Trial details are provided in Table 3. Separate trial sites were established for lentil and barley with each site consisting of six sub trials transversing the landscape from a clay loam soil type on the swale to a deep sandy soil on top of a dune. Grain yield was measured for each sub-trial using a plot harvester. Each sub-trial was analysed independently using a two-way ANOVA in Genstat 23rd Edition.

Table 3. Trial details, Loxton 2023.

Trial design	RCBD
Plot size	10 m x 1.68 m
Replicates	3
Sowing date	10/5/23
Plant density	Lentil & Barley: 120 plants/m^2
Row spacing	28 cm
Fertiliser	See Treatments
Harvest date	1/11/23

Treatments:

Trials compared nutritional treatments for lentil and barley grown on a range of Mallee soil types, with and without deep ripping. There were six sub trials located on soil types transitioning across a 70 m transect from the clay loam soil on the swale to the deep sandy soil located on the top of a dune. The average composition of sand, clay and silt in the top 60 cm of soil at each landscape position is shown in Table 4. Deep ripping treatments were implemented prior to sowing to a depth of 50 cm using Tilco straight shank tynes.

Table 4. Average sand, clay and silt percentage in the 0-60 cm soil at each landscape position.

Texture	**Landscape Position** *(1 = swale, 6 = dune)*					
	1	**2**	**3**	**4**	**5**	**6**
Sand (%)	69	74	80	85	90	91
Clay (%)	19	16	13	9	5	5
Silt (%)	12	10	8	6	5	4
Texture	Sandy loam	Sandy loam	Sandy loam	Loamy sand	Sand	Sand

There were also five nutrient treatments (Table 5), which included Monoammonium Phosphate (MAP) and Sulphate of Ammonia (SOA) banded below the seed at seeding, and liquid trace elements that were applied both in-furrow at seeding and in-crop as a foliar application. The lentil site was sown to the variety GIA Lightning and the barley site was sown to the variety Titan AX.

Table 5. Nutrition treatments applied to lentil and barley*, Loxton 2023.

Treatment No.	Treatment Description	MAP (Banded)	SOA (Banded)	Liquid Inject (In furrow)	Liquid Foliar
1	Nil	Nil	Nil	Nil	
2	MAP (Low)	25 kg/ha	Nil		
3	MAP (High)	50 kg/ha	Nil		
4	MAP (High) + SOA	50 kg/ha	50 kg/ha		
5	MAP (High) + SOA + ZMC + Mo	50 kg/ha	50 kg/ha	Sipcam Multisol @ 8 L/ha + Sipcam Amino Boss Moly @ 0.8 L/ha	Sipcam Amino Boss ZMC @ 4 L/ha + Sipcam Amino Boss Moly @ 0.8 L/ha

**All barley treatments received an additional 150 L/ha of UAN (64 kg N/ha) throughout the season*

Key messages

- *The yield benefit from deep ripping prior to sowing lentils was 0.1 – 0.2 t/ha (30 – 80%) on the sandy soil only.*
- *The yield benefit from deep ripping prior to sowing barley was 0.2 – 0.3 t/ha (30 – 40%).*
- *Negative responses to deep ripping were observed on the heavy soils.*
- *There was a yield response in both lentil and barley to the highest MAP rate on the clay loam soil.*
- *There was no grain yield response in lentil or barley to SOA or trace elements.*

Results and Discussion:

Deep ripping improved the grain yield of both lentils and barley (Table 6**Table** 7), but only on the sandiest soils located on mid-slope and top of the sandy dune (Landscape positions 3 – 6). These soil types had a soil texture with more than 80% sand in the top 60cm of soil. Lentil yields were very low (<0.5 t/ha), however deep ripping significantly increased grain yield by 0.1 – 0.2 t/ha (Table 6). This represents a 30 – 80% yield improvement. Barley grain yields were also low on the sandy soil types, ranging from 0.5 – 1.7 t/ha (Table 7). Deep ripping improved grain yield by 0.2 – 0.3 t/ha, which represents a yield improvement of 30 – 40%. Deep ripping soil types with higher clay content (Landscape position 1 & 2) generally resulted in a yield penalty in both lentils and barley.

There was a grain yield response in lentil to the application of MAP at landscape Position 3 (Table 8), with treatments of 50 kg/ha MAP yielding higher than the Nil. The response on this soil type was predicted through soil tests collected prior to sowing, which recommended that 40-60 kg/ha MAP was required to maximise lentil yield on this soil type.

Barley grain yield was also improved when MAP was applied, with this benefit observed across most soil types (Table 9). Treatments where 50 kg/ha of MAP was applied were generally higher than both the nil and 25 kg/ha MAP rates. However, applying 25 kg/ha MAP was also better than applying no MAP.

There was no evidence that the application SOA or trace elements improved the grain yield of either lentils or barley. There was also no interaction between deep ripping and nutrition treatments for either crop in this location, suggesting the interaction response is variable or complex.

Table 6. Effect of deep ripping on lentil grain yield (t/ha) across the six landscape positions. NS = not significant (P>0.05).

Treatment	**Landscape Position** *(1 = swale, 6 = dune)*					
	1	*2*	*3*	*4*	*5*	*6*
No Rip	0.78	0.78	0.56	0.20	0.16	0.16
Deep Rip	0.68	0.73	0.72	0.37	0.24	0.27
P value	0.053	0.179	<.001	<.001	<.001	<.001
LSD (p<0.05)	NS	NS	0.05	0.04	0.03	0.03

Table 7. Effect of deep ripping on barley grain yield (t/ha) across the six landscape positions. NS = not significant (P>0.05).

Treatment	**Landscape Position** *(1 = swale, 6 = dune)*					
	1	*2*	*3*	*4*	*5*	*6*
No Rip	1.54	1.63	1.77	1.22	0.66	0.56

Deep Rip	1.38	1.44	1.64	1.31	0.86	0.80
P value	0.005	<.001	0.043	0.165	<.001	<.001
LSD (p<0.05)	0.10	0.09	0.13	NS	0.08	0.14

Table 8. Effect of nutrition treatments on lentil grain yield (t/ha) across the six landscape positions. NS = not significant (P>0.05).

Treatment	**Landscape Position** *(1 = swale, 6 = dune)*					
	1	*2*	*3*	*4*	*5*	*6*
Nil	0.70	0.69	0.58	0.26	0.19	0.21
MAP 25 kg/ha	0.65	0.76	0.61	0.28	0.19	0.21
MAP 50 kg/ha	0.76	0.81	0.66	0.29	0.20	0.23
MAP 50 kg/ha + SOA 50 kg/ha	0.74	0.75	0.70	0.31	0.22	0.23
MAP 50 kg/ha + SOA 50 kg/ha + Trace Elements	0.78	0.75	0.66	0.28	0.20	0.20
P value	*0.47*	*0.29*	0.03	0.68	0.83	0.70
LSD (p<0.05)	*NS*	*NS*	0.08	NS	NS	NS

Table 9. Effect of nutrition treatments on barley grain yield (t/ha) across the six landscape positions. NS = not significant (P>0.05).

Treatment	**Landscape Position** *(1 = swale, 6 = dune)*					
	1	*2*	*3*	*4*	*5*	*6*
Nil	1.22	1.31	1.61	1.08	0.58	0.51
MAP 25 kg/ha	1.31	1.49	1.65	1.17	0.63	0.67
MAP 50 kg/ha	1.55	1.52	1.79	1.27	0.86	0.73
MAP 50 kg/ha + SOA 50 kg/ha	1.62	1.70	1.70	1.38	0.87	0.82
MAP 50 kg/ha + SOA 50 kg/ha + Trace Elements	1.59	1.64	1.79	1.40	0.85	0.68
P value	<.001	<.001	0.31	0.02	<.001	0.02
LSD (p<0.05)	0.16	0.14	NS	0.21	0.13	0.17

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Thank you to SIPCAM for supplying trace elements products used in the trial.

OPTIMISING SEEDING RATES TO MANAGE RISK IN CHICKPEA

Authors: Michael Moodie, *Frontier Farming Systems*

Aim: To evaluate if lower seeding rates can reduce the risk of growing high value chickpeas in the low rainfall South Australian Mallee.

Methodology:

Trial details are provided in Table 10. Plant establishment was measured from the four internal crop rows using two quadrat (2 rows x 1 m) drops per plot. Grain yield was measured using a plot harvester. Data was analysed with a two-way ANOVA in Genstat 23rd Edition.

Table 10. Trial details, Loxton 2023.

Trial design	RCBD
Plot size	10 m x 1.68 m
Replicates	4
Sowing date	11/5/23
Plant density	See treatments
Row spacing	28 cm
Fertiliser	Granulock SZ (12 (N), 18 (P), 0 (K), 8 (S) + 1% Zn) @ 50 kg/ha
Harvest date	15/11/2023

Treatments:

Genesis 090 (Kabuli chickpea) and CBA Captain (Desi chickpea) were each sown at four different seeding rates with the aim to establish each variety at plant densities of 20, 30, 40 and 50 plants/m^2. The seeding rates used for each treatment are provided in Table 11.

Table 11. Chickpea seeding rates used for each treatment, Loxton 2023.

Variety	Seed Weight (g/1000 seeds)	Target Plant Density (plants m^2)	Seeding Rate (kg/ha)
Genesis 090	277.6	20	61
		30	92
		40	122
		50	153
CBA Captain	199.6	20	44
		30	66
		40	88
		50	110

Key messages

- Chickpea germination declined from 100 % when a low plant density was targeted (20 plants/m^2) to 80 % where the target density was high (50 plants/m^2).
- A plant density of at least 35 plants/m^2 improved grain yield by 0.1 t/ha relative to treatments where plant densities were 20 – 30 plants/m^2.

Results and Discussion:

All chickpea seeds emerged when the target plant density was low (20 plants/m^2), however, germination fell to 80 percent in the high (50 plants/m^2) plant density treatment (Table 12). This resulted in a narrower range of actual plant densities (20 and 40 plants per/m^2) than targeted.

Higher chickpea plant densities slightly improved grain yield (

Table 13). When averaged across both varieties, chickpea yield improved from 0.6 to 0.7 t/ha as the plant population increased from 20 – 40 plants/m^2. Based on this limited data set, yield was optimised where the plant population was 35 plants/m^2 or above which aligns with the recommended plant density for chickpea.

There was no significant effect of variety on actual plant density or grain yield. There was also no interaction between plant density and variety.

Table 12. Actual plant density (plants m2) achieved for each target plant density. NS = not significant (P>0.05).

Variety	**Target Plant Density**				**Mean**
	20 plants/m^2	**30 plants/m^2**	**40 plants/m^2**	**50 plants/m^2**	
Genesis 090	22.3	28.6	35.5	40.2	31.1
CBA Captain	20.5	25.2	37.5	41.1	31.8
Mean	21.8	26.9	36.5	40.6	31.45
Variety LSD (p<0.05)			*NS*		
Target Plant Density LSD (p<0.05)			*4.7*		
Variety x Seeding Rate LSD (p<0.05)			*NS*		

Table 13. Chickpea grain yield (t/ha) achieved for each target plant density. NS = not significant (P>0.05).

Variety	**Target Plant Density**				**Mean**
	20 plants/m^2	**30 plants/m^2**	**40 plants/m^2**	**50 plants/m^2**	
Genesis 090	0.61	0.64	0.71	0.63	0.64
CBA Captain	0.60	0.64	0.75	0.77	0.69
Mean	0.60	0.64	7.4	0.70	0.67
Variety LSD (p<0.05)			*NS*		
Target Plant Density LSD (p<0.05)			*0.09*		
Variety x Seeding Rate LSD (p<0.05)			*NS*		

MANAGING ASCOCHYA BLIGHT WITH VARIETAL RESISTANCE

Authors: Michael Moodie, *Frontier Farming Systems*

Aim: To quantify the benefit of improved varietal resistance to ascochyta blight in chickpeas grown in the low rainfall Mallee region.

Methodology:

Trial details are provided in Table 14. Grain yield was measured using a plot harvester. Data was analysed with a two-way ANOVA in Genstat 23rd Edition.

Table 14. Trial details, Loxton 2024.

Trial design	RCBD
Plot size	10 m x 1.68 m
Replicates	4
Sowing date	11/5/23
Plant density	35 plants/m^2
Row spacing	28 cm
Fertiliser	Granulock SZ (12 (N), 18 (P), 0 (K), 8 (S) + 1% Zn) @ 50 kg/ha
Harvest date	15/11/2023

Treatments: The trial compared four chickpea varieties: CBA line (Desi), CBA Captain (Desi), Genesis 090 (Kabuli) and PBA Magnus (Kabuli).

CBA Captain, PBA Magnus and Genesis 090 are commercial varieties. The Chickpea Breeding Australia (CBA) line is a non-commercial breeding line with improved resistance to ascochyta blight. Each variety was grown with no fungicide applied (nil disease control) and three fungicide applications to prevent the development of ascochyta blight (full disease control).

Key messages

- The mean chickpea grain yield for the trial was 0.47 t/ha.

Results and Discussion:

Ascochyta blight did not develop within the trial. The mean chickpea yield for the trial was 0.47 t/ha and there were no significant differences for grain yield between fungicide treatments or chickpea varieties.

DEMONSTRATING METRIBUZIN TOLERANT LENTIL IN THE LOW RAINFAL MALLEE

Authors: Michael Moodie, *Frontier Farming Systems*

Aim: To compare the performance herbicide tolerant (HT) lentil varieties with and without Group 2 and Group 5 herbicides applied.

Methodology:
Trial details are provided in Table 15. Grain yield was measured using a plot harvester. Data was analysed with a two-way ANOVA in Genstat 23rd Edition.

Table 15. Trial details, Loxton 2024.

Trial design	RCBD
Plot size	10 m x 1.68 m
Replicates	4
Sowing date	11/05/23
Plant density	120 plants/m^2
Row spacing	28 cm
Fertiliser	Granulock SZ (12 (N), 18 (P), 0 (K), 8 (S) + 1% Zn) @ 50 kg/ha
Harvest date	2/11/23

Treatments:
The trial compared two HT lentil varieties:

- GIA Thunder: with tolerance to Group 2 imidazolinone herbicides.
- GIA Metro: with tolerance to Group 2 imidazolinone herbicides and the group 5 herbicide metribuzin.

The two varieties were grown with and without the following herbicides applied:

- Diuron (200 g/ha) applied and incorporated by sowing (IBS).
- Intercept (750 ml/ha) applied post emergence (PE) at the 6-node growth stage.

Additionally, metribuzin (280 g/ha) was also applied post emergent (PE) at the 6-node growth stage to GIA Metro only, as permitted under the APAV Permit (PER92810).

Key messages:

- GIA Thunder was 25% higher yielding than GIA Metro.
- The post emergent application of 280 g/ha of Metribuzin to GIA Metro had no impact on grain yield.

Results and Discussion:

GIA Thunder was 25% higher yielding than GIA Metro. Where herbicide treatments were consistent across both varieties, the grain yield of GIA Thunder was 0.65 t/ha while the grain yield of GIA Metro was 0.49 t/ha.

The post emergent application of 280 g/ha of metribuzin did not affect the grain yield of GIA Metro (Figure 3).

Rainfall during April provided early emergence of broadleaf weeds, which were controlled with knockdown herbicides prior to sowing. Therefore, weed levels were low and did not affect grain yield. In situations where there are significant weed burdens, the yield difference between the two varieties may be less, where post emergent applications of Metribuzin can be applied to improve weed control.

Table 16. Grain yield (t/ha) for GIA Thunder and GIA Metro lentils with different herbicide treatments applied. LSD (p<0.05) = 0.18 t/ha.

Herbicide Treatment		Variety	
Group 5 Herbicide	**Group 2 Herbicide**	**GIA Thunder**	**GIA Metro**
Nil	**Nil**	0.67	0.59
Nil	**Intercept @ 750 ml/ha**	0.70	0.46
Diuron (200 g/ha) + Simazine (200 g/ha) IBS	**Nil**	0.63	0.48
Diuron (200 g/ha) + Simazine (200 g/ha) IBS	**Intercept @ 750 ml/ha**	0.61	0.45
Metribuzin (280 g/ha) PE	**Nil**	N/A	0.59
Metribuzin (280 g/ha) PE	**Intercept @ 750 ml/ha**	N/A	0.49

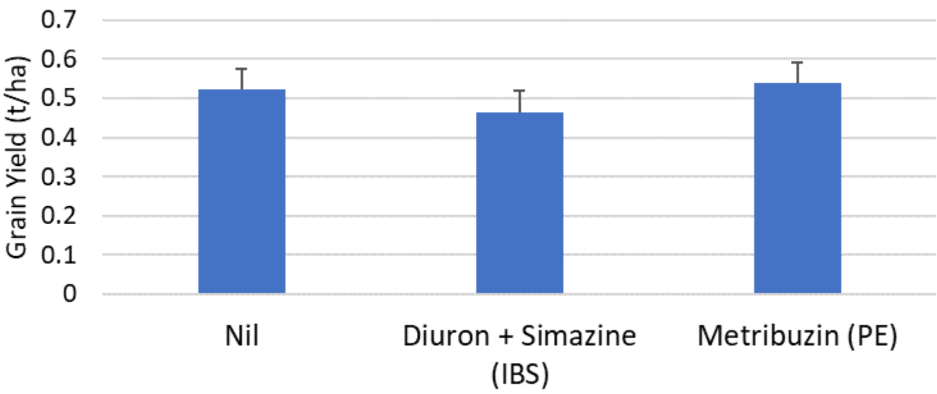

Figure 3. The impact of group 5 herbicide treatments on the grain yield of GIA Metro. Error bars represent the Least Significant Difference (p<0.05).

PINNAROO

SITE SUMMARY

Annual rainfall at the site was similar to the long-term average for Pinnaroo (Figure 4Table 4). However, rainfall distribution was weighted towards a wet winter and dry spring. The faba bean/vetch mixed species crop was sprayed out as brown manure on 12th September, therefore the dry conditions during September did not adversely affect legume production. However, the total biomass produced by the legume crop was below potential as the crop was browned manured early to ensure effective ryegrass control.

The sandy topsoil at the site was acidic with a pH of 4.8 (CaCl2) (Table 17). This topsoil overlayed an alkaline clay subsoil; therefore, acidification was constrained to the top 10-15 cm. The clay subsoil had high salinity levels Ece>4 dS/m below 60 cm, therefore, crop root growth is expected to be limited to this depth, especially for sensitive legume crops.

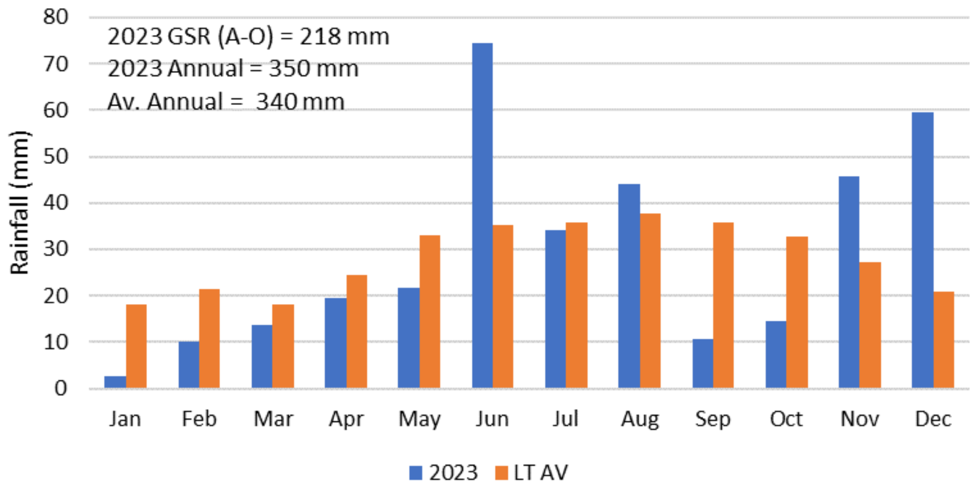

Figure 4. Monthly rainfall recorded at Pinnaroo in 2023 compared to the long-term average rainfall at the Pinnaroo BOM site (#25015).

Table 17. Soil properties of the sandy soil type at the Pinnaroo demonstration site, 2023.

Depth (cm)	NH_3-N	NO_3-N	P (mg/kg)	K	S	OC (%)	EC (dS/m)	pH ($CaCl_2$)	
0-10	2.1	17	31	86	5.2	0.57	2.7	4.8	
10-20	<1.0	9		262	6.2		2	7.4	
20-40	<1.0	8		401	22		2.9	8.4	
40-60	<1.0	3.9		332	41		3.6	8.6	
60-80	<1.0	3		273	46		6.1	8.6	
80-100	<1.0	2.6		248	36		5.1	8.7	

Depth (cm)	Cu	Fe	Mn (mg/kg)	Zn	B	Exc Ca	Exc Mg	Exc K (cmol/kg)	Exc Na	Exc Al
0-10	0.09	91	2.8	1.8	0.39	1.0	0.7	0.2	0.3	<0.02
10-20					3	3.7	7.4	0.7	3.5	<0.02
20-40					8.1	8.5	11.7	1.0	5.9	<0.02
40-60					9.4	15.2	11.1	0.8	5.9	<0.02
60-80					6.9	15.3	9.7	0.7	5.7	<0.02
80-100					7.1	13.1	9.0	0.6	5.4	<0.02

MANAGEMENT STRATEGIES TO OVERCOME ACIDIFICATION OF MALLEE SANDY SOILS

Authors: Michael Moodie, *Frontier Farming Systems*

Aim: To demonstrate management options to overcome acidification in sandy Mallee soils to improve legume production.

Key messages

- Raising soil pH from less than <5 to >6.5 improved the dry matter produced of the faba bean/ vetch mixed species legume crop by 200%.

Results and Discussion:

All treatments had some effect of raising the soil pH, relative to the untreated control (Figure 5). Surface applied lime at 3 t/ha successfully raised the pH of the top 5 cm of topsoil, however, the sandy soil below this depth (5 – 15 cm) remained acidic. Ameliorating the soil with spading raised the pH of the top 15 cm of topsoil to around 6.5, irrespective of the addition of lime (Figure 5). Spading mixed the soil to a depth of 25 cm, combining alkaline clay from the subsoil and with the sandy topsoil, thereby neutralising the acidification. In the treatment that was deep ripped prior to spading and also had lime applied, the top 15 cm of soil pH was raised to 7, uniformly throughout this depth.

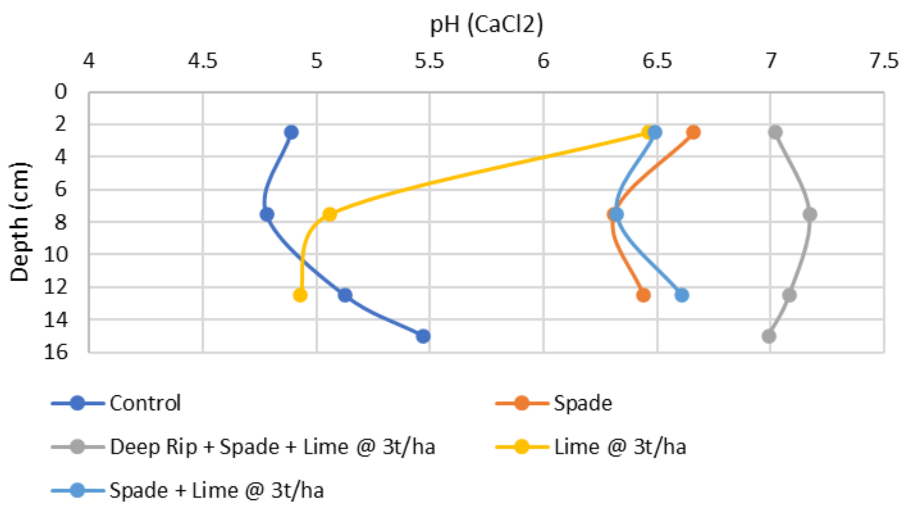

Figure 5. Effect of selected treatments on the pH (CaCl2) of the sandy topsoil (0-20 cm).

With no soil amelioration or lime applied, the faba bean/vetch mixed species crop produced just 1 t/ha of dry matter. Each treatment significantly increased the quantity of dry matter produced by the faba bean/vetch mixed species brown manure, relative to the untreated control (Figure 6). Visual assessments throughout the season showed that plants in the control treatment were stunted and yellow with poor nodulation (Figure 7). Where lime was applied but not incorporated, 0.5 – 1 t/ha more legume dry matter was produced than in the control. Ameliorating the soil with deep ripping or spading increased legume biomass to around 2.5 t/ha. The highest legume dry matter was produced in the treatments that included both soil amelioration and lime, with up to 3 t/ha of legume dry matter produced when both management strategies were combined.

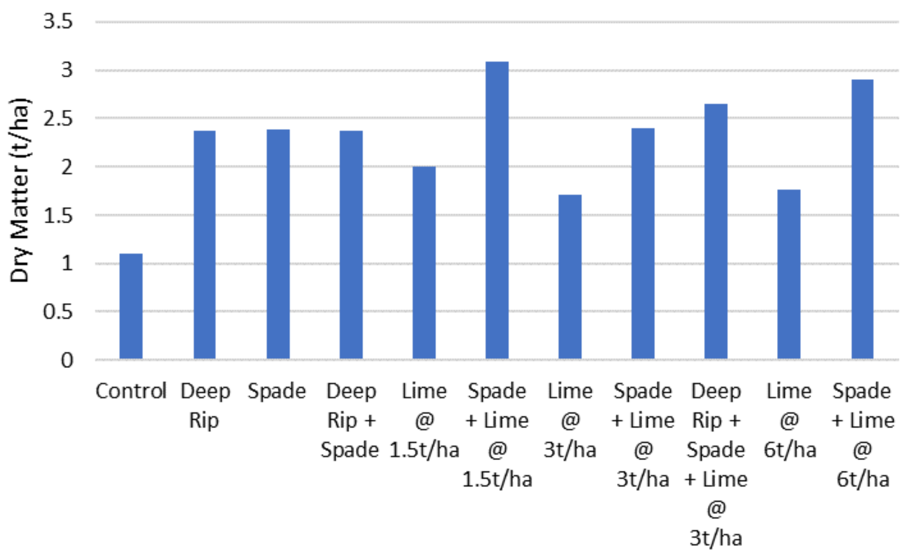

Figure 6. Legume dry matter (t/ha) produced for each treatment by the faba bean + vetch mixed species crop.

Figure 7. Faba bean plant from the Spade + Lime @ 6 t/ha treatment (Left) compared to a plant from the untreated control (Right).

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