

SA Grain Legume Development and Extension Project



Summary of 2021 Field Trial Results



Trengove
Consulting



Acknowledgements

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Project management

Penny Roberts and Sarah Day, SARDI Agronomy

Project Investment

Grains Research and Development Corporation: project UOA2105-013RTX “Development and extension to close the economic yield gap and maximise farming systems benefits from grain legume production in South Australia”

Contributions and Trial Management

Melrose, Palmer, Lameroo, Riverton, Hart and Condowie: Sarah Day, SARDI Agronomy Clare
sarah.day@sa.gov.au

Kimba and Tooligie: Amy Keeley (née Gutsche) and Brianna Guidera, SARDI Agronomy Port Lincoln
amy.gutsche@sa.gov.au

Loxton and Pinnaroo: Michael Moodie, Frontier Farming Systems michael@frontierfarming.com.au

Mount Hope and Cummins: Andrew Ware, EP AG Research andrew@epagresearch.com.au

Millicent: Max Bloomfield, FAR Australia max.bloomfield@faraustralia.com.au

Maitland, Bute and Kulpara: Sam Trengove, Trengove Consulting samtrenny34@hotmail.com

Extension Hosts

Loxton, Pinnaroo and Lameroo: Tanja Morgan, Mallee Sustainable Farming tanja.morgan@msfp.org.au

Mount Hope, Cummins, Kimba and Tooligie: Naomi Scholz, AIR EP eo@airep.com.au

Millicent: Max Bloomfield, FAR Australia max.bloomfield@faraustralia.com.au

Maitland, Bute and Kulpara: Sam Trengove, Trengove Consulting samtrenny34@hotmail.com

Melrose: Ruth Sommerville Upper North Farming Systems unfs@outlook.com

Riverton: Jarred Tilley Mid North High Rainfall Zone greenwith.invermay@outlook.com

Hart and Condowie: Sandy Kimber, Hart Field Site Group admin@hartfieldsite.org.au

Cover image: Melrose salt tolerant lentil variety trial, 10 September 2021

INTRODUCTION

The project aims to deliver local development and extension to close the economic yield gap and maximise faming systems benefits from grain legume production in South Australia.

Over the lifeline of the project (2021-2025), the proposed investment will:

- Address the current yield gap in grain legumes and drive its closure through supporting increased technical efficiency of growers with extension of best practice grain legume agronomy;
- Support grain growers and their advisers (100 per hub, 20 per spoke) in the target regions (Figure 1) to maximise system profitability by incorporating grain legumes in rotation;
- Drive and support sustainable expansion of the area grown to grain legumes; and
- A targeted 45% of growers adopt or intend to adopt new and novel practices emerging from linked proof-of concept and innovation research

Average annual rainfall 30-year climatology (1981 to 2010)
Australian Bureau of Meteorology

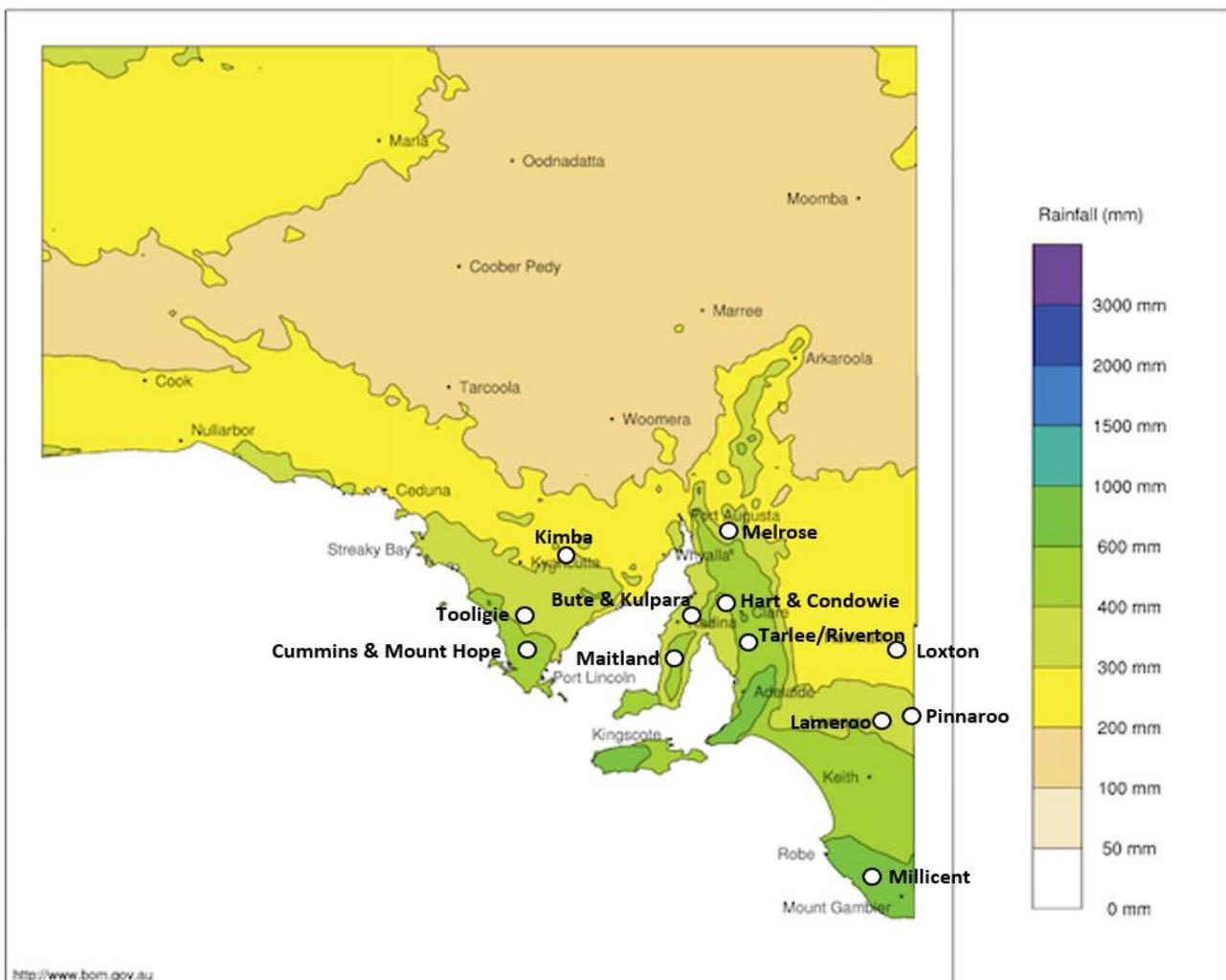


Figure 1. Trial locations for SA Grain Legume hub and spoke sites in 2021, selected by collaborators to represent the range of environments and soil types across the state’s legume cropping regions.

MOUNT HOPE

SITE SUMMARY

Mount Hope is in the medium rainfall zone on the lower Eyre Peninsula. Season breaking rainfall did not occur until 26 May 2021. The paddock was sown on 3 June. Rainfall received during June and July at the site was above average for that period (Figure 2). Rainfall was below average in August and well below average in September, followed by a wetter than average finish to the growing season. Both maximum and minimum temperatures were below long-term averages from August to the end October, providing cool temperatures for crops to mature (Figure 3). Across the site pulse grain yields averaged 1.1 t/ha for lentil, 2.6 t/ha for faba bean, and 3.3 t/ha for lupin.

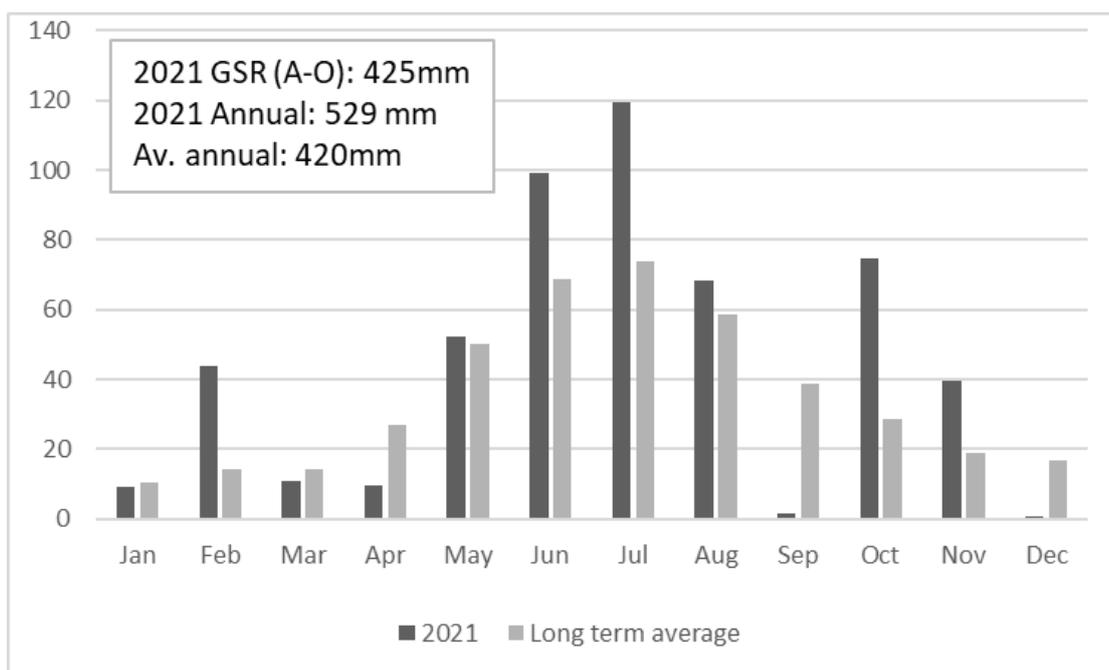


Figure 2. Monthly rainfall recorded at Mount Hope in 2021 compared to the long-term average rainfall from the Mount Hope Bureau of Meteorology weather station (#18171).

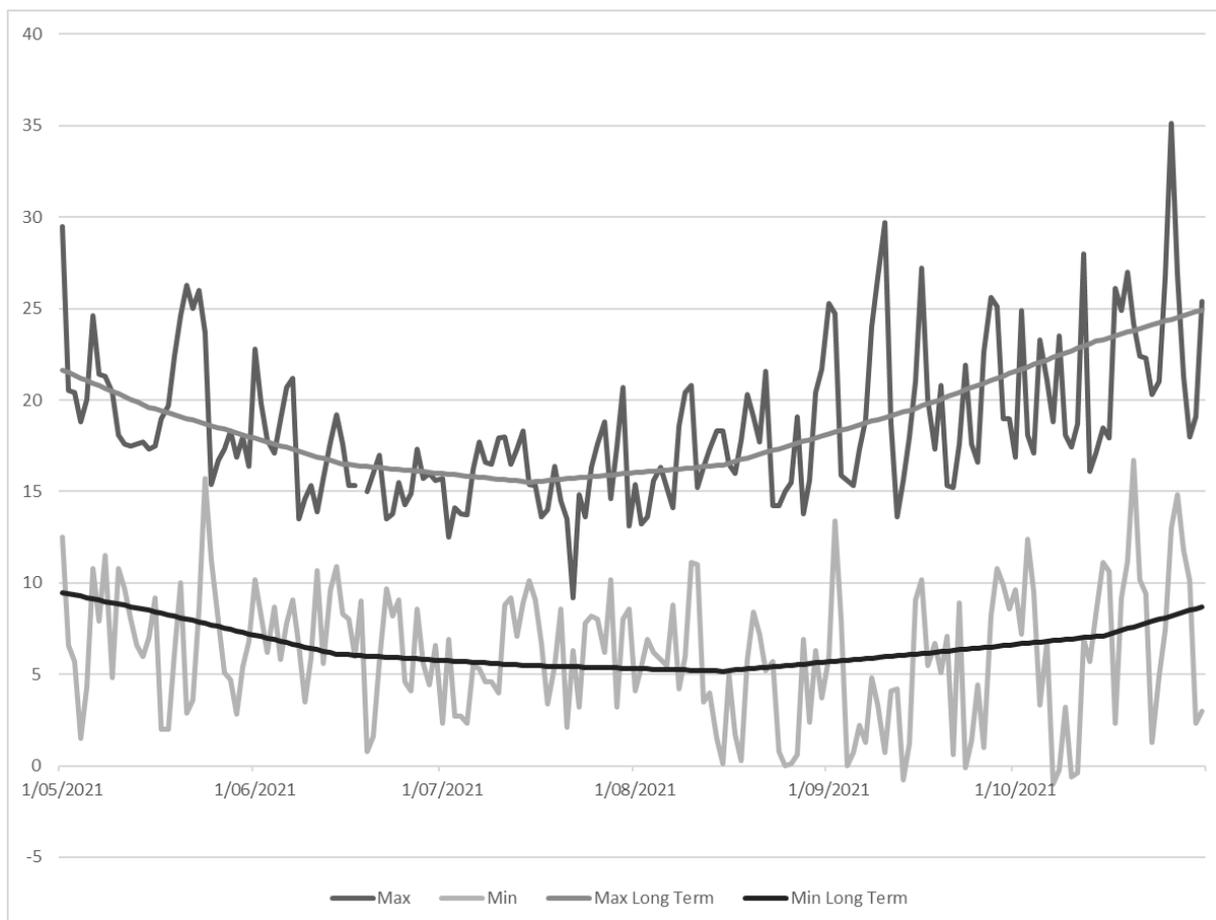


Figure 3. Long-term average, minimum and maximum temperature (°C) recorded during the growing season at Cummins Aero Bureau of Meteorology weather station, 2021 (#18217).

Table 1. Soil test results for Mount Hope demonstration paddock (mean of six tests collected), Eyre Peninsula, 2021.

Depth (cm)	NH3-N	NO3-N	Cow. P (mg/kg)	PBI + Col P (mg/kg)	Sulfur (S)	OC (%)	Texture mg/kg	pH (H ₂ O)	pH (CaCl ₂)
0-10	9.48	0.98	26	33.8	10.5	0.74	SL	7.6	7.1
10-30							SC	7.6	7.0
30-60							C	7.9	7.3
60-100							C	8.2	7.6

Depth (cm)	Cu	Fe	Mn (mg/kg)	Zn	B	Salinity EC dS/m	Ece dS/m
0-10	0.4	21.5	1.8	0.5	0.8	0.2	3.9
10-30	0.9					0.1	1.6
30-60	2.0					0.2	1.0
60-100	1.4					0.2	2.3

GROWING PULSE CROPS ON SANDY SOILS

Andrew Ware, Mark Saunders, Rhaquelle Meiklejohn, and Gary Miller, EP AG Research

Aim: This demonstration aims to provide information to growers with acidic sandy soils on the value that liming and ameliorating soils can have on the production of lentil and faba beans compared to lupin crops on Lower Eyre Peninsula.

Methodology:

A paddock near Mount Hope was mapped for pH in 2018 and it was found to have variable top-soil pH of between 5.2 and 6.5 (CaCl₂). The paddock had variable rates of lime applied, depending on the acidity of the soil, in early 2019. The lime was then incorporated by delving, and the surface smoothed and then cropped each year.

In 2021, the paddock was planted on 3 June using the grower's air-seeder with zones sown to lupin (cv PBA Barlock), lentil (cv PBA Kelpie XT) and faba bean (cv PBA Samira) (Table 2). All crops were treated with high rates of the appropriate inoculant and broadleaf weeds controlled with label rates of herbicide, appropriate for the crop and the soil type.

During the season emergence, nodulation scores, biomass, and grain yield data were collected using quadrant cuts at multiple locations in each zone.

Treatments:

Strips of lentil (cv PBA Kelpie XT), faba Bean (cv PBA Samira) and lupin (cv PBA Barlock) were planted across areas of the paddock that had been +/- delved in 2019.

Table 2. Trial details, including sowing and harvest date, Mount Hope, 2021.

Trial design	demo
Replicates	demo
Sowing date	3/6/21
Row spacing	25 cm
Fertiliser	80 kg/ha MAP
Harvest date	11/11/21

Key messages

- Soil amelioration/ liming has the potential to allow profitable production of high value pulse crops such as lentil on sandy soils on Lower Eyre Peninsula, however yields were considerably lower compared to the lupin crop in the same paddock.

Results and Discussion:

Soil testing conducted in autumn 2021 found that top-soil pH (0-10 cm) to be 7-7.6, the sub-soil was also near-neutral 7.6 (CaCl₂) at 60-100 cm (Table 1).

Nodule scores conducted twice during the growing season found that all crops were able to produce enough nodules to meet industry standards considered for adequate nodulation. However, the beans and lupins did appear to have a higher nodulation rate than lentil (Table 3).

Pulses grown on the deep ripped/delved soil all produced grain yields higher than where the soil wasn't ripped (Table 3). A 31% grain yield advantage from ripping was recorded in lupin, 15% in faba bean, and 30% in lentil.

Whilst the way the paddock was sown doesn't allow for direct statistical analysis to compare grain yields of each of the crops against each other, the yields obtained do provide a realistic impression of achievable pulse yields on limed and ameliorated soil in this environment. When these yields were used to extrapolate out to a gross margin it showed that lupins were reasonably profitable in 2021 at the grain yields achieved, while faba bean and lentil have the potential to also be profitable in this environment (Table 4).

While adjusting soil pH and ameliorating soil are important steps in growing high value pulse crops, such as lentil, on acidic sandy soils, returns still may be lower or only match that of a productive lupin crop (Table 5).

A range of skills and practices not used in cereal, canola or lupin production are also required when growing high value pulse crops for the first time. These include (but are not limited to) matching broadleaf herbicide performance to soil type and harvesting crops vulnerable to pod drop low to the ground.

Table 3. Nodule scores, biomass and grain yield of pulse crops grown at Mount Hope, 2021.

		Plants/m ²	Nodule score 3Aug	Nodule score 6 Sept	Biomass (t/ha) 11/Oct	Biomass maturity (t/ha)	Hand cut grain yield (t/ha)	Harvester grain yield (t/ha)
Lupin	Ripped	48	5.6	7.2	7.66	8.43	3.29	1.79
	Unripped	50			3.92	5.47	2.27	
Faba bean	Ripped	28	7	6.4	4.50	5.10	2.60	2.00
	Unripped	30			3.15	4.60	2.20	
Lentil	Ripped	92	4.4	4.8	3.00	3.12	1.07	0.8**
	Unripped	96			1.85	2.51	0.75	

** some yield loss experienced due to pod drop prior to harvest.

Table 4. Pulse crop gross margin x grain price sensitivity (\$/ha).

Crop	Grain Price (\$/t)									
	300	350	400	450	500	600	700	800	900	1000
Lupin	624	789	953	1118	1282	1611	1940	2269	2598	2927
Faba bean	262	392	522	652	782	1042	1302	1562	1822	2082
Lentil	-176	-123	-69	-16	38	145	252	359	466	573

Table 5. Grain yield and variable costs used in grain price sensitivity analysis in Table 4.

Crop	Hand cut grain yield* (t/ha)	Variable costs** (\$/ha)
Lupins	3.29	363
Faba bean	2.60	518
Lentil	1.07	497

*Yields from hand-cuts collected adjacent to each crop (collected 11 November).

**Variable costs derived from PIRSA Farm Gross Margin Guide 2021.