

# Establishment of Lower EP cropping systems trial

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## Location

Edillilie - Mark Modra  
AIR EP

## Rainfall

Av. Annual: 420 mm  
Av. GSR: 340 mm  
2023 Total: 342 mm  
2023 GSR: 268 mm

## Yield

Potential: Wheat derived from Yield Prophet 50% probability (4 July)  
6.0 t/ha

Actual: Wheat 4.7 - 5.2 t/ha

## Paddock history

2022: Canola  
2021: Faba beans  
2020: Wheat

## Soil type

Ironstone gravel, red brown earth, Chromosol

## Soil test

pH (CaCl) 0 - 10 cm: 6.77

## Plot size

10 m long x 1.5 m wide, with buffer plots either side, planted to the same crop x 3 replicates

## Trial design

Experimental: Fully phased crop rotation, with complete plot randomisation

## Yield limiting factors

Terminal drought

## Key messages

- **This is the first year of a long-term experiment looking to shed light on increasing productivity and sustainability of Lower Eyre Peninsula farming systems.**
- **An early break to the season followed by decile 2-3 growing season rainfall at Edillilie in 2023 saw**

**conditions get close to waterlogging in late June, but then soil conditions rapidly dried out and bought an early end to the season.**

- **Conditions weren't suitable for disease to proliferate in pulse, cereal or canola crops.**
- **There was no response to higher rates of nitrogen, as lower rates of nitrogen were sufficient to reach water limited yields.**
- **Lentil yielded around 2.0 t/ha, faba bean 2.5 t/ha, canola 3.1 t/ha and wheat 5 t/ha.**

## Why do the trial?

The trial is part of a network of 9 trials being conducted across SA and Vic as part of the flagship GRDC-University of Adelaide 'Farming Systems South' project (full title: 'Enterprise choice and sequence strategies that drive sustainable and profitable southern Australian farming systems').

The project is motivated by the perceived 'gap' that remains in profitability and efficiency (e.g. gross margin per mm rainfall) despite good single crop agronomy. The project aims to better understand the drivers of profitability and sustainability in farming systems in the southern region, and better realise water-limited potential.

The Eyre Peninsula (EP) trial aims to shed light on the drivers of profitability and sustainability in the Lower EP in terms of strategic

decisions (e.g. proportion of pulse, oilseed and cereals in rotation), tactical decisions (e.g. in-season fertiliser application) as well as the interactions between them. The trial aims to address questions such as: what is the most profitable farming system for Lower EP? Can the yield frontier be lifted through changes to farming systems?

The project is innovative in its (1) evaluation of broader system performance – beyond productivity and explore trade-offs, to better understand "why" systems perform the way they do; and (2) test new systems and how they compare to baseline (e.g. canola-wheat) and alternative systems (e.g. lentil-canola-wheat-wheat), for example, lower input, higher broadleaf proportion, etc.

In addition to agronomic research, the project also involves biophysical modelling and economic evaluation workstreams. The modelling component will enable evaluation of more farming systems with respect to more performance metrics, beyond the trials themselves (e.g. estimation of GHG emissions and its trade-offs with profitability, WUE, etc.).

## How was it done?

The Edillilie trial involves the following treatments (Table 1), which were a result of consultation with the AIR EP Medium Rainfall RD&E Committee.

**Trial details**

Wheat: Calibre sown 12 May 2024

Treatments:

Decile 2 (target yield 4t/ha) - 66 kg/ha N

Decile 5 (target yield 6t/ha) - 112 kg/ha N

Decile 7 (target yield 7t/ha) - 158 kg/ha N

Fungicides applied at GS25 & 49.

Canola: Nuseed Emu sown 12 May 2024 (short season variety sown late as 2023 surrounding crop was also canola)

Treatments:

Decile 2 (target yield 2t/ha) - 75 kg/ha N

Decile 5 (target yield 3.0t/ha) - 121 kg/ha N

Decile 7 (target yield 3.5t/ha) - 167 kg/ha N

Fungicide applied at 10% bloom.

Faba Bean: PBA Samira sown 12 May 2024

Fungicide applied at canopy closure.

Lentil: GIA Thunder sown 12 May 2024

Fungicide applied at canopy closure.

Measurements taken were soil chemistry, starting soil water, Predicta B, weed counts, disease scores, biomass at maturity, grain yield and grain quality.

**Table 1. Trial systems/treatments. ‘District practice’ represents the most common practice among local growers (112 kg N/ha applied in 2023). ‘Decile’ refers to a strategy whereby Yield Prophet is used, parameterised with soil water and nutrient sampling results, to determine nitrogen requirements to satisfy a water-limited yield corresponding to a particular rainfall decile.**

System ID	Crop rotation	Nitrogen strategies
Baseline	Ca-W	District practice Decile 2 Decile 7
Diverse high value	Lt-Ca-W-W	Decile 2 Decile 7
Diverse	Fb-Ca-W-W	Decile 7

Ca=canola; W=wheat; Lt=lentil; Fb=faba bean.

**Table 2. Maturity biomass, grain yield and grain quality measurements collected at Edillilie trial site in 2023.**

Crop/N strategy	Biomass (t/ha)	Grain yield (t/ha)	Oil (%)	Test weight (kg/hl)	Screenings (%)	Protein (%)
Canola - D2	9.26	3.12	42.8			
Canola - D7	9.28	3.12	38.8			
Canola - Std	9.38	3.19	40.5			
Faba Bean	6.27	2.54				
Lentil	5.71	2.08				
Wheat - D2	12.32	5.23		80.1	0.9	10.4
Wheat - D7	11.90	4.76		76.6	2.3	12.4
Wheat - Std	12.02	4.79		78.3	2.3	11.3

## What happened?

Results are still being analysed by University of Adelaide AAGI group. Table 2 contains preliminary maturity biomass, grain yield and grain quality measurements collected at the site.

## What does this mean?

The Edillilie trial has just completed its first year. Given the project's systems focus, requiring the legacy effects within different crop sequences and with different nitrogen strategies, results from 2023 are just the start of the sequences.

There was no positive yield response from higher rates of nitrogen (N) applied above the

Decile 2 treatment, due to the Decile 2 amount being sufficient to reach the water limited yield potential in 2023. There does appear to be a slight negative effect from applying higher rates of N to the wheat, but statistical analysis will need to be conducted to confirm this. Wheat grain quality (particularly test weight) also appears to have been reduced by higher N rates.

One of the critical factors in determining long term profitability of higher nitrogen rates will be if the nitrogen that was not needed for the 2023 crop can be carried over for use in subsequent crops (nitrogen banking) and how that compares to sourcing fixed nitrogen from pulse crops.

Attaining lentil yields of 2 t/ha made the crop a viable alternative to canola in 2023, however the dry finish and lack of water logging may have helped such a positive result. This trial will help assess lentil production in this area over several seasons.

## Acknowledgements

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