Barellan site attributes

2024

Focus

- ***Pulse species and variety comparison*** – evaluate pulse species including chickpeas, faba beans, field peas, lentils, lupins and vetch to determine suitability within the site environment.
- ***Phosphorus (P) response*** – determine the P efficiency of lentils and field peas. Which species is more responsive to P and which can better adapt to varying P rates?
- ***Field pea fungicide*** – determine the most cost-effective management strategy for controlling blackspot in field peas in a variable rainfall environment.

Climate

The 2024 season began strongly, with soaking rains in early April. Although a dry spell followed, beneficial rainfall in mid-May led to very wet conditions, allowing crops to establish well. This promising start, categorised as decile 8 to 10, set the season up for optimum grain yield (Table 1).

However, below-average rainfall persisted across much of the area throughout winter, with warm, dry conditions into August. By September, conditions were tightening, culminating in a widespread severe frost in mid-September. On September 16, the temperature at Griffith Airport dropped as low as −2.1 °C, with even lower temperatures recorded in other areas, remaining below 0 °C for much of the night. Rainfall in the last week of September allowed some crops to recover.

In mid to late October, storms with strong winds and hail caused further crop damage in some regions.

Table 1: *Monthly rainfall for 2023, 2024 and long-term average (LTA, 1878–2024) at Barellan Post Office (BOM Number 74005) and total annual and growing season (GSR, April–October) rainfall.*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	GSR
2023	43.6	0	79.1	44.6	17.0	50.3	22.8	19.3	4.3	10.0	97.7	40.4	**429.1**	**168.3**
2024	112.6	48.7	5.4	45.4	59.2	18.9	32.2	31.0	22.4	27.2	69.4	34.6	**507.0**	**236.3**
LTA	38.9	34.0	38.2	34.8	37.6	40.3	36.5	37.9	34.9	42.6	35.4	31.6	**442.7**	**264.6**

Crop sequence and key management dates

Crop sequence		
Year	Crop	Cultivar
2023	Wheat	Scepter(D)
2022	Wheat	Scepter(D)

Site management 2024		
Activity	Date	Comments
Sowing	1 May	Pulse species and variety comparison P response in lentils and field peas Field pea fungicide
Establishment	13 June	Establishment scores on all trials
NDVI early	24 July	Biomass assessed on all trials
NDVI flowering	27 August	Biomass assessed on all trials
Harvest	22 November	All trials

Soil characteristics

Table 2: *Soil chemical characteristics at Barellan in April 2024.*

Characteristic	Unit	Soil depth (cm)	
		0–10	10–60
Nitrate (NO_3) N	ppm	37	5
Ammonium (NH_4) N	ppm	<1.0	<1.0
Phosphorus [Colwell]	ppm	29	
Potassium [Am. Acet.]	meq/100 g	0.86	
Magnesium [Am. Acet.]	meq/100 g	0.69	
Calcium [Am. Acet.]	meq/100 g	4.75	
Sulphur [MCP]	ppm	7.0	
Manganese [DTPA]	ppm	24.7	
Boron [$CaCl_2$]	ppm	0.4	
Copper [DTPA]	ppm	0.4	
Iron [DTPA]	ppm	17.0	
Zinc [DTPA]	ppm	0.2	
Organic matter	%	1.5	
CEC	meq/100 g	6.35	
Ca:Mg ratio		6.9	
K base saturation	%	13.6	
Mg base saturation	%	10.9	
Ca base saturation	%	74.9	
Na base saturation	%	<1.0	
pH [1:5 $CaCl_2$]		5.4	
EC [1:5 H_2O]	dS/m	0.09	
Aluminium [KCl]	meq/100 g	0.03	
Chloride	ppm	17.0	
Sodium [Am. Acet.]	meq/100 g	<0.1	
Soil N	kg N/ha	44	33
Total N (0–60 cm)	kg N/ha	77	

Barellan farm walk, 25 September 2024

Table 3: *Segmented soil pH and salinity at the 2024 Barellan pulse trial site sampled February 2025.*

Depth (cm)	pH ($CaCl_2$)	Salinity (dS/m)
0–5	5.00	0.170
5–10	4.33	0.076
10–15	4.54	0.063
15–20	5.16	0.054

Pulse species and variety comparison

Barellan 2024

Key findings

Chickpeas

- The average grain yield of the chickpea trial was 2.08 t/ha. The variety CBA Captain$^{\Phi}$ was the highest yielding (2.33 t/ha) and PBA Seamer$^{\Phi}$ the lowest (1.92 t/ha).
- CBA Captain$^{\Phi}$ produced the largest seed (21.35 g/100 seeds), and PBA HatTrick$^{\Phi}$ the smallest (19.16 g/100 seeds).
- There were no differences in NDVI values between the chickpea varieties.

Faba beans

- The average grain yield of the faba bean trial was 3.11 t/ha. The variety PBA Amberley$^{\Phi}$ was the highest yielding (3.75 t/ha), followed by PBA Samira$^{\Phi}$ (3.42 t/ha), PBA Nasma$^{\Phi}$ (2.83 t/ha) and FBA Ayla$^{\Phi}$ the lowest (2.44 t/ha).
- Harvested seed size was greatest for PBA Nasma$^{\Phi}$ (75.89 g/100 seeds), with PBA Amberley$^{\Phi}$ having the smallest seed (65.71 g/100seeds).
- At flowering FBA Ayla$^{\Phi}$ had the lowest NDVI (0.62) and PBA Nasma$^{\Phi}$ the highest value (0.67).

Field peas

- APB Bondi$^{\Phi}$ was the highest yielding (2.57 t/ha). PBA Butler$^{\Phi}$ was the lowest, yielding 1.03 t/ha.
- PBA Taylor$^{\Phi}$ had the largest seed (19.95 g/100 seeds), followed by APB Bondi$^{\Phi}$ (18.91 g/100 seeds), PBA Butler$^{\Phi}$ (15.35 g/100 seeds) and Sturt (14.90 g/100 seeds) with the smallest.
- Sturt had good crop vigour and biomass, having the highest NDVI values at both assessment timings out of the field pea varieties.

Lentils

- The variety GIA Thunder$^{\Phi}$ was the highest yielding (2.34 t/ha) and PBA Kelpie XT$^{\Phi}$ (1.64 t/ha) the lowest.
- PBA Kelpie XT$^{\Phi}$, while lowest yielding, produced the largest seed (4.36 g/100 seeds). There was little difference in seed size between the other varieties in the trial.
- There were only small differences in NDVI values between the lentil varieties at both assessment timings.

Lupins

- The average grain yield of the lupin trial was 1.97 t/ha, with narrow leaf lupin varieties averaging 2.35 t/ha and albus lupins averaging 1.59 t/ha. PBA Bateman$^{\Phi}$ was the highest yielding variety (2.59 t/ha) and the albus

variety Murringo$^{\phi}$ the lowest yielding (1.36 t/ha).

- The average harvested seed size of the narrow leaf varieties was 15.69 g/100 seeds, compared to 36.13 g/100 seeds for the albus varieties.
- The albus lupin varieties had greater NDVI values than the narrow leaf varieties, with Murringo$^{\phi}$ having the highest NDVI values of all the lupins.

Vetch

- Timok$^{\phi}$ (2.78 t/ha) and Rasina (2.42 t/ha) were the highest yielding varieties in the vetch trial, whilst Volga$^{\phi}$ (2.17 t/ha) and Studenica$^{\phi}$ (1.93 t/ha) were the lowest.
- Volga$^{\phi}$ produced larger seed (8.11 g/100 seeds) than all other varieties.
- Volga$^{\phi}$ and Studenica$^{\phi}$ had the highest NDVI values early and at flowering, and Rasina the lowest at both assessment times.

Trial details

The pulse species and variety comparison trials were set up to compare the performance of four varieties of six pulse species (chickpeas, faba beans, field peas, lentils, lupins, vetch) in the local variable rainfall environment.

Six separate pulse variety trials, consisting of 4 cultivars in each trial (Table 44), were conducted at Barellan in 2024. Measurements taken on each trial included NDVI, grain yield and seed size. Plant material at peak biomass (related to nitrogen (N) fixation) and seed from selected varieties in each trial will be further analysed to determine total N fixation and N removal.

Table 1: *Trial management and the pulse species and varieties evaluated at Barellan in 2024.*

Management	2024			
Pre-sow herbicides	Terbyne® Xtreme® 875 @ 1 kg/ha + Terrad'or® @ 20 g/ha + TriflurX® @ 1.2 L/ha + Gramoxone® 250 @ 2 L/ha			
Sowing date	1 May			
Starter fertiliser	SuPerfect® (8.8% phosphorus, 11% sulphate sulphur, 19% calcium) @ 80 kg/ha			
Sowing rate	Calculated from seed size for target plant population (see below)			
Post-emergent herbicides	24 June: Factor® @ 80g/ha + Platinum® Xtra 360 @ 0.33 L/ha + Hasten @ 1%			
Fungicide	21 August: 1 L/ha of Miravis® Star			
Insecticide	2 October: Trojan @ 30 mL/ha + BS1000 @ 0.2%			
Desiccation	11 November			
Harvest	22 November			
Species	**Target plant population (plant/m²)**	**Variety**		
Chickpea	40	PBA Seamer$^{\phi}$	PBA HatTrick$^{\phi}$	CBA Captain$^{\phi}$	PBA Slasher$^{\phi}$
Faba bean	20	PBA Samira$^{\phi}$	PBA Nasma$^{\phi}$	PBA Amberley$^{\phi}$	FBA Ayla$^{\phi}$
Field pea	40	APB Bondi$^{\phi}$	Sturt	PBA Butler$^{\phi}$	PBA Taylor$^{\phi}$
Lentil	100	PBA Hallmark XT$^{\phi}$	PBA Kelpie XT$^{\phi}$	ALB Terrier$^{\phi}$	GIA Thunder$^{\phi}$
Lupin	30–40	Mandelup$^{\phi}$	PBA Bateman$^{\phi}$	Luxor$^{\phi}$	Murringo$^{\phi}$
Vetch	40	Volga$^{\phi}$	Rasina	Timok$^{\phi}$	Studenica$^{\phi}$

Note: varieties in shaded cells are undergoing further testing to determine N fixation

Results

NDVI

NDVI (normalised difference vegetation index) was used to assess crop growth and vigour of the different varieties in each trial, obtained using a handheld GreenSeeker crop sensor. Two readings were taken, an early reading mid-July and the second at flowering (Table 45).

Table 2: *NDVI for each variety in the six pulse species trials at Barellan in 2024.*

Variety	NDVI 1	NDVI 2
Chickpeas		
CBA Captain	0.32	0.61
PBA HatTrick	0.31	0.61
PBA Seamer	0.32	0.60
PBA Slasher	0.30	0.59
Mean	0.31	0.60
l.s.d. (*P* = 0.05)	ns	ns
Faba beans		
FBA Ayla	0.40	0.61[c]
PBA Amberley	0.44	0.66[ab]
PBA Nasma	0.45	0.67[a]
PBA Samira	0.45	0.63[bc]
Mean	0.43	0.64
l.s.d. (*P* = 0.05)	ns	0.029
Field peas		
APB Bondi	0.42[c]	0.66[a]
PBA Butler	0.44[c]	0.62[b]
PBA Taylor	0.49[b]	0.61[b]
Sturt	0.56[a]	0.69[a]
Mean	0.47	0.64
l.s.d. (*P* = 0.05)	0.045	0.036

Variety	NDVI 1	NDVI 2
Lentils		
ALB Terrier	0.31[a]	0.66
GIA Thunder	0.30[ab]	0.65
PBA Hallmark XT	0.31[a]	0.64
PBA Kelpie XT	0.27[b]	0.61
Mean	0.29	0.64
l.s.d. (*P* = 0.05)	0.032	ns
Lupins		
Luxor	0.37[b]	0.71[ab]
Mandelup	0.29[c]	0.69[bc]
Murringo	0.42[a]	0.73[a]
PBA Bateman	0.25[c]	0.67[c]
Mean	0.33	0.70
l.s.d. (*P* = 0.05)	0.04	0.034
Vetch		
Rasina	0.38[b]	0.75[b]
Studenica	0.46[a]	0.79[a]
Timok	0.43[ab]	0.77[ab]
Volga	0.46[a]	0.79[a]
Mean	0.43	0.77
l.s.d. (*P* = 0.05)	0.058	0.032

Means followed by the same letter are not significantly different when compared within a species; ns = not significant
NDVI 1: mid July; NDVI 2: flowering.

Peak biomass

Representative varieties were cut in each trial to assess peak biomass (Table 46), and are in the process of being analysed for N fixation and N removal in grain. This data was not available at time of reporting.

Table 3: *Peak biomass of selected pulse varieties at Barellan in 2024.*

Species	Variety	Peak biomass (t/ha)
Chickpea	CBA Captain	8.86
Faba Bean	PBA Nasma	9.49
	PBA Samira	9.47
Field Pea	PBA Butler	7.52
Lentil	PBA Hallmark XT	5.33
Lupin	Luxor	7.57
	PBA Bateman	9.21
Vetch	Timok	8.16

Lupin variety comparison at flowering time NDVI at Barellan, 27 August 2024

Grain yield

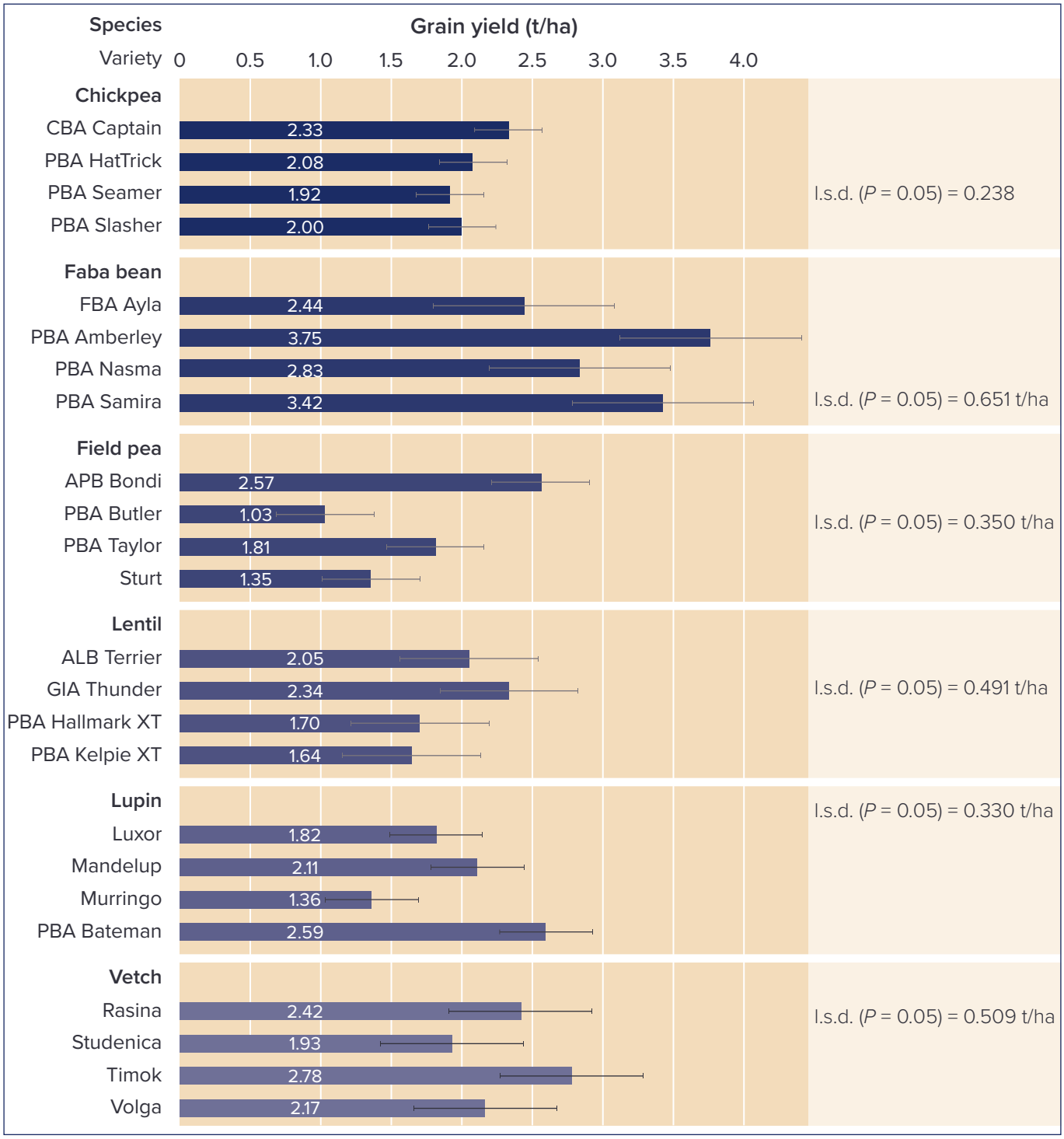

Figure 1: *Grain yield of each variety in the six pulse species trials at Barellan in 2024.*

Seed size

Table 4: *Harvested seed size (100 seed weight) of each variety in the six pulse species trials at Barellan in 2024.*

Variety	Seed size (g/100 seeds)
Chickpeas	
CBA Captain	21.35[a]
PBA HatTrick	19.16[b]
PBA Seamer	20.59[ab]
PBA Slasher	19.63[ab]
Mean	20.18
l.s.d. (*P* = 0.05)	2.17
Faba beans	
FBA Ayla	72.66[a]
PBA Amberley	65.71[b]
PBA Nasma	75.89[a]
PBA Samira	72.73[a]
Mean	71.75
l.s.d. (*P* = 0.05)	4.62
Field peas	
APB Bondi	18.91[a]
PBA Butler	15.35[b]
PBA Taylor	19.95[a]
Sturt	14.90[a]
Mean	17.28
l.s.d. (*P* = 0.05)	1.33

Variety	Seed size (g/100 seeds)
Lentils	
ALB Terrier	3.60[b]
GIA Thunder	3.63[b]
PBA Hallmark XT	3.55[b]
PBA Kelpie XT	4.36[a]
Mean	3.78
l.s.d. (*P* = 0.05)	0.29
Lupins	
Luxor	34.53[a]
Mandelup	15.13[b]
Murringo	37.72[a]
PBA Bateman	16.24[b]
Mean	25.91
l.s.d. (*P* = 0.05)	4.27
Vetch	
Rasina	6.58[b]
Studenica	6.75[b]
Timok	6.52[b]
Volga	8.11[a]
Mean	6.99
l.s.d. (*P* = 0.05)	0.23

Means followed by the same letter are not significantly different when compared within a species.

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Contributors

Barry Haskins and Rachael Whitworth – Ag Grow Agronomy and Research
rachael@aggrowagronomy.com.au