

Closing the Economic Yield Gap of Grain Legumes in WA

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KEY MESSAGES

- Cereals performed significantly greater than legumes in terms of establishment, biomass and yield.
- There were no standout variety or species in terms of yield for the cereal treatments.
- Field peas were the highest yielding legume species, with similar returns to wheat.

AIM

To further grower knowledge regarding legume profitability by comparing the gross margins of cereals (wheat, barley and oats) with legumes (chickpea, faba bean, lentil, lupin and field pea) across various WA locations. This project also aims to develop grower confidence in growing legumes in their area by demonstrating the best practices to maximise production.

BACKGROUND

Cereals have been the dominant crop type grown in WA due to clear management knowledge and high profitability. However, legumes are an increasingly popular rotational crop with nitrogen (N) legacy benefits. Since the release of varieties and rhizobia better suited to WA soils as well as high/volatile N prices, growers have shown increased interest in the profitability of legumes comparative to cereals. A lack of confidence in the agronomy management to maximise production is also a barrier to incorporating legumes in farming systems. This trial included the comparison of one variety of chickpeas, faba beans, lentil, lupin, field peas and vetch to two wheat and barley varieties, as well as one oat.

TRIAL DETAILS

Trial location	CR & R Cail & Sons, Nugadong
Plot size & replication	10 m x 1.85 m x 3 replications
Soil type	Loam
Paddock rotation	2024 chemical fallow, 2023 wheat, 2022 barley
Sowing date	07/05/2025
Sowing rate	80 kg/ha Calibre & Vortex Wheat 90 kg/ha Maximus & Granite Barley 85 kg/ha Goldie Oats 120 kg/ha Amberley Faba beans 35 kg/ha Thunder Lentils 100 kg/ha Jurien Lupins, CBA Captain Chickpeas & PBA Butler Field Peas 40 kg/ha 37107 (New) Vetch
Fertiliser	07/05/2025 100 kg/ha Macro Pro Extra with Uniform + Urea 80 kg/ha (cereals only) 10/07/2025 UAN 100 L/ha (cereals only) 22/07/2025 UAN 40 L/ha + Nano Zinc (650 g/L) 500 mL/ha + Nano Copper (500 g/L) 500 mL/ha (cereals only)
Trial management	07/05/2025 Bifenthrin 250 g/L Insecticide 50 mL/ha, Fomesafen 240 g/L Herbicide 750 mL/ha, Propyzamide 500g/L Herbicide 1 L/ha, Diuron 900 g/kg Herbicide 200 g/ha, Chlorpyrifos 500 g/L Insecticide 500 mL/ha, Glyphosate 470 g/L Herbicide 2 L/ha (legumes) and Chlorpyrifos 500 g/L Insecticide 500 mL/ha, Diuron 900 g/kg Herbicide 200 g/ha, S-Metolachlor 120 g/L Herbicide 2.5 L/ha, Saflufenacil 250 g/L Herbicide 200 mL/ha, Bifenthrin 250 g/L Insecticide 80 mL/ha, Glyphosate 470 g/L Herbicide 2 L/ha (cereals) 10/07/2025 Bixafen 75 g/L Fungicide 600 mL/ha, Bifenthrin 250 g/L Insecticide 150 mL 01/08/2025 Gamma-cyhalothrin 150 g/L Insecticide 500 mL/ha 22/08/2025 Bixafen 75 g/L Fungicide 500 mL/ha, Gamma-cyhalothrin 150 g/L Insecticide 20 mL/ha 01/10/2025 Gamma-cyhalothrin 150 g/L Insecticide 30 mL/ha
Growing season rainfall	265.6 mm
Harvest date	05/12/2025

TREATMENTS

Treatment	Species	Variety
1	Wheat 1	Calibre
2	Wheat 2	Vortex
3	Barley 1	Maximus
4	Barley 2	Granite
5	Oats	Goldie
6	Chickpea	CBA Captain
7	Faba bean	Amberley
8	Lentil	Thunder
9	Lupin	Jurien
10	Field pea	Butler
11	Vetch	37107 (New)

SOIL COMPOSITION

Depth (cm)	pH (CaCl ₂)	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	N (NO ₃) (mg/kg)	N (NH ₄) (mg/kg)	EC (ds/m)	OC (%)
0-10	6.9	56	363	10.8	20	8	0.188	0.57
10-30	5.6	34	216	10.8	9	3	0.077	0.42

RESULTS

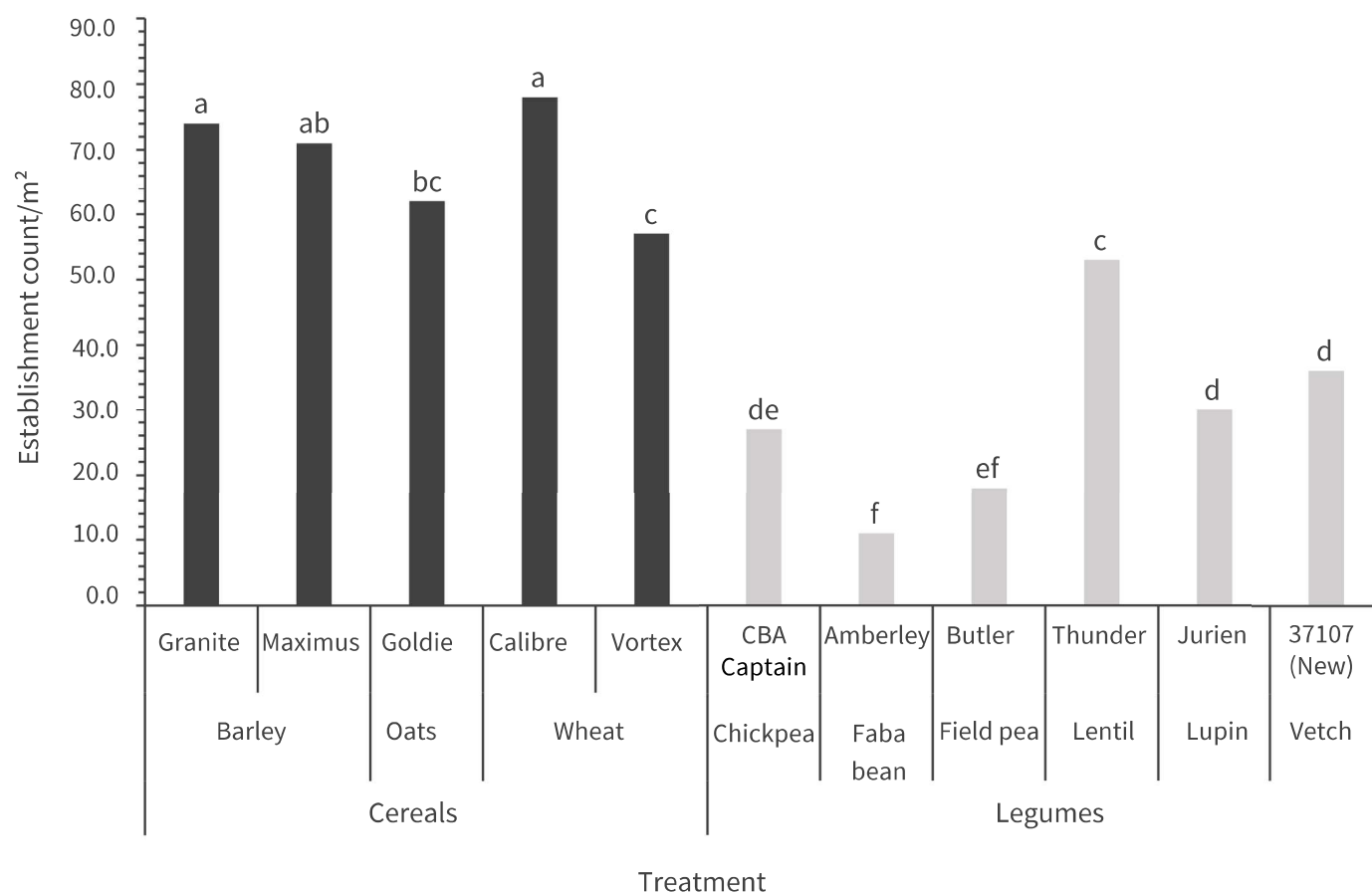


Figure 1. Plant establishment counts per metre². Letters represent significant differences between treatments. Target plant densities – Barley:120 plants/m², Oats: 160 plants/m², Wheat: 160 plants/m², Chickpea: 40-50 plants/m², Faba bean: 25-30 plants/m², Field pea: 50 plants/m², Lentil: 100-110 plants/m², Lupin: 40-45 plants/m² and Vetch: 40 plants/m²(Crop Sowing Guide 2025).

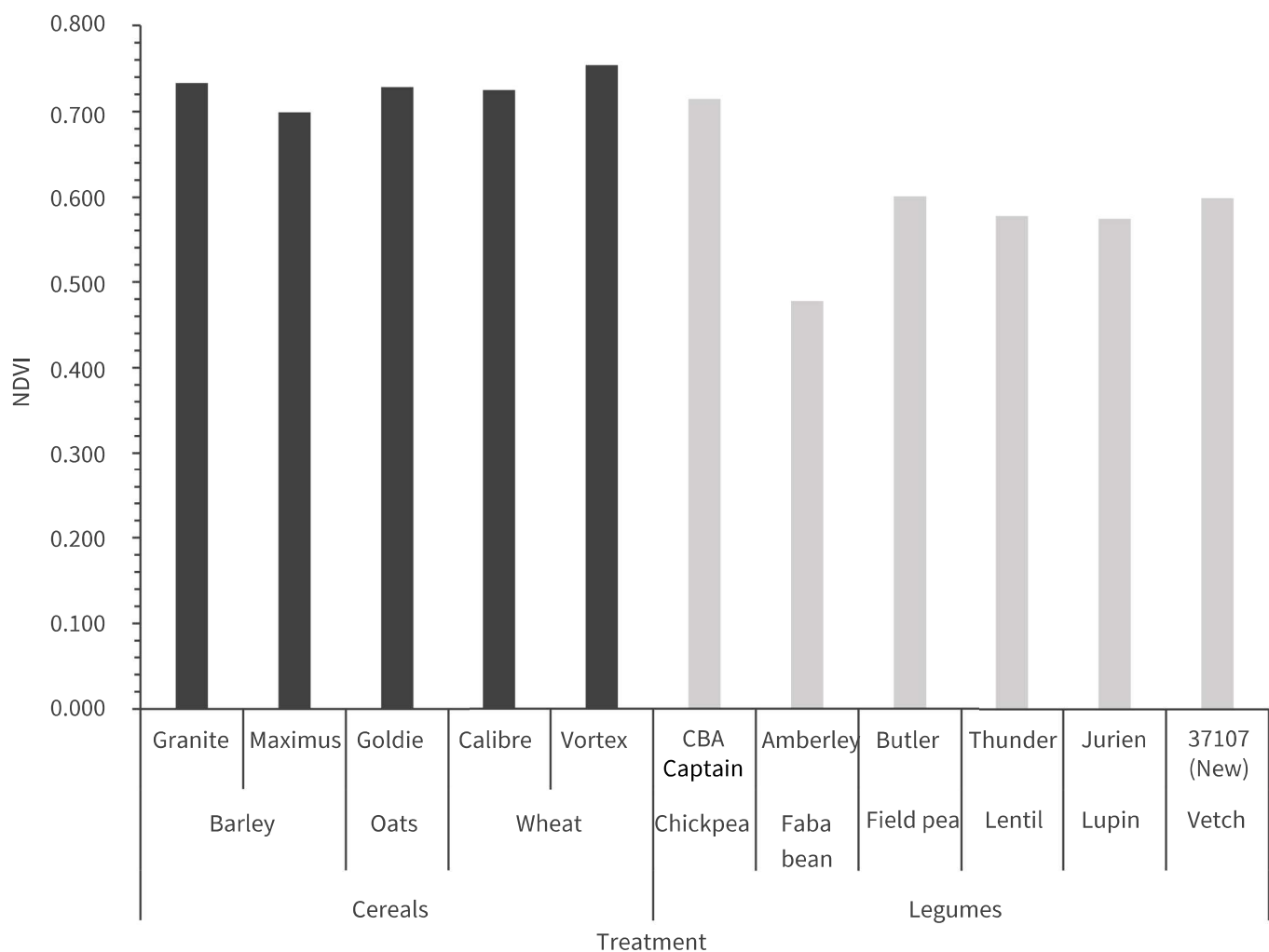


Figure 2. NDVI results pre-flowering (16th July), separated by cereals and legumes. NDVI values for healthy crops generally vary between 0.4 to 0.7, depending on the spatial distribution of species and their biomass/canopy cover at each growth-stage.

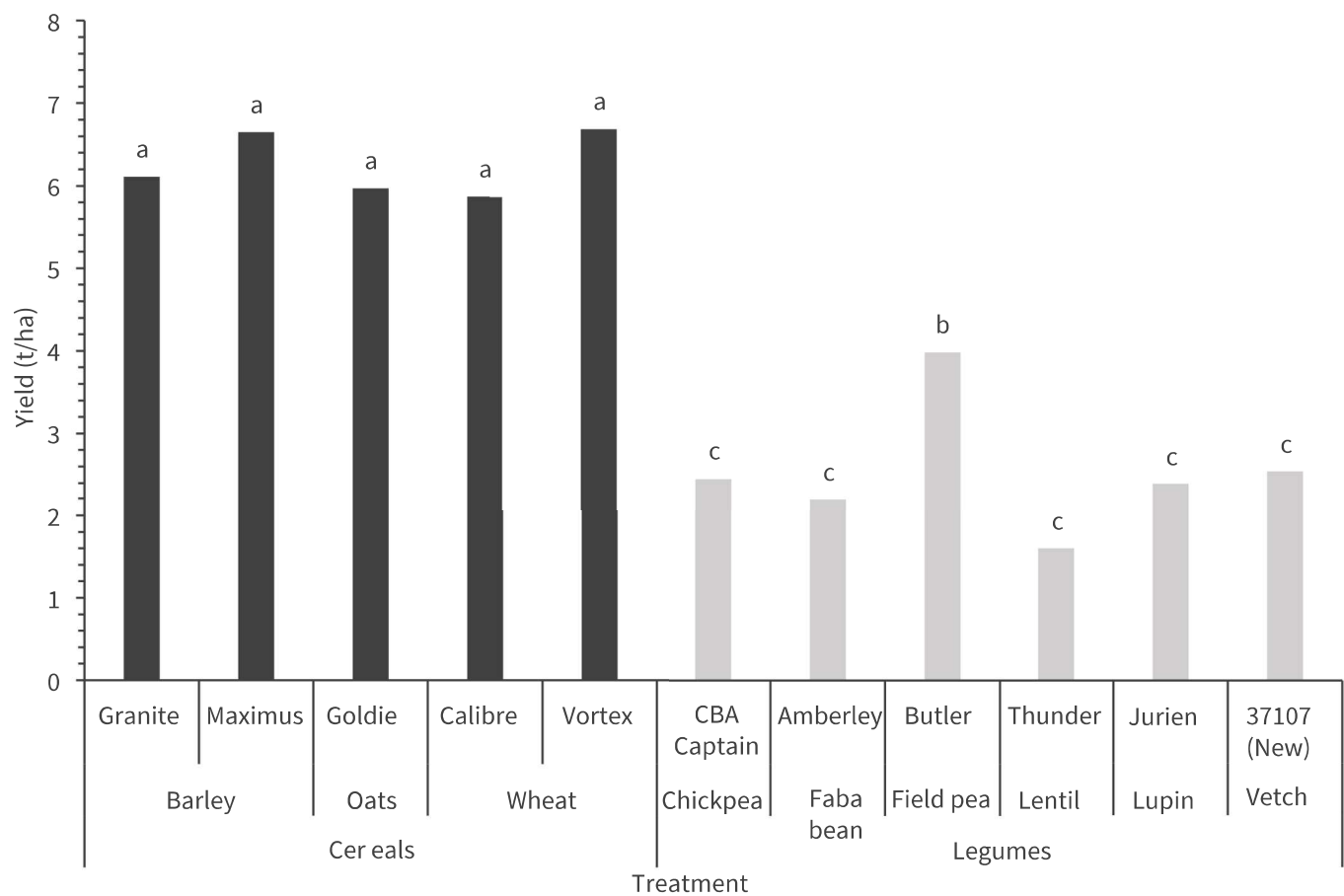


Figure 3. Yield (t/ha) across treatments, separated by cereals and legumes. Letters represent significant difference between treatments.

Table 1. Yield & grain quality data across treatments. Letters represent significant difference between treatments.

Trt	Species	Variety	Average Yield (t/ha)	1000 seed weight (g)	100 seed weight (g)*	Protein (%)*	Screenings (%<2mm)*	Retention (%>2.5mm)	Delivery Grade	Return (\$)**
1	Wheat 1	Calibre	5.87 ^a	34.10 ^a		11.7 ^{de}	3.8 ^{cd}		H2	1996
2	Wheat 2	Vortex	6.69 ^a	34.27 ^a		10.6 ^{ef}	4.3 ^c		APWN	2275
3	Barley 1	Maximus	6.65 ^a	36.30 ^a		12.8 ^d	2.6 ^d	84.47	MALT1	2148
4	Barley 2	Granite	6.11 ^a	33.93 ^a		13.1 ^d	6.6 ^b	60.83	BFED1	2029
5	Oats	Goldie	5.97 ^a	26.93 ^b		9.2 ^f	15.1 ^a		OAT3	1672
6	Chickpea	CBA Captain	2.45 ^c		19.70 ^b	21.4 ^c				1409
7	Faba bean	Amberley	2.19 ^c		52.23 ^a					876
8	Lentil	Thunder	1.60 ^c		3.50 ^d	22.1 ^{bc}			LENT1	960
9	Lupin	Jurien	2.38 ^c		14.20 ^c	35.6 ^a			LUP1	845
10	Field pea	Butler	3.98 ^b		14.50 ^c	24.0 ^b			PKA1	2090
11	Vetch	37107 (New)	2.53 ^c		5.00 ^d					898
		<i>L.S.D.</i>	1.4	3.2	-	-	-			
		<i>C.V.</i>	19.7	5.2	4.0	3.3	8.0	NS		
		<i>f- prob.</i>	0.854	0.92	0.354	0.22	0.693	NS		

*data presented as back-transformed means.

** January 26 pricing – wheat H2: \$340/t, wheat APWN: \$340/t, barley MALT1: \$323/t, barley BFED1: \$332/t, oats OAT3: \$280/t, chickpea: \$575/t, faba bean: \$400/t, lentil LENT1: \$600/t, lupin LUP1: \$355/t, field pea PKA1: \$525/t, vetch: \$355/t

RESULTS & DISCUSSION

This trial revealed distinct differences in early -season establishment, pre-flowering biomass, and yield between cereal and legume species. Low rainfall during the post-sowing period led to decreased establishment compared to expected target densities for most species (Figure 1). Early -season emergence was significantly greater in cereals compared to legumes, though no significant differences were recorded between varieties for each cereal crop-type, nor among the pulse species. This pattern was also reflected in NDVI, with no significant differences detected between varieties for NDVI (Figure 2, Figure 3).

Lentils were the lowest yielding legume and field peas were the highest, achieving 1.6 t/ha and 3.98 t/ha, respectively (Table 1). Cereals produced significantly greater grain yields than legumes, with no varietal differences detected between crop-types. Maximus and Vortex were the highest yielding cereals, with all varieties achieving classification expectations (Table 1). Using 2025/26 pricing and trial yields, cereals would generate \$1,672 to \$2,275 gross (not including costs). Field peas performed comparably at \$2,090 gross, while chickpeas fell just short at \$1,409 gross (Table 1). Lupins and vetch had similar prices to wheat but their lower yields resulted in smaller returns. Despite the lowest pricing, oats outperformed most legumes in overall value. Final analysis will compare the gross margins of species and provide more economic context for the agronomic differences observed/recorded within this trial.

ACKNOWLEDGMENTS

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REFERENCES

1. Power, S, Shackley, B, Paynter, B, Seymour, M, Dhammu, H, and Wackett, B. (2024), 2025 Western Australian Crop Sowing Guide. State of Western Australia (Department of Primary Industries and Regional Development), Perth. Bulletin 4935. <https://library.dpir.wa.gov.au/bulletins/292>

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