

Irrigation focus paddocks

Key messages

- A local Grains Research and Development Corporation (GRDC) and Field Applied Research (FAR) Australia research trial has shown that higher planting densities in irrigated faba beans are correlated to higher yields. Faba beans are not regularly grown in local irrigation systems, so in 2022, a demonstration was sown to test and discuss the results with the Riverine Plains Irrigation Discussion Group.
- The site received very high levels of rainfall (decile 10) and did not require irrigation. The high rainfall caused severe disease and waterlogging, which dramatically reduced podding and yield potential. The highest yield of 0.98t/ha was the paddock treatment, Amberley sown at 26 plants/m².
- Farmers were interested in the gross margin performance of beans compared to other irrigated crops. Economic analysis of the 2022 season showed that faba beans in the region were less profitable and in some cases unprofitable compared to canola and wheat. This was mainly due to disease impacting faba bean yields. Even though faba beans can have good returns, there is a risk of low or negative returns in high rainfall years.
- Dry matter measurements indicate that between 134kg N/ha and 190kg N/ha was fixed by the faba bean crop, which will benefit the next two to three years' crop production. The value of 190kgN/ha at current urea prices is \$413/ha.

Aim

To demonstrate that higher seeding rates in irrigated beans provides higher yields and compares the economics of irrigated beans to irrigated canola and wheat.

Method

The site was soil tested on the 17 May 2022 to provide background information for the site (Table 1). Treatments were decided in consultation with FAR Australia and the host farmer, to test two varieties and a range of plant populations (Table 2). Treatments were two seeder widths wide (24m) and 1000m long. Yields were measured by the host farmer's yield monitor.

A gross margin analysis was completed at the end of the season to compare the profitability of irrigated winter crops in the region. The analysis used actual grain prices, irrigated yields, irrigation water (Table 3) and the following input prices: MAP \$1,300/t, Urea \$1,500/t.

Table 1: Site description

Irrigation type	Centre Pivot
Rainfall (mm): Jan – March	258

Rainfall (mm): April – October	498
Sowing date	22 April 2022
Row spacing	165mm
Soil type	Clay loam
pH CaCl ₂ (0-10cm)	5.9
Soil Mineral N kgN/ha (0-30cm)	101.6
Soil Mineral N kgN/ha (30-60cm)	22.1
Total Mineral N kgN/ha (0-60cm)	123.7
Phosphorus (Colwell)	39
Potassium (Colwell)	240
Sulphur (KCl40)	10

Results

Dry matter samples were taken from three treatments at mid-pod fill on the 17 October 2022. At this stage, the plants were badly lodged, and chocolate spot disease was causing loss of green leaf. Visual inspection indicated that the conditions had greatly reduced the number of pods on the faba beans.

The highest yielding treatment was four, Paddock Amberley (26 plants/m²), which yielded 0.98t/ha. The second highest yielding treatment was one, Bendoc (25 plants/m²) and the lowest yielding treatment was two, Bendoc (29 plants/m²). Refer to Table 2.

The economic analysis was based on actual prices, yields achieved in the region on irrigated paddocks (no irrigation water was applied in 2023). The yields achieved were about 25% below the target set at the beginning of the year, due to the waterlogged conditions. The analysis showed that faba beans are significantly less profitable in a wet year compared to canola, due to lower yields and poorer prices (Table 3). Due to the waterlogging and diseased conditions, the case study paddock of faba beans yielded approximately 1t/ha dramatically reducing the gross margin to a loss of \$349/ha.

Table 2: Treatments

Treatment	Seeding rate kg/ha*	Actual plant population plants/m ²	Dry Matter at mid-pod fill tonnes/ha	Grain yield Tonnes/ha	Estimated nitrogen fixation kg N/ha **
Control: Bendoc 22 plants/m ²	150	21	11.9	0.68	190.4
1: Bendoc 25 plants/m ²	170	25	#	0.71	#
2: Bendoc 29 plants/m ²	200	29	8.4	0.26	134.4
3: Amberley 25 plants/m ²	235	40	10.8	0.64	172.8
4: Paddock Amberley	170	26	#	0.98	#

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*Seeding rates were calculated based on Bendoc 300 grain weight 148g, Amberley 300 grain weight 215g.

#These plots were not measured.

**Based on 16kgN/t of above ground DM (Glover et al, 2013).

Table 3: Economic parameters

Crop type	Actual price \$/t	Actual yield (in the region) t/ha	Irrigation water applied mm/ha	Gross margin \$/ha
Wheat	\$350	5.2	0	\$800
Canola	\$700	2.8	0	\$976
Faba beans	\$300	3.0	0	\$458

Observations and comments

The purpose of the demonstration was to show that higher planting densities for irrigated faba beans produce higher yields. However, the demonstration was affected by excessive rainfall, water logging and disease, which meant that the crop could not reach its potential.

In the 2022 scenario of high disease pressure, the highest seeding rates had the most disease pressure, and were lower yielding. The narrow row spacing of the paddock also provided conditions that favoured the spread of disease, as the large crop and narrow row spacing did not allow much airflow through the canopy. The Amberley variety did appear to perform better than Bendoc, which may be due to its higher disease resistance. However, Amberley is a long season variety compared to Bendoc and not really suited to the Riverine Plains region, particularly when the region experiences a hot, dry spring.

If yields of 5.5t/ha plus can be achieved in irrigated faba beans, the returns are similar to irrigated wheat, however lower than canola. Historically, high gross margins of irrigated faba beans have been demonstrated over a number of years in the Irrigated Cropping Trials at Kerang (Pers.comm D Jones, 2022) however there is very low adoption by growers. The results of this demonstration have shown that disease can be devastating in faba beans for both yield and gross margin, which explains the reluctance of growers to adopt them in irrigated cropping systems. If the faba beans can fix 190kgN/ha, this is equivalent to 413kg urea per hectare. Based on current urea prices of \$1,000/t this represents a financial benefit in the following years of \$413/ha. If this benefit can be realised, by the following crops, it may provide farmers with more incentive to grow beans.

A lower risk option of incorporating a nitrogen fixing legume is to sow a high-density legume pasture option. This option has more flexibility as it can be made into hay or grazed by livestock. The ability to terminate the pasture early, by making hay or brown manuring, also makes it an effective option to then double crop with maize in an irrigated cropping system.

Acknowledgements

The Optimising Irrigated Grains project is part of the GRDC investment in ICF1906-002RTX, FAR1906-003RTX and UOT1906-002RTX, which is led by the Irrigated Cropping Council. Riverine Plains would like to thank the Trevethan family who hosted this trial and provided the economic analysis. Riverine Plains would also like to thank Seednet for supplying some of the Amberley seed for the trial.

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