

Break Crop Comparison at Palmer in 2020

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Key Messages

- Average growing season rainfall with an early break lead grain yields of between 0.9-1.6 t/ha for the leading variety within each break crop.
- Later sowing generally benefited pulse crop while early sowing favoured canola in 2020.
- Variety selection was important in field pea, chickpea, vetch and Morava, however variety choice did not influence the yield of lentil, lupin, faba bean and vetch.
- The most profitable break crops in 2020 were canola, vetch and lentil which all produced high gross margins of approximately \$600/ha
- Long term profit and risk analysis of pulse crops shows that lentils are likely to have not only the best long term gross margin, but also will have the least number of seasons with negative gross margins.

Background

There is potential for pulse crops to be more widely adopted by low rainfall farmers to improve profitability through enterprise diversity. For example, chickpeas and lentils have traditionally not been grown in the Murray Plains area and yet they are a valuable and profitable break crop in many other parts of South Australia. More commonly grown break crops in the area are vetch and peas because of the grazing option and their suitability for heavy soils respectively. However, making these a profitable contributor to the rotation has long been a challenge for Murray Plains growers.

In 2018, a new SAGIT funded project 'Profitable Pulses for the Murray Plains' commenced a three-year project. The objective of this project is for Murray Plains grain growers to be able to:

- Select appropriate break crops that enhance the productivity and sustainability of their crop sequences.
- Increase their understanding about the agronomic requirements to successfully grow legumes in the area.
- Ensure pulses are a profitable contributor to rotations and the farm business overall.

The final year of trials was completed in 2020. Similar trials were conducted near Sedan in 2018 and Angus Valley in 2019, however both sites were severely drought affected.

About the trial

Replicated trials were established for two sowing times for Canola, Chickpea, Field Pea, Lentil, Vetch, Faba bean and Lupin. Each trial comprised of four leading varieties sown in four replicates (Table 1).

Table 1. Details of break crops variety evaluation trials in 2020.

Canola	Chickpea	Field pea	Lentil	Vetch	Faba bean	Lupin
ATR Stingray	Genesis 090	PBA Wharton	PBA Jumbo2	Studenica	PBA Marne	Coyote
Nuseed Daimond	PBA Royal	PBA Twilight	PBA Hurricane	Volga	PBA Samira	PBA Jurien
Pioneer 44T02 TT	PBA Striker	PBA Gunya	PBA Highland	Timok	PBA Bendoc	PBA Bateman
HyTtek Trident	CBA Captain	PBA Butler	PBA Hallmark	Morava	1225	Mandelup

Time of sowing 1 (TOS1) trials were sown on the 7th of May and the second sowing time (TOS2) was the 26th of May. All trials were sown with 50 kg ha⁻¹ of Granulock Z and both canola trials received a further 150 kg/ha of urea which was spread before sowing and incorporated by the sowing process. Weeds were controlled with a knockdown application of glyphosate prior to cropping with in-crop grass weeds controlled with clethodim and haloxyfop.

Broadleaf weeds were managed with pre-emergent herbicides specific to each crop. Insects were controlled with Trojan insecticide during spring. All trials were harvested with a mechanical plot harvester.

Gross Margins were calculated for each crop type using the yield of the best performing treatment for each TOS for the variety trials. Gross margins were calculated using the Rural Solutions Farm Gross Margin and Enterprise Planning Guide. Gross margins used the January grain price which was supplied by Grainwise.

Results & Discussion

Rainfall and Climate

Total rainfall for the year at the site was below average with 262 mm, however most of this rainfall fell within the growing season (222 mm). An early sowing opportunity was facilitated by 60 mm falling in April-May, while a further 60 mm of rainfall during September and October and provided favourable conditions during the critical flowering and pod fill stage. The period from July – August was well below average and moisture stress was evident throughout the district. It is also worth noting the 2 severe frost events that occurred in early August which may also have had an impact on pulses sown at TOS 1.

Time of sowing

Sowing time cannot be statistically compared as each time of sowing were managed as separate blocks. However, the general trend was for the grain yield of pulse crops to be favoured by delayed sowing in 2020 (Figure 1). The average yield of the TOS 2 trials was higher than the yield of TOS 1 trials by 0.5 t/ha for lentil, 0.4 t/ha for field pea and faba bean and 0.25 t/ha for chickpea. In contrast the average canola yield for TOS 1 was 0.3 t/ha higher than the average canola yield in the TOS 2 trial. The average yield of vetch and lupin was similar between both the TOS 1 and TOS 2 trials

Productivity

There were significant differences between varieties for field pea, chickpea, lupin, vetch and canola (Figure 1). Lentil and faba bean yields did not differ between the four varieties in the experiment (Figure 2). A summary of the significant differences is provided below:

- Variety performance changed with sowing date
- PBA Butler yielded significantly more at TOS 1 than the other three varieties. At the second sowing time, PBA Butler and PBA Twilight yielded similar and significantly greater than PBA Wharton.
- CBA Captain and PBA Royal had significantly higher grain yields than Genesis 090 when sown at the second sowing time but cultivars were similar at the first sowing date
- Morava had the lowest grain yield of all vetch varieties at both sowing times and all other varieties were similar.
- September biomass was also measured for vetch to simulate a hay cut scenario. Volga vetch sown at TOS 1 produced significantly more biomass than the other varieties sown at the same time with 3.2 t/ha compared to 2.6 t/ha. There was no difference in biomass production between varieties sown at TOS 2 with an average of 2.6 t/ha across all varieties.
- The Canola variety Nuseed Diamond had significantly higher yields than the other varieties in both the TOS 1 and TOS 2 trials. Both hybrid TT varieties Pioneer 44T01 and HyTTek Trident yielded similarly across both sowing dates. These two varieties had significantly higher yields than ATR Stingray at TOS 1 but yields were similar to ATR Stingray at TOS 2.

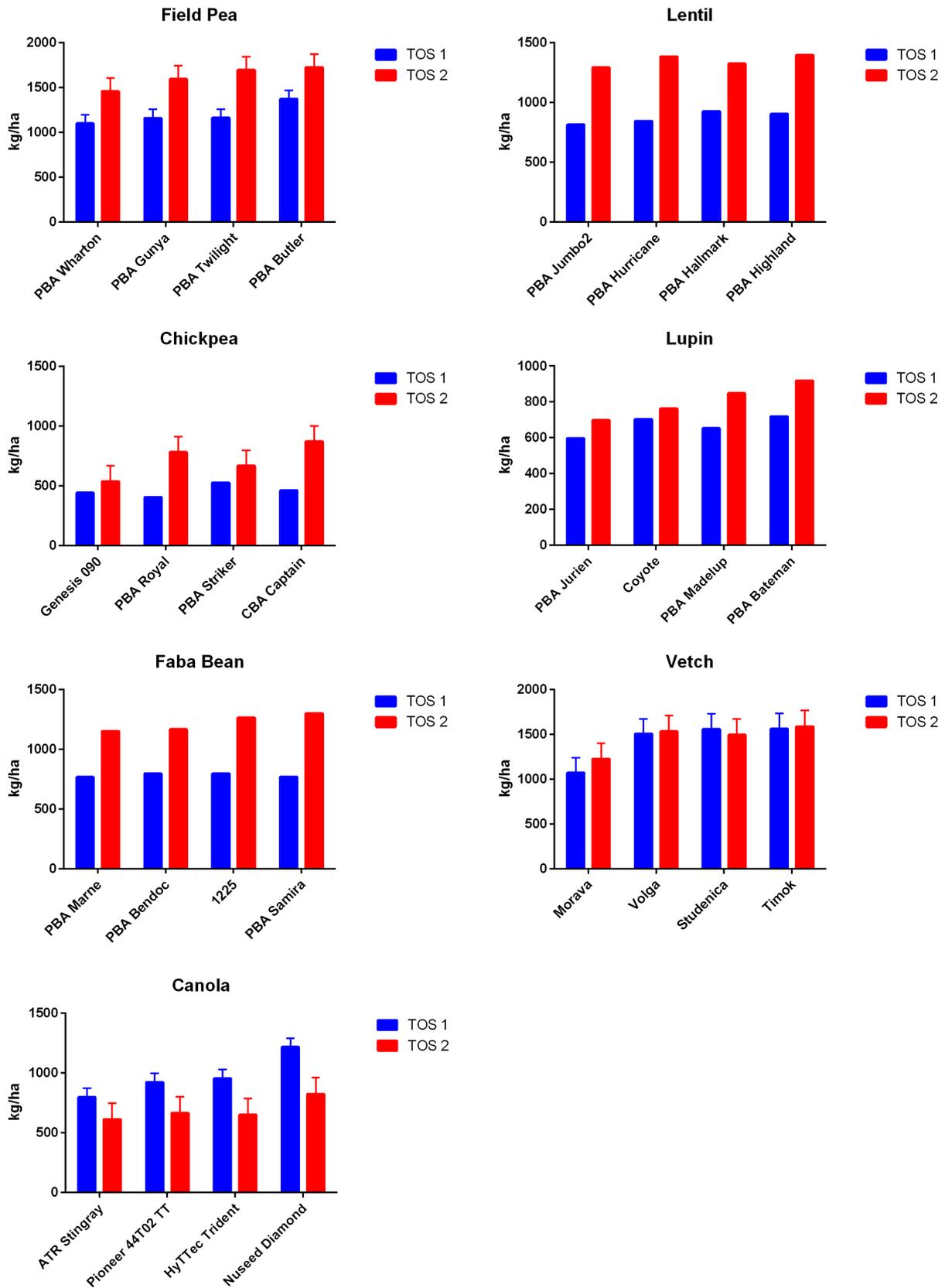


Figure 5. Grain yield for the four varieties grown for each break crop. Each time of sowing (TOS) was a separate trial and therefore varieties can only be statistically compared within each TOS. Error bars represent the LSD for each TOS trial. Bars without and LSD indicate no significant yield differences between varieties that trial.

Profitability

Gross margin analysis showed that each of the break crop options trialled in 2020 had a positive gross margin (Table 2). The most profitable crops were canola, vetch and lentils based on 2020 yields and grain prices. The gross margin for each of these crops was approximately \$700/ha. The next most profitable crops were field pea with around \$300/ha and chickpea \$250/ha. The gross margins for both lupin and faba beans were \$180/ha. This is the first year of the project where gross margins have been positive. In 2018, field pea, canola and vetch produced break even gross margins, while in 2019 only lentils (\$30/ha) had a positive gross margin.

Table 2. Gross margins of the best yielding variety for each break crop variety trial.

Crop	Variety	Grain yield (t/ha)	January 2020 Price (\$/t)	Gross Margin (\$/ha)
Canola	Nuseed Diamond (TOS1)	1.2	571	729
Vetch	Timok (TOS 2)	1.6	600	729
Lentil	PBA Highland (TOS 2)	1.4	672	686
Field Pea	PBA Butler (TOS 2)	1.7	350	319
Chickpea	CBA Captain (TOS 2)	0.9	610	256
Lupin	-PBA Bateman (TOS 2)	0.9	393	184
Faba Bean	PBA Samira (TOS 2)	1.3	370	180

Implications for commercial practice

Long term gross margins and risk

To understand the financial risk of growing pulse crops in the longer term, a gross margin analysis was undertaken using Monte Carlo simulation with the Microsoft Excel add-in @Risk. The data generated by this project was combined with data from other low rainfall Mallee sites dating back to 2013 to generate a long-term yield probability. A long-term grain price distribution was also developed for each crop using long-term (2003 – 2020) average January grain price from the Farm gross margin and enterprise planning guide (Rural Solutions). The gross margin analysis was then repeated 5000 times for each crop, drawing a new random yield by price combination each time from the distributions described above to generate a new gross margin distribution. The outcome of this analysis is shown in Table 3.

This analysis shows that lentils are predicted to be both the most profitable and least risky pulse crop grown in the long term. The average long term gross margin for lentils is predicted as \$365, however importantly a negative gross margin is expected only 15% of the time. Conversely lentils also have a strong possibility of achieving a high gross margin with a gross margin of more than \$500/ha probable 28% of the time.

Vetch was the next most profitable break crop with an average gross margin of \$255/ha (Table 3). However, vetch as grain is predominantly sold for seed to plant fodder and hay crops. While there have been some high prices received for vetch, the grain market is limited and becomes easily flooded, which is not reflected in the @Risk simulation.

Chickpea and field pea had similar profitability and risk outcomes with both having a mean long-term gross margin of about \$200/ha (Table 3). Both crops also had similar risk of not achieving a break-even gross margin (25%) while both crops had an 15% probability of the gross margin exceeding \$500/ha. Despite both crops having a similar profitability and risk profile, our observations from the trials were that they could be complementary within a farm enterprise mix. Field pea which flowers and matures earlier tended to perform well in frost-free situations with terminal drought and/or high levels of heat in spring. Conversely, chickpea which flowers and matures later, performed well at sites which were frosted in early spring or in situations where soil moisture was available late in the season.

Lupin and faba bean had lowest simulated long-term gross margins of \$65/ha (Table 3). Faba bean were also the riskiest crop and are expected to not break even in 49% of seasons. Lupin has the lowest probability of achieving a high gross margin of more than \$500/ha. This is due to low long term price outcomes for lupins relative to other pulse crops.

Table 3. Mean gross margins for pulse crops and the probability of gross margin which are less than \$0/ha or greater than \$500/ha generated with @Risk simulations.

Crop	Mean Gross Margin \$/ha	Probability Gross margin <\$0/ha	Probability Gross margin <\$0-500/ha	Probability Gross margin >\$500/ha
Lentil	365	15%	57%	28%
Vetch	255	23%	60%	15%
Chickpea	220	24%	60%	15%
Field Pea	174	27%	62%	10%
Faba Bean	65	49%	46%	5%
Lupin	65	40%	58%	2%

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Trial partners

