

Rotations for Profit **Public Release**

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KEY MESSAGES

Despite having completed four years of a five year rotation there has been very little long term rotation effect on yield. In 2005, large differences in wheat yield were seen resulting from differences in nitrogen fixation in 2004. This observation has not been repeated, with subsequent years not showing decrease in yield associated with continuous cereal cropping relative to a cereal/break crop scenario.

Strong gross margins were achieved for all cropping enterprises in 2007 ranging from \$379 /ha for lupins to a high of \$1104 /ha for Wheat. This was due to a combination of good yields and record grain prices. Canola and lupins were the least profitable crops, at \$626 and \$379 /ha respectively, although both performed significantly better than the volunteer pasture, with a gross margin of just \$10 /ha.

AIM

1. To determine the profitability and sustainability of various rotations over 5 years.
2. To determine the impact of rotation on weed populations, disease and nutrition.
3. To evaluate profitability based on gross margins within years and across years.

METHOD

The site was located 2kms south of Wickepin, Western Australia. Narrogin, 39km South West of Wickepin, has a mean annual rainfall of 495mm and a growing season mean of 382mm. Rainfall was 305 mm for the 2007 growing season (May to October). The soil was a loamy sand with a soil pH_{ca} ranging from 4.4 to 4.7 at 0-10cm. Organic carbon ranged from 1.2 to 1.8% at 0-10cm.

This was the 4th year of a five year rotation. The actual rotations can be seen below in figure 1.

The trial was laid out in 2004 in a complete randomised block design with 9 treatments. This was replicated 3 times. Plots were 9.8m wide, 20m long and sown at 22cm row spacings. The 2007 treatments were sown with knifepoints into a friable, moist seedbed. The lupins and canola were sown on the 3rd of May. The wheat and barley were sown on the 14th of June. Lupins (cv. Mandellup) were sown at 90kg/ha, canola (cv. Bravo) at 4kg/ha, wheat (cv. Yitpi and EGA 2248) at 80kg/ha and barley (cv. Vlamingh) at 70kg/ha. The cereals and lupins were sown at a depth of 4cm and the canola at 1cm. Appropriate pre emergent and post emergent herbicides were used. Crop nutrition was provided as soil and tissue testing dictated with basal and top dressed fertilisers. Systemic seed fungicide dressings were used on all cereals, with fungicidal sprays being used on the barley treatments.

Crops were assessed for crop vigour and weed populations at 84 days after sowing (DAS) and disease severity at 153 DAS. Canola and lupins were direct harvested at 194 DAS. Cereals were direct harvested at 222 DAS. Cereal grain was analysed for protein, moisture, screenings, specific weight and yield. Lupin grain was analysed for protein, moisture and yield. Canola seed was analysed for oil content, moisture and yield.

All data was statistically analysed using a confidence interval of 95% unless otherwise specified. Means were compared using Fisher's Least Significant Difference (Lsd) Test.

Rotation	2004	2005	2006	2007
1	Dalkeith Clover	Wyalkatchem Wheat	Natural Pasture	Yitpi Wheat
2	Belara Lupins	Wyalkatchem Wheat	Baudin Barley	Mandelup Lupins
3	Belara Lupins	Wyalkatchem Wheat	Tornado Canola	Yitpi Wheat
4	Arrino Wheat	Arrino Wheat	Calingiri Wheat	EGA 2248 Wheat
5	Parafield Peas	Wyalkatchem Wheat	Calingiri Wheat	Bravo Canola
6	Morova Vetch	Wyalkatchem Wheat	Calingiri Wheat	Yitpi Wheat
7	Stubby Canola	Wyalkatchem Wheat	Dalkeith Pasture	Vol. Dalkeith Pasture
8	Summer Crop/Fallow	Wyalkatchem Wheat	Calingiri Wheat	Vlamingh Barley
9	Hamelin Barley	Baudin Barley	Baudin Barley	Vlamingh Barley

Figure 1: Actual species and cultivars used in the Facey Group Rotations for Profit Trial, 2004-2007.

RESULTS AND DISCUSSION

Crop Vigour and weed populations

Crop vigour index (1-9) ranged from 5.3 to 6.7 and weed populations ranged from 11.3 to 17.3 plants per m². There was no difference between treatments for crop vigour (P=0.46) or weed population (P=0.85).

Disease

Disease incidence in the cereals was low. No disease problems were reported in the lupins or canola. The powdery mildew severity index (0-100) ranged from 0 to 9.8. The EGA 2248 wheat cultivar was the most susceptible with the Vlamingh barley cultivar being the most tolerant. The cereal on cereal rotations had the lowest scores amongst all treatments. Net Blotch infection in barley was low with less than 3.5% on all leaves. There was no difference (P>0.40) between barley treatments.

Yield

Grain yields ranged from 1.6 to 3.8 t/ha, with cereals yielding more than either canola or lupins. The only difference to note was the Yitpi wheat cultivar in the vetch/wheat/wheat/wheat treatment (3.8t/ha) yielding higher than the EGA 2248 wheat cultivar in the continuous wheat rotation (3.0t/ha). This difference was more likely cultivar related than rotation related. Yields can be seen below in figure 2.

Grain Quality

No differences in grain quality arose from the different rotations with statistically similar protein, moisture, specific weight and screening levels for wheat.

Gross Margins

Gross margins for crops in 2007 were generally quite high ranging from \$379/ha for lupins through to \$1104/ha for wheat. Canola and lupins were the least profitable crops, at \$626 and \$379/ha respectively, but clearly outperformed volunteer pasture's gross margin of \$10/ha. Gross margins and yields for 2007 can be seen below in figure 2.

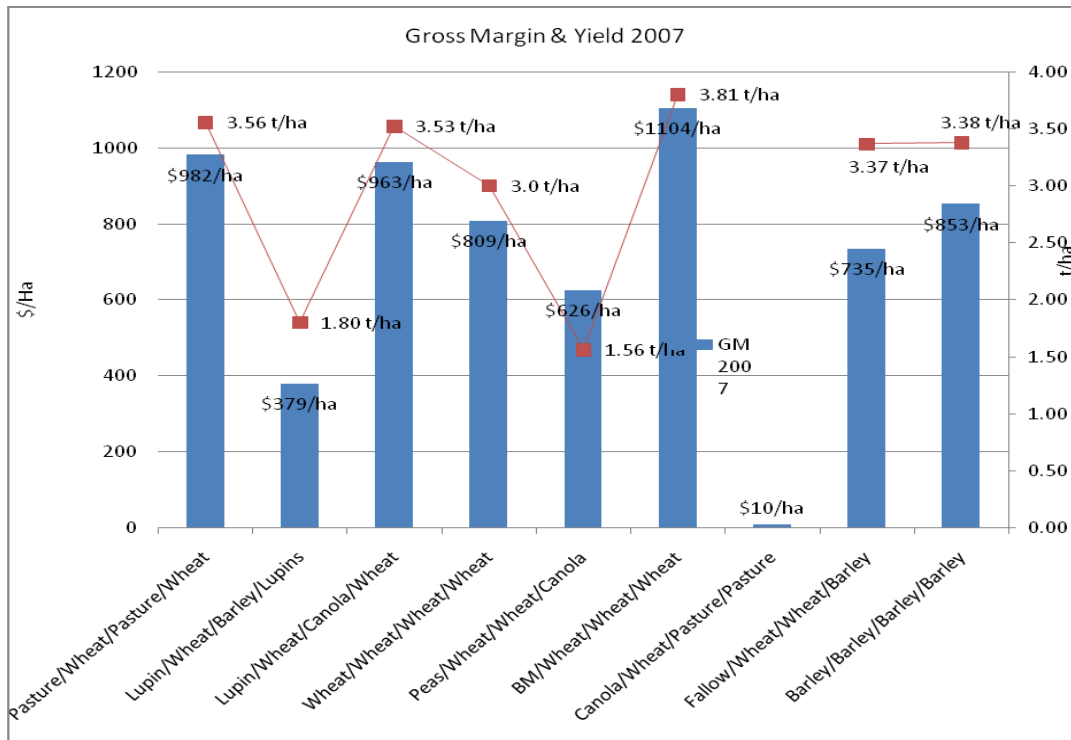


Figure 2: Yields and gross margins for the different rotations in the Facey Group Rotations for Profit Trial

Record grain prices played a significant role in the gross margin returns for cropping. Maximum gross margins between years varied significantly despite higher yields being recorded in 2005 (\$330/ha) than in 2007 (\$1104). Record grain prices and relatively lower sheep returns in 2007 may also adversely skew the long term gross margin for rotation 7. Individual yearly gross margin returns can be seen below in figure 3, and cumulative gross margins can be seen below in figure 4.

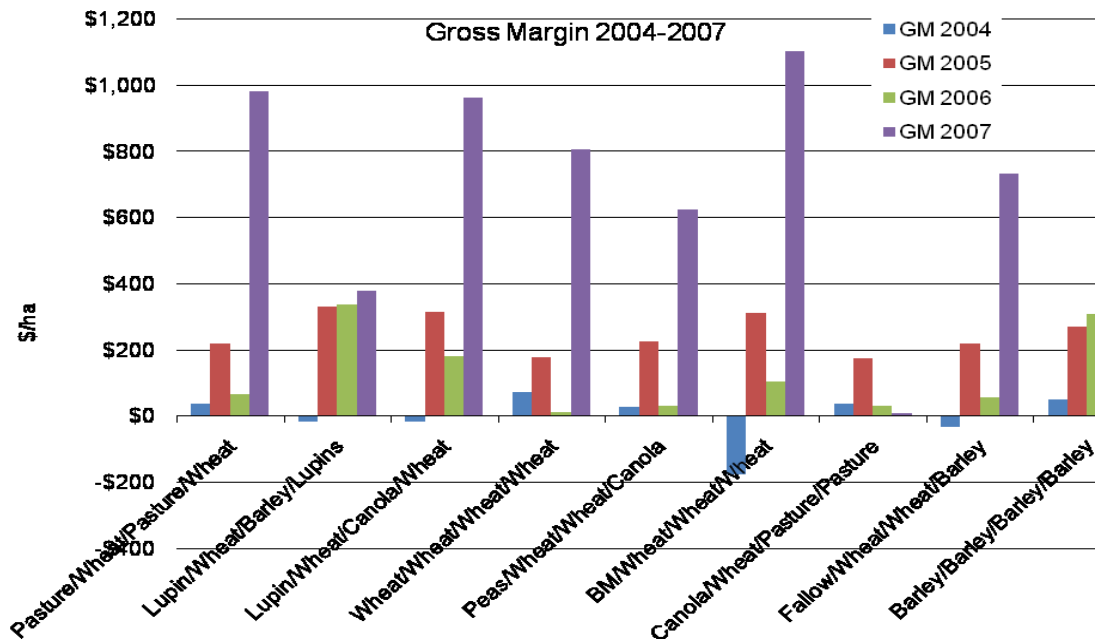


Figure 3: Yearly gross margin returns from 2004-2007

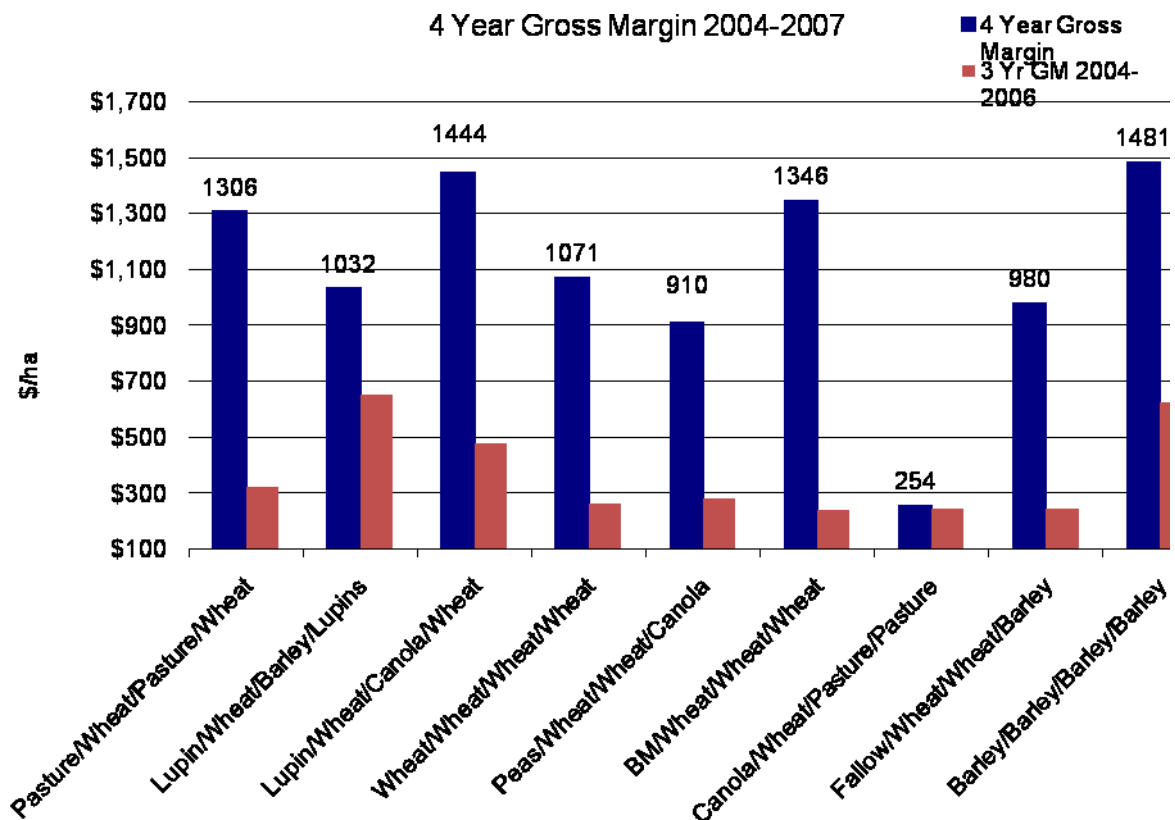


Figure 4: Cumulative 3 year (2004-2006) and 4 year (2004-2007) gross margins for the Facey Group Rotation for Profit Trial.

CONCLUSIONS

No significant differences in weed density or crop vigour were found between treatments. The use of continuous cereals as opposed to break crop rotations has not led to an increase in leaf diseases or significant differences in yield. The highest yielding treatment was the Vetch/Wheat/Wheat/Wheat rotation. Continuous barley has the highest 4 year gross margin (\$1481/ha) whilst Lupin/Wheat/Canola/Wheat (\$1444/ha), Vetch/Wheat/Wheat/Wheat (\$1346/ha) were quite strong performers also. The traditional role of volunteer pasture within a cropping rotation may have to be questioned as the gross margins over 1, 3 and 4 year periods show a considerable lag between it and continuous cropping enterprises. The use of brown manure crops such as vetch has revealed positive correlations for yield and gross margin. The final year of the rotation trial should lead to a better understanding of the implications of rotation choice on the long term sustainability of farming enterprises in the Wickepin Shire.

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ACKNOWLEDGEMENTS

Darren Hughes and Peter Rees of Kalyx Agriculture

Grains Research and Development Corporation

The Shire of Wickepin - Land