

# Profitable paddock rotations: Is the choice of break crop costing you money?

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## Key messages

Crop rotations in Western Australia's Wheatbelt are heavily dominated by 4 crop types and pasture, with around 94% of farm paddocks using some combination wheat, canola, lupins, barley or pasture.

Canola is a part of 53% of rotations in the southern Wheatbelt and 30% of northern Wheatbelt rotations after 3 years of measurements (2010-12).

Wheat/Wheat/Wheat rotations appear to be most popular in north of wheatbelt accounting for 25% of paddock rotations in the Focus Paddock data, being especially dominant in low rainfall systems across the state.

## Aims

To identify what crop rotations farmers in the Wheatbelt of Western Australia were using and the profitability of those rotations.

## Method

### Paddock Selection

An initial 140 paddocks were included from regions across the Wheatbelt. Paddocks were chosen by the farmers involved in the project as being "typical" of their farm. All paddocks needed to start in wheat in 2010, and paddock rotations following this point were entirely up to the choice of the farmers. An additional 42 paddocks were added in 2011 from the M5 rainfall zone (near the South Coast) and these started in wheat in that year.

### Data Collection

Currently there are 3 years of data from the initial 140 paddocks, but given a large number of these will continue to be monitored by the project we shouldn't take preliminary data as the end result regarding the profitability of individual rotations. However, there are a number of trends which can be identified and discussed.

Focus Paddocks by Rainfall Zone									
Rainfall Zone	L1	M1	H2	L2	M3	M4	L4	H5	M5
No. of Paddocks in sample	6	30	4	30	29	28	5	8	42

The data being used in order to determine profitability of different rotations in the Focus Paddock project is collected through farm interviews with grower group consultants or Department of Agriculture and Food WA staff. Farmers tended to govern exactly what information was supplied with regards to their costs and treatments for particular paddocks, with DAFWA filling in incomplete information with best estimates as to costs based on location and wholesale price of the chemical or fertiliser in question.

As the data collected does not include fixed costs, paddock performance is assessed at a gross margin level.

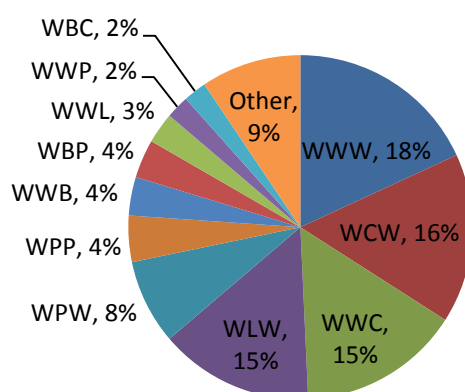
Yield and variety data is well provided, whilst the majority of commodity sale price data is estimated using historical records of cash rates, meaning no allowance is made for better marketing between growers.

If yield data was not supplied there were no estimates generated regarding the yield of that paddock, and it was simply ignored for the purpose of calculating both group average profit, and rotational profit.

Whilst data is available for rotation choices for the 2013 season, there is currently minimal actual data on costs and yields, which will be collected in early 2014.

## Results

With data from all paddocks from 2010 to 2012 included, there are 510 individual paddock records. The breakdown of crop choice, with 5 primary crops, (including pasture) accounting for 98% of samples. It should be noted that with all paddocks starting in wheat in their first year that this high wheat percentage is likely to currently overstate the dominance of wheat for current dataset. However rotations made up of some order of Wheat, Canola, Barley, Lupins and Pasture account for over 94% of those used, and if the use of Fallow is added this rises to 96%.



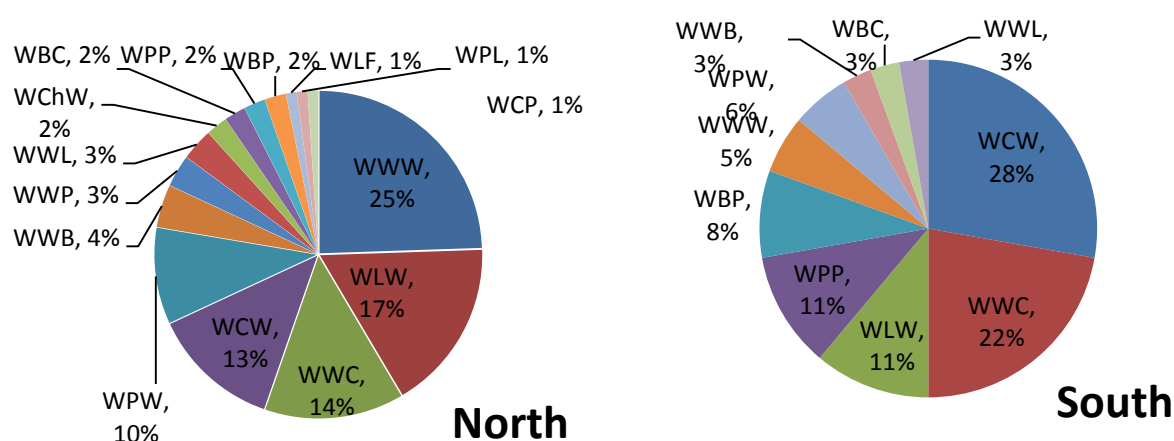
**Figure 1 Focus Paddock rotations choices across the Wheatbelt**

### Common Rotations

The most popular individual rotation across the 3 year dataset is currently Wheat/Wheat/Wheat, accounting for 18%. Wheat/Wheat/Canola (15%) and Wheat/Canola/Wheat (16%) rotations combined account for 31% of paddock rotations. When Wheat/Lupin/Wheat (15%) along with Wheat/Wheat/Lupin (3%) are added to this mix almost 70% of all paddock rotations are accounted for within these 3 crop types.

### North versus South

The rotations can be further broken down if we split the data in North and South of the Wheatbelt. There are significant differences between the prevalence of different rotations across the state, with the most obvious example being the previously mentioned Wheat/Wheat/Wheat rotation which accounts for 25% of all paddocks monitored in the north, whilst only 5% of those in south.



**Figure 2 Differences in rotations between north and south of wheatbelt**

Focus Paddock rotations that included some form of pasture make up around 8% of paddocks in the northern Wheatbelt, dwarfed by the 25% of rotations in the south that include pasture. Once data from those paddocks which started in 2011 is added it is expected this pasture discrepancy will climb even higher as roughly half of those used pasture in their second year.

As expected, there is also a significant difference in the use of lupins in the rotation between north and south, with the north having 22% of paddocks using lupins in the rotation within the first 3 years compared 14% in the south. However the importance of canola in the system is shared by both regions.

**Table 1 Most popular rotations in focus paddocks by rainfall zone**

L1	M1	H2	L2	M3	M4	L4	H5
WLW	WLW	WWW / WWC	WWW	WPW	WCC	WPP	WCW

### Rotation Profitability

The appearance of canola in the most profitable rotations should leave little doubt as to the reasons behind the rapid uptake of canola across the state. Equally, all but two of the 8 most profitable 3 year sequences have at least 2 years of wheat which supports the idea that the ability to get tight wheat rotations into the system being a key driver of profitability for much of the wheat belt. However, as most paddocks in this system area on rotations of 4 or more years it is too early to draw too many conclusions in terms of overall profitability.

Looking at the most popular rotations we can identify whether or not there are any significant differences between a Wheat/Wheat/Wheat rotation when compared to a Wheat/Canola/Wheat rotation. Looking at the third year wheat component of these rotations it doesn't appear as though there is any significant difference in either average fertiliser costs or the range of fertiliser costs, coming in at an average \$85/ha (ie \$28 - \$115/ha) and \$87 (ie \$28 to \$121/ha) respectively.

As we would expect after 3 years of wheat, there does appear to be a difference in chemical costs. The WCW rotations have an extremely narrow range, with 18 of 21 samples being between \$6 and \$33/ha. The WWW rotations on the other hand were largely between \$24 and \$56/ha, with the average cost being approximately 25% higher than WCW rotations. It is likely that at least part of this differential can be explained by difference in Take-all and Rhizoctonia concentrations between sequences (Table 2), specifically the impact of canola on reducing disease concentration. This relationship is further cemented with WWC rotations also showing a decline in disease prevalence.

**Table 2 Disease Concentration by Rotation in Focus Paddocks**

PDK Sequence	n	Rhizo 2010	Rhizo 2013	% of initial	TA 2010	TA 2013	TA% of initial
Wheat/Wheat/Wheat	21	3.4	18.4	547	0.5	1.2	257
Wheat/Canola/Wheat	19	40.2	11.2	28	1.8	1.5	80
Wheat/Wheat/Canola	16	4.4	1.7	38	1.4	1.8	135

Weed numbers also play a key role in explaining this difference in chemical costs. As with disease there is a significant difference between the two rotations, with average weed numbers declining by 40% over the 3 years in Wheat/Canola/Wheat rotations, and increasing by 374% for Wheat/Wheat/Wheat rotations (Table 3).

**Table 3 Weed Numbers by Rotation in Focus Paddocks**

PDK Sequence	n	Weeds Per m Sq 2010	Weeds Per m Sq 2012	% of initial
Wheat/Canola/Wheat	21	20.9	12.5	60%
Wheat/Wheat/Wheat	19	12.6	47	374%

## Conclusion

Current paddock rotations are dominated by five main choices, and whilst the secondary reasons for crop rotation choice may differ from year to year (ranging from controlling weed pressure, being used as a disease break, or as a nitrogen injection), the primary reason is always long term rotational profitability.

Canola's role in the system has increased dramatically over time, with Focus Paddock project data suggesting it has a place in 53% of rotations in the south of the Wheatbelt and 30% in the north. The reasons for its inclusion appear obvious with the weed and disease data presented in combination with its profitability.

In many locations, particularly in the lower rainfall zones, tightness of wheat in the rotation appears to be the primary goal, and wheat/wheat/wheat rotations are common. Whilst currently this system does appear to be among the most profitable, the fourth year performance may drastically alter the overall profitability of varying rotations, especially where fallow is a part of the system.

## Key words

Focus paddocks, rotations

## Acknowledgments

Thanks go to the farmers across the state whose paddocks have been allowed to be used in the Focus Paddock project, along with all the Grower Group and DAFWA staff who have been involved in the organisation and collection of the data used. Thanks also goes to the GRDC for providing the funding which makes this project possible.

**GRDC Project No.:** DAW00213

**Paper reviewed by:** Jaron Leask, DAFWA