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Farming Systems

Profitable crop sequences with a one or two year break

RESEARCH

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Searching for answers

Location: Minnipa Ag Centre, Airport paddock
Rainfall
Av. Annual: 324 mm
Av. GSR: 241 mm
2013 Total: 334 mm
2013 GSR: 237 mm
Yield
Potential: 3.0 t/ha (W)
Actual: 1.7 t/ha
Paddock History
2012: Various
2011: Various
2010: Wheat
2009: Wheat
Soil Type
Red sandy loam over light clay
Plot Size
40 m x 1.5 m x 3 reps
Yield Limiting Factors
Poor soil health
Grass weed competition
Environmental Impacts
Soil Health
Project aims to recommend options to improve;
- soil nutrients and groundcover
- reduce disease levels and chemical use

Key messages

- **Continuously cropping cereals has increased grass weeds and root disease to a point that it is no longer the most economical option, due to decreased yield and costs associated with addressing weed and disease issues.**
- **Two year breaks starting to pay their way in the third year of the rotation.**
- **One year breaks have lifted wheat performance but have not kept grassy weeds or diseases under control.**

Why do the trial?

To determine the comparative performance of alternative crops and pastures as pest and disease breaks in an intensive cereal phase.

In low rainfall regions of south-eastern Australia broad-leaf crops make up only a very small proportion of the total area of sown crops. In light of increasing climate variability farmers have adopted continuous cereal cropping strategies as non-cereal crops are perceived as riskier than cereals due to greater yield and price fluctuations. At the same time, this domination of cereals is increasing the need for non-cereal options to provide profitable rotational crops, disease breaks and weed control opportunities to sustain cereal production. Currently, the most common 'break crop' is often a poor performing volunteer annual grass dominant pasture. They are often havens for cereal pests and disease and are seen as having negative impacts on subsequent cereal grain yield and quality.

How was it done?

In year three (2013) of the study all of the treatments were sown to wheat at 55 kg/ha with 65 kg/ha DAP (18:20:0:0) on 14 May. Three treatments that had been sown with cereals (wheat or oats) in both the previous two years were sown with the Clearfield variety Kord CL Plus to address grass weed issues. Five treatments that had not had any legume break phase (2 x continuous wheat, vetch/oats mix followed by wheat, oats then canola and canola then oats) in the previous two years also received 50 kg/ha of urea at sowing to compensate for any nitrogen deficiency.

One month post-sowing the Kord plots were sprayed with Intervix @ 0.7 L/ha. The entire trial was sprayed for broadleaf weeds with MCPA+ diflufenican @ 0.75 L/ha on 4 July and any treatment that had had a medic break phase received an additional herbicide application the following day of clopyralid 0.08 L/ha to target volunteer medic.

Seven treatments (Angel medic/wheat, oats/canola, oats/peas, Jaguar medic/wheat, canola/peas, peas/wheat and peas+canola/wheat) with high levels of grassy weeds were subsequently sprayed with grass selective cloqintocet-mexyl + pyroxsulam @ 0.5 L/ha.

Grassy weeds were measured in three ways to gain a greater understanding of what was occurring within rotations. Prior to sowing soil was collected from the west end of each plot to assess weed seed banks. They were grown out in a shade house where emerged plants were counted and recorded. The counting process was repeated following three times of emergence 22 May, 30 May and 3 July. The second assessment was undertaken in the field plots on 20 August when grass species were counted and recorded for each plot, and thirdly on 25 September panicle counts of grass weeds were completed as a measure of potential seed bank for the 2014 season.

Each sub-plot was machine harvested individually to identify any differences as a result of the management strategies employed in years one and two. Grain samples were retained for quality testing.

What happened?

Treatments sown to Kord compared to Mace had fewer plants established with 106 plants/m^2 compared to 124-152 plants/m^2, despite being sown at the same rate of 55 kg/ha. Larger seed size and continuous cereal stubble residues causing poor seed-to-soil contact and intermittent blocking of machinery is likely to have contributed to Kord failing to reach similar plant populations to Mace.

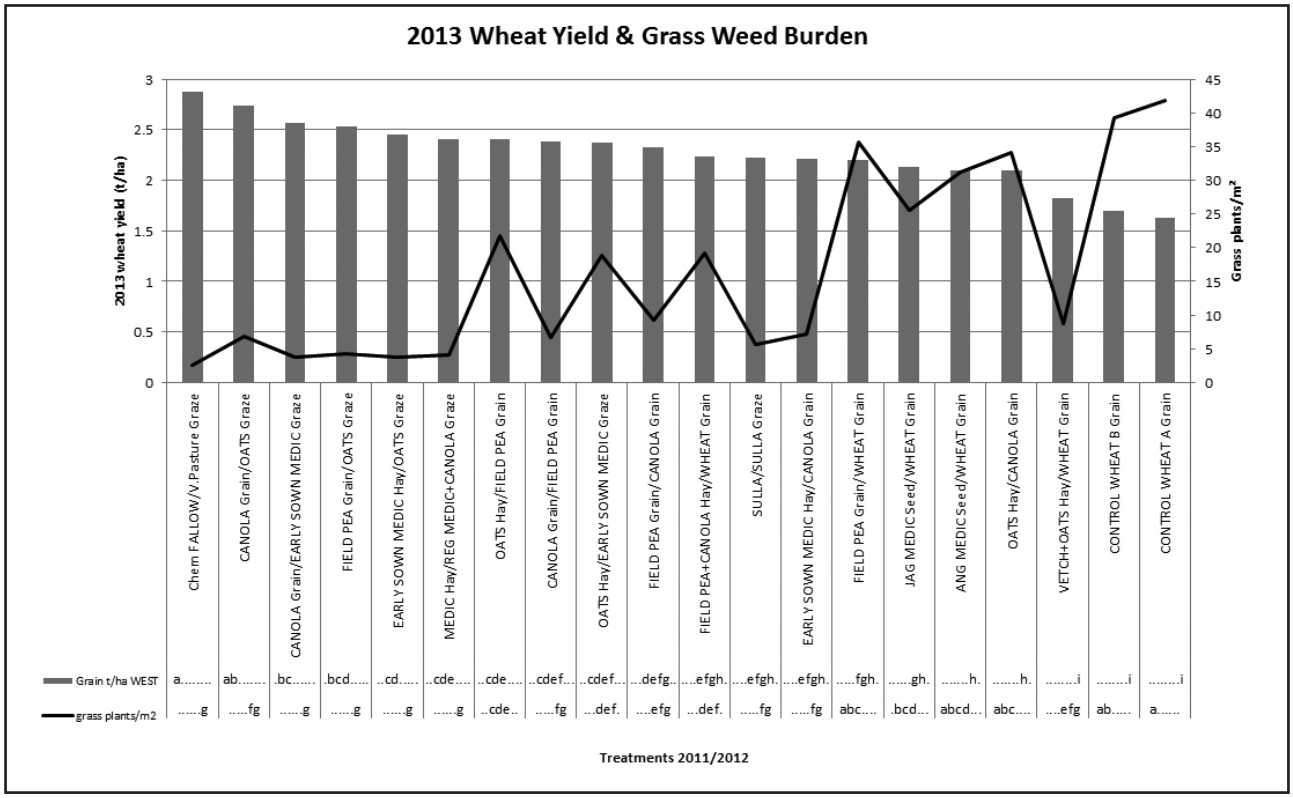
On 15 August roots were collected and scored on a 0-5 (0 being no damage, 5 severe damage) scale for Rhizoctonia wheat root damage. The continuous cereal treatments had significantly higher root disease incidence with levels above two, compared to all other treatments. At these levels nutrient uptake can be reduced and could help explain the poor yields recorded in these treatments.

Grain yields averaged 1.7 t/ha with continuous cereals right up to 2.9 t/ha following a 2 year fallow (Figure 1). Wheat following a one year legume break in 2011 still yielded higher than a continuous cereal rotation, highlighting the continued yield benefit two years after a single break.

Screenings greater than 5% were measured with continuous wheat (sown with Kord) which is classified as Australian General Purpose (AGP) despite protein levels of over 13%. This drop in classification from H1 to AGP resulted in a $60/ha reduction in gross margin using Viterra Port Lincoln cash prices 20 November.

Wheat in 2013 following canola yielded on average 0.28 t/ha less than if the break had been medic, peas or oats, regardless of the phase prior to the 2012 canola. Canola following oats yielded lower than canola following peas or medic due to a higher grass weed burden despite several control operations.

Cutting canola for hay in 2012 instead of harvesting for grain increased grain yields in the following wheat crops by up to 0.7 t/ha.



LSD (P=0.05) wheat yield t/ha 0.21, grass plants/m^2 14.32

Figure 1 2013 wheat yields (t/ha) and grass weed counts plants/m^2 taken 20 August 2013 following treatments imposed in 2011 and 2012

Late germinating barley grass was problematic in this trial. Expensive but effective selective grass herbicides used post emergence in many treatments in 2013 controlled annual rye grass and brome grass. However, barley grass then became dominant in many of these plots.

Simulated grazing by mowing on three occasions (10 July, 17 August and 18 September) in 2012 substantially reduced grassy weeds in 2013.

A two year break with the biennial legume *Hedysarum coronarium* (Sulla) resulted in the lowest amount of water in the profile (111 mm) pre-sowing in 2013, which compares to volunteer pasture/ chemical fallow with 137 mm. Subsequent wheat yields reflected this with 2.2 t/ha, the same as treatments with only a one year 2011 cereal break.

An economic analysis over the 3 years found that continuous cereal cropping was the most profitable through 2011 and 2012, however in year three the positive effects of particular break options became apparent with higher wheat yields recorded. Gross margin comparisons in 2013 saw wheat following two years of fallow as the highest grossing with $558/ha compared to $152/ ha for continuous wheat. A two year break of canola cut for hay following peas for grain was the second highest grossing with $550/ha.

When comparing the treatments over three years canola – graze & grain/oats - hay, oats - hay/medic – graze and canola – grain/oats – graze were the highest grossing with over $900/ha and up to $1006/ha. The most profitable one year break was a pea and canola mixture that was grazed, this grossed $840/ha.

What does this mean?

The value of break phases in the rotation are starting to show through in this trial. Despite very strong wheat yields in the first two years of the trial, disease and grassy weeds are now starting to reduce performance of continuous wheat. However, wheat following two year breaks are now producing gross margins several hundreds of dollars per hectare better than continuous wheat with no major constraints developing yet. One year breaks have improved the following wheat performance, but weeds and diseases are still present.

In 2014 the treatments will be sown again to wheat and this will complete the four year rotation for each of the 20 treatments. Any ongoing benefits of the break treatment options in 2011 and 2012 will continue to be measured.

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Intervix – registered product of Crop Care Australasia Pty Ltd.