

The Benefit of Break Options to Wheat Production at Appila

Author: Nigel Wilhelm, SARDI

Funded By: GRDC

Project Title: Crop Sequencing in the Upper North

Project Duration: 2010-2015

Key Points:

- All two year break options increased yield by 0.5 – 1.0 t/ha compared to continuous wheat.
- Single year breaks improved wheat yields in 2012 and also appeared to increase them slightly in 2013.
- Grassy weeds had a major impact on wheat yields
- Only two year breaks reduced grassy weed seed banks substantially compared to the continuous wheat control

Background:

In low rainfall regions of south-eastern Australia, farmers stuck with continuous cereal cropping strategies in many paddocks as they tried to manage through the millennium drought; non-cereal crops were perceived as too risky due to greater yield and price fluctuations. There is a need for non-cereal crop and pasture options to provide profitable rotational crops, disease breaks and weed control opportunities for cereal production.

GRDC has funded a programme to address this issue and one of the projects within this programme is developing an improved understanding and implementation of management practices for brassica and pulse crops, pastures and other options to reduce the risk of crop failure and improve whole farm profitability in low rainfall south-east Australia.

The experiment at Ian Keller's property at Appila is being run as a partnership between UNFS and SARDI. The paddock had been in cereal for several years and while still being productive, had rye-grass and wild oats building in patches across the paddock. The experiment was set up in 2011 and will finish at the end of the 2014 season.

About the Upper North trial

The experiment has tested the performance of nearly twenty different break options for wheat over 2011 and 2012. These breaks were mostly for two years (aiming to overcome a grassy weed problem) but some one year breaks were also included. The benchmark which all these breaks are being evaluated against is continuous wheat.

Every break was managed to optimise its potential productivity and profitability in a low rainfall environment (i.e. inputs are generally conservative). While pastures were included in the break options, we used mowing as a proxy for grazing as the plots are too small to effectively use sheep. The 2013 season was our first chance to fully test the impact of break options on wheat production and these results are reported below.

In 2013, Shield wheat was sown on 17th May in treatments where grassy weed burdens were considered low; the other treatments were sown on the same day with Grenade (CL) to improve grass control options. Continuous wheat benchmarks were also sown with Grenade (CL) but one week later because of their even higher grassy weed burdens. Extra nitrogen (N) was only applied to those treatments where soil N reserves pre-seeding were low.

What has happened so far?

All treatments were sown to wheat in 2013 after breaks of one or two year's duration (Figure 1). These breaks included phases with canola, pulses (peas or lentils), chemical fallow or various pastures or forage mixes.

Growing season rainfall in 2013 was 20 mm above the Appila average of 272 mm and break options which reduced grassy weeds and improved N supply resulted in wheat which yielded well (Figure 1). All two year breaks (regardless of whether they contained legumes or not) increased the yield of wheat in 2013 from the continuous benchmark by at least 0.5 t/ha, and up to 1 t/ha.

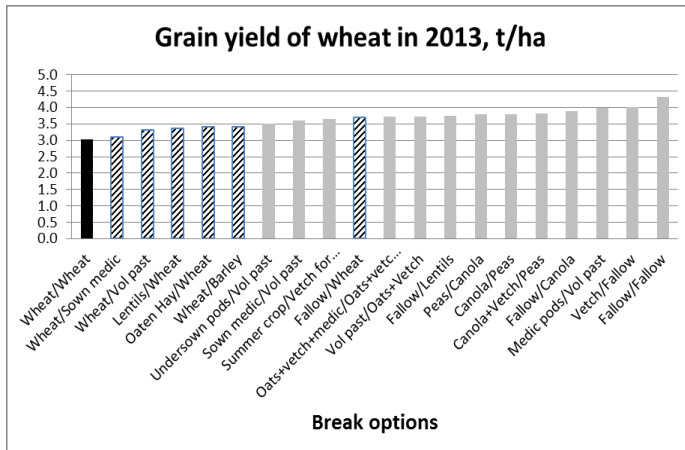


Figure 1. Impact of breaks on wheat yields in 2013. Grey bars are two year breaks. Striped bars are one year breaks.

Continuous wheat yielded 3 t/ha. Several treatments involved a single break in 2011 which was then seeded with wheat in 2012 and 2013. These single year breaks improved wheat yields in 2012 and also appeared to increase them slightly in 2013.

A major driver behind improved wheat production following breaks appeared to be grassy weed control. Figure 2 shows that as the grassy weed pressure (as estimated by the number of weed seeds in the topsoil prior to seeding in 2013) increased, wheat yields declined sharply. This trend occurred despite the use of trifluralin at seeding in all treatments and the strategic use of Intervix mid-season in all those treatments where Grenade had been sown. Only two year breaks reduced grassy weed seed banks substantially compared to the continuous wheat control (Figure 3). Most of the options with simulated pastures had little impact on grassy weed pressure.

Other resources in the trial which have been monitored for the impact of treatments are mineral N reserves in the root zone, soil moisture reserves and soil-borne disease levels.

Breaks had large impacts on mineral N reserves (Figure 4) and these impacts almost certainly improved the performance of wheat in 2013 where the levels were high.

The only break type which had a large impact on soil moisture reserves was chemical fallow. All other options resulted in similar soil water reserves prior to seeding in 2013 (Figure 5).

Root diseases were low at this site, regardless of break options and had little impact on wheat performance in 2013.

Gross margins for these three year options are being developed so that break options can be compared on not only production grounds, but also on economic returns relative to continuous wheat.

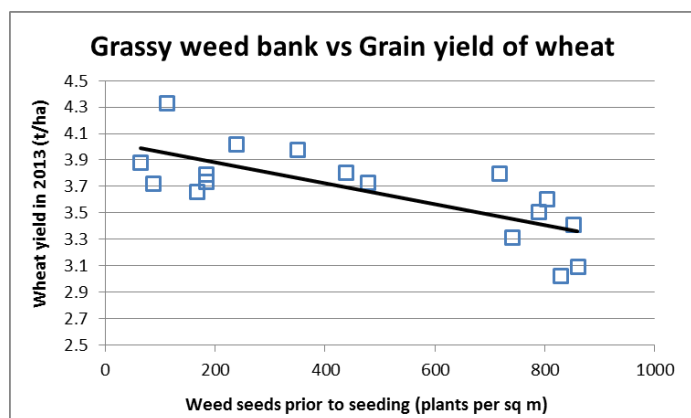


Figure 2. Effect of grassy weed pressure on wheat production in 2013.

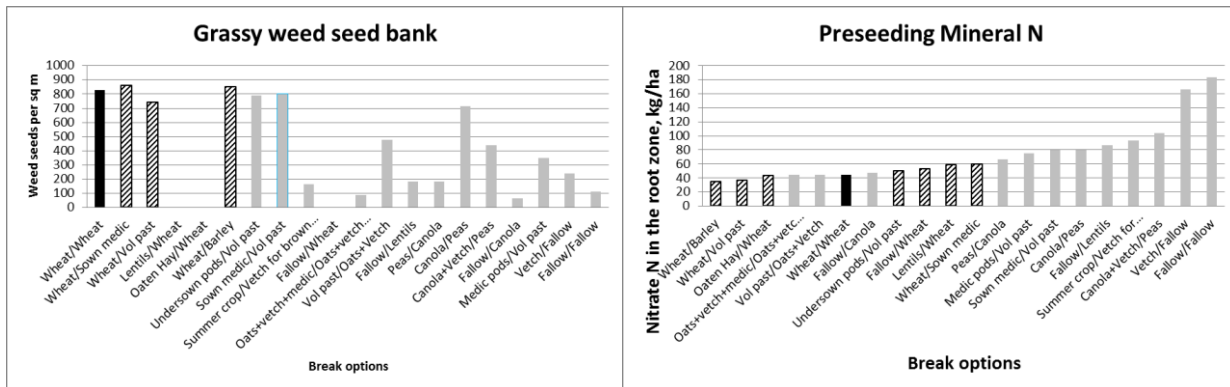


Figure 3 and 4. Impact of breaks on grassy weed pressure (left hand graph) and soil reserves of N (right hand graph) in 2013. Grey bars are two year breaks. Striped bars are one year breaks.

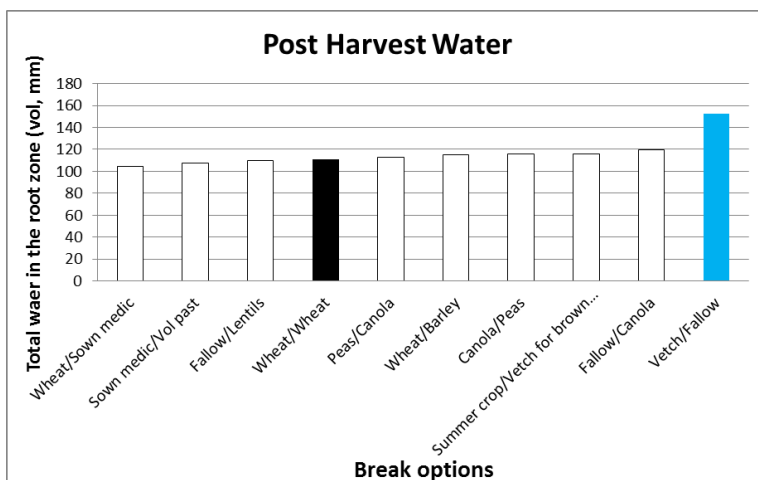


Figure 5. Impact of breaks on soil moisture after harvest in 2012.

What now?

There are 5 trials in total in the project, all similar in scale to the one at Appila. All have fully assessed the impact of one and two year breaks on wheat production for the first time. Most of these trials started with grassy weed and root disease pressures. These trials have consistently shown yield increases of wheat in 2013 of up to 1/ha, regardless of the yield of the continuous wheat benchmark. All two year breaks which reduced grassy weeds and rhizoctonia inoculum resulted in such wheat yield increases, regardless of the options making up the two year breaks.

In many cases, the two year breaks produced substantially higher three year gross margins than continuous wheat, even if one of the two year breaks lost money in the year of production. One year breaks had limited impact on grassy weed pressures.

All these trials will be seeded to wheat again in 2014 to assess the benefits of break options into a second (or third) wheat crop.

More Information:

Nigel Wilhelm, SARDI, 0407 185501, nigel.wilhelm@sa.gov.au

Or

Michael Moodie, Mallee Sustainable Farming Inc. Tel: 03 5021 9100 Fax: 03 5022 0579 Email: admin@msfp.org.au Webpage: www.msfp.org.au