"Crop Sequencing trials 2013, Lochaber"

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Key Outcomes:

- 2 seasons after the break crop being planted, significant yield benefits from the break crop are still being observed
- Significant interactions between the nitrogen requirements of wheat after the break crop were observed again in 2013 (also noted in 2012)
- Splitting nitrogen treatments after wheat and canola resulted in significant yield increases when compared to a single nitrogen application

Site:	Farmer co-operator:
Lochaber	D. Miles

Trial Sites:
Year 1 treatments: Large Replicated blocks
Year 2 and 3 treatments:
Smaller replicated sub-plots were overlaid over the initial large blocks.

April-October Rainfall: 456mm

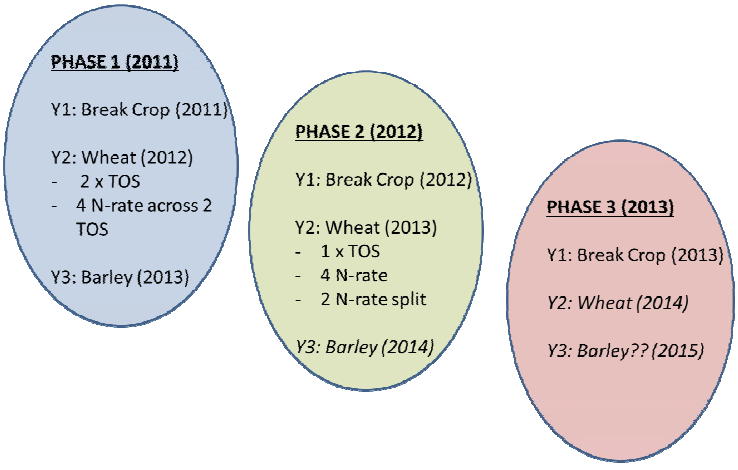
Background:

The trial aims to explore rotational options for the South-East region with the aim of improving yield and water use efficiency of these and the subsequent crops.

In 2011, 2012 and 2013 "Break Phases" have been established, where a range of rotational crops were sown in large plots. These are referred to as Phase 1 (2011 established break), Phase 2 (2012 established break), and Phase 3 (2013 established break) below.

The following year after the break, wheat has been oversown with a range of rotational treatments (N-rate and time of sowing in 2012, and N-rate at different timings in 2013). The flow-on effect was then captured in 2013 in GrangeR barley that was oversown on the wheat sub-plots. Figure 1 shows the different phases and treatments applied each year.

Figure 1: Rotational Phases and subsequent treatments:



Rotational crops:

A range of rotational crops were sown in plots 18 m long by 9 m wide. Antas sub clover, canola, beans, wheat and winter sown peas were sown on 30th May. Later in spring, barley and pea plots were sown on 15th August. All trials were sown with small plot equipment and managed as per usual agronomic treatment. All wheat plots were sprayed with fungicides to control any stripe rust. Grain yield was determined by machine harvest. Soil water measurements were taken before and also harvest to determine water use by each crop.

Table 1: 2013 Phase 3, Year 1 break crop yields

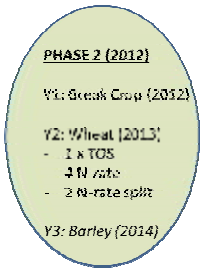
Entry	DM T/ha	Yield T/ha
Antas	*10.362*	
Barley Spring		1.834
Beans		3.835
Canola		1.674
Peas Spring		1.742
Peas Winter		4.491
Wheat		3.944
Site mean		2.503
lsd (0.05)		0.854

In 2013, the Antas sub-clover produced a much greater amount of biomass than in previous years; this is thought to be due to the mild spring conditions allowing good spring growth. The beans and winter peas also yielded higher than they had in previous seasons. The comparison between crop production and seasons in shown below in Table 2. The wheat yields were extremely consistent with previous years. The mild spring also appeared to favour the spring sown peas and barley.

Table 2: Year 1 break crop results across all Phases (2011-2013)

	Phase 1 (2011)		Phase 2 (2012)		Phase 3 (2013)		Average (3 year)	Average (3 year)
Entry	Biomass (t/ha)	Grain yld (t/ha)	Biomass (t/ha)	Grain yld (t/ha)	Biomass (t/ha)	Grain yld (t/ha)	Biomass (t/ha)	Yield (t/ha)
Antas sub-clover	7.55		6.04		10.362		7.984	
Barley (spring)		2.952		0.775		1.834		1.854
Beans		2.658		2.09		3.835		2.861
Canola (grain)		2.286		1.721		1.674		1.894
Canola (hay)	8.4		9.07			-		
Canola G&G	1.051	2.235	1.53	1.234		-		
Peas (spring)		1.44		0.495		1.742		1.226
Peas (winter)		3.125		2.832		4.491		3.483
Safflower (spring)		1.412		*		-		
Wheat (30cm rows)		3.506		-		-		
Wheat (grain)		4.001		4.065		3.944		4.003
Wheat G&G	0.465	3.754		-		-		

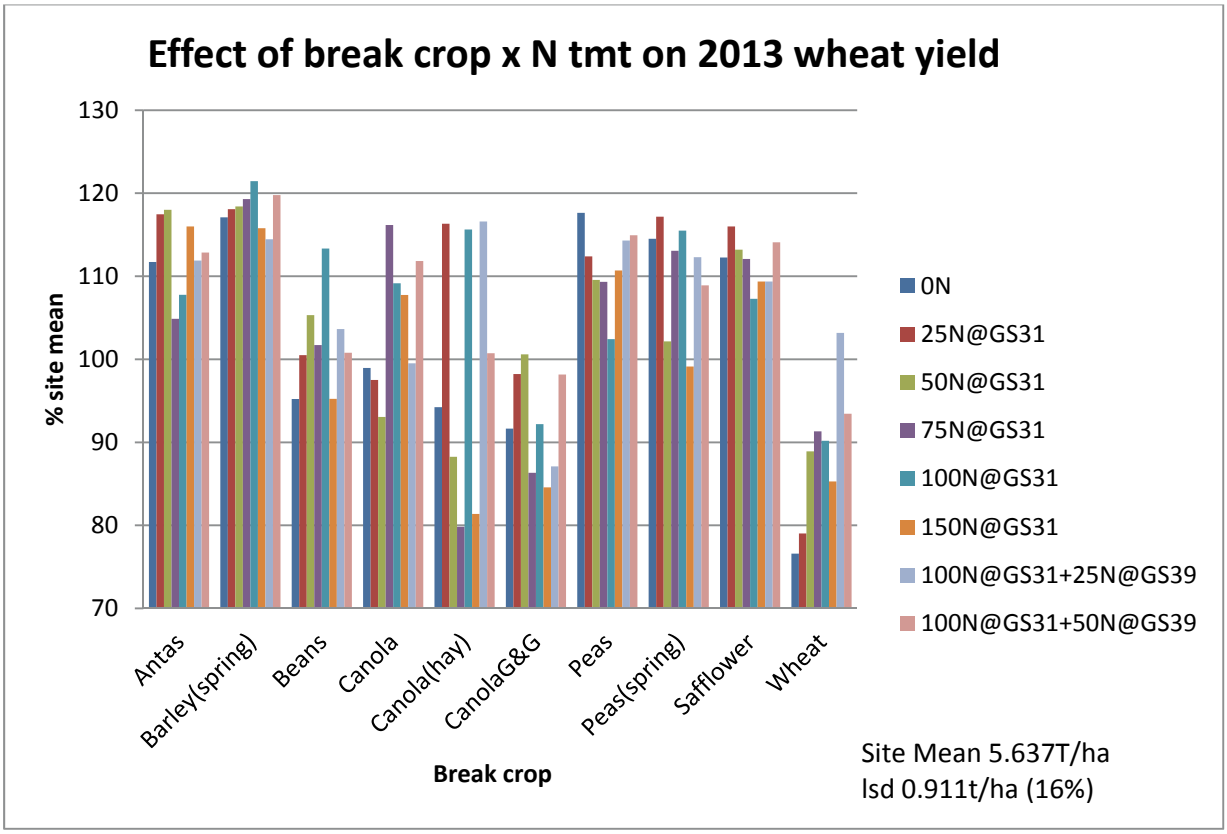
Wheat sown after rotational crops:



The year following the break crop, the big plots were split into smaller sub-plots, and wheat was sown. In 2013, only one time of sowing was looked at. The nitrogen applications were looked at as a single application, but there was also the inclusion of 2 split rates to measure the response to different timings of N-applications. Pre-seedir sampled for soil moisture and nitrogen to determine water use and water use efficiency of the wheat following the range of rotational treatments. The Scout wheat was sown on 31st May, and the crop was managed as per usual agronomic treatments.

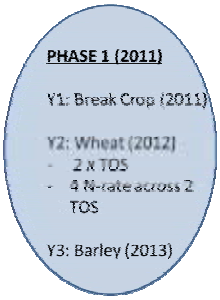
Nitrogen treatments were applied at GS31 (13th August) and those plots that had split applications were then spread at GS39 (19th September). The results are shown below in Graph 1.

Graph 1:



There was a significant interaction between the break crop and the nitrogen response across the plots. The surprises were the yields after the spring-sown barley and safflower plots. This is thought to be due to retained soil moisture, as the barley only yielded 0.77t/ha the previous season, and the safflower was essentially a fallow due to bird damage. Soil water measurements are currently being assessed to establish if this was in fact the reason. The other key finding was the response of the break Canola (particularly the hay) and wheat

treatments to the split applications of nitrogen; splitting the N in these treatments resulted in significant yield benefits over the single application (with the same amount of total N being applied).



Barley sown after wheat

2011 the initial break crops were planted down, they were then split into wheat plots in 2012 where 2 time's of sowing (3 weeks apart) with different nitrogen rates applied. These plots were then oversown with Barley in 2013. Plots were managed as per standard agronomic practice. All Plots were treated the same to follow through the break crop and time of sowing effects. There was a significant 3-way interaction between the break crop effect, time of sowing of wheat and nitrogen applications.

An economic analysis is currently being carried out on these results to come up with the most profitable system taking all of these interactions into account.

Generally where a break crop was used in Year 1 (2011), the barley was still yielding significantly higher than where wheat was the initial crop.

Any effects that were being seen on barley yield as a result of the time of sowing of the wheat in Year 2 (2012) were alleviated (not seen) in the canola and bean break crop treatments.

Conclusions:

The use of a break crop continued to result in higher yields in the following wheat crop (when compared with wheat on wheat).
The benefits from this break crop continued to be observed into the second season after, with the barley yielding significantly higher after the break crop.
Splitting nitrogen treatments, with applications at GS31 and GS39 (as opposed to a single application) is definitely something to consider if you are not utilising a pulse in the rotation.

Acknowledgements

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