



Yield response Gross margin analysis

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Field experiments

- Graham Centre site (2011-2014)
 - Focused on nitrogen benefits of break crops to subsequent crops
- Site at Paddock 45 (2012-2015)
 - Focused on weed management strategies using break crops

Graham Centre site

	2011	2012	2013	2014	Treatment
Single break	Break crops	Wheat	Wheat	Wheat	5
	Wheat+N	Break crops	Wheat	Wheat	5
Double breaks	Canola+N	Break crops	Wheat	Wheat	3
	Break crops	Canola	Wheat	Wheat	3
Control	Wheat+N	Wheat+N	Wheat+N	Wheat+N	1
		Wheat-N	Wheat-N	Wheat-N	1

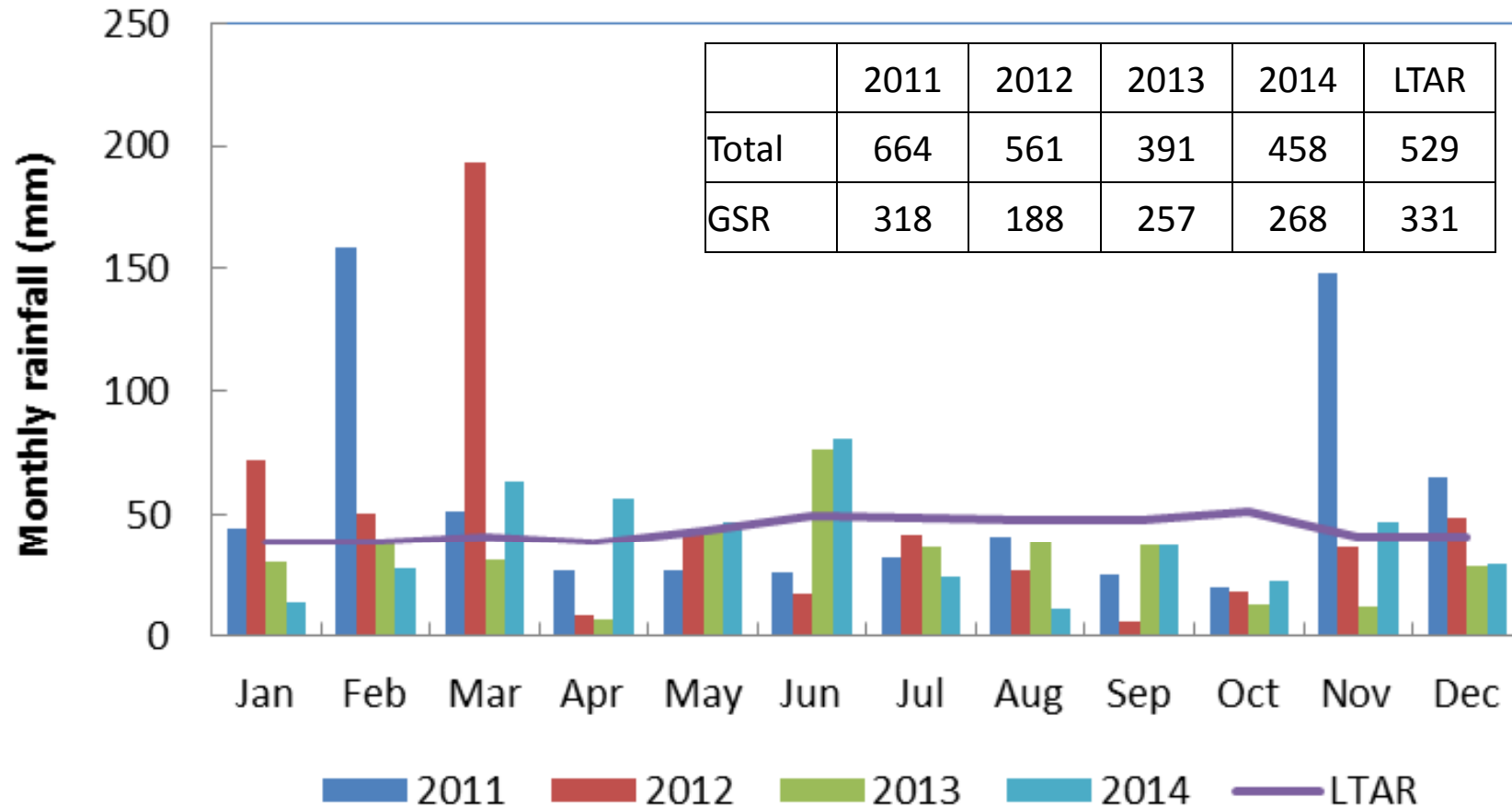
- Break crops
 - Lupins, Field pea
 - Vetch and Pastures
 - Canola
- Crop management
 - Brown manured
 - Hay cut
 - Grain harvested

Site at Paddock 45

2012	Weed management		2013	2014	2015	
Break crops	Weeds free		Wheat	Wheat	Wheat	
			Canola	Wheat	Wheat	
	Weeds present		Crop desicated	Wheat	Wheat	Wheat
			Brown manured	Canola	Wheat	Wheat
			Crop desicated	Wheat	Wheat	Wheat
			Brown manured	Canola	Wheat	Wheat

- Break crops: Canola, lupin, field pea and pastures
- Weed management: Weed free vs. Weed present

Rainfall



Yield response under single break

Year 1	Year 2	Years 3&4	Crop	Year 1	Year 2	Year 3	Year4
2011	2012	2013&14	Management	Grain (t/ha)			
Pea	Wheat	Wheat	Grain	2.5	3.5	3.5	3.5
		Wheat	BM		3.7	4.2	3.5
			Significance		<i>P</i> = 0.055	<i>n.s.</i>	
Vetch	Wheat	Wheat	Hay cut		3.4	3.6	3.5
		Wheat	BM		3.7	3.8	3.6
			Significance		<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Pasture	Wheat	Wheat	Hay cut		3.0	3.4	3.4
		Wheat	BM		3.6	3.7	3.3
			Significance		<i>P</i> = 0.01	<i>n.s.</i>	<i>n.s.</i>
Lupin	Wheat	Wheat	Grain	2.0	3.4	3.6	3.5
	Canola	Wheat	Grain		2.1	3.9	3.4
			Significance		<i>N.A.</i>	<i>P</i> < 0.05	<i>n.s.</i>
Wheat+N	Wheat+N	Wheat+N	Grain	5.2	3.5	3.6	3.4
	Wheat-N	Wheat-N	Grain		2.4	3.1	3.4
			Significance		<i>P</i> < 0.05	<i>P</i> < 0.05	<i>n.s.</i>

Yield response under single break

Crop	Year 1	Year 2	Years 3&4	Year 1	Year 2	Year 3	Year 4
Management	2011	2012	2013&2014	Grain (t/ha)			
B.Manured	Pea	Wheat	Wheat		3.7	4.2	3.5
	Vetch	Wheat	Wheat		3.7	3.8	3.6
	Pasture	Wheat	Wheat		3.6	3.7	3.3
			Significance		<i>n.s.</i>	<i>P= 0.054</i>	<i>n.s.</i>
Hay cut	Vetch	Wheat	Wheat		3.4	3.6	3.5
	Pasture	Wheat	Wheat		3.0	3.4	3.4
			Significance		<i>P= 0.056</i>	<i>P< 0.01</i>	
Grain	Pea	Wheat	Wheat	2.4	3.5	3.5	3.5
	Lupin	Wheat	Wheat	2.1	3.4	3.6	3.5
			Significance	N.A.	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>

Yield response under double breaks

Year 1	Year 2	Years 3&4	Crop	Year 1	Year 2	Year 3	Year4
2011	2012	2013&14	Management	Grain (t/ha)			
Pea	Canola	Wheat	Grain	2.5	2.0	3.7	3.5
		Wheat	BM		2.3	3.7	3.4
			Significance		<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Pasture	Canola	Wheat	Hay cut		1.8	3.7	3.4
		Wheat	BM		2.3	3.7	3.4
			Significance		<i>P</i> < 0.05	<i>n.s.</i>	<i>n.s.</i>
Lupin	Wheat	Wheat	Grain	2.0	3.4	3.6	3.5
	Canola	Wheat	Grain		2.1	3.9	3.4
			Significance		<i>N.A.</i>	<i>P</i> < 0.05	<i>n.s.</i>
Wheat+N	Wheat+N	Wheat+N	Grain	5.2	3.5	3.6	3.4
	Wheat-N	Wheat-N	Grain		2.4	3.1	3.4
			Significance		<i>P</i> < 0.05	<i>P</i> < 0.05	<i>n.s.</i>

Yield response under double breaks

Crop	Year 1	Year 2	Years 3&4	Year 1	Year 2	Year 3	Year 4
Management	2011	2012	2013&2014	Grain (t/ha)			
B.Manured	Pea	Canola	Wheat		2.3	3.7	3.4
	Pasture	Canola	Wheat		2.3	3.7	3.4
			Significance		<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Grain	Pea	Canola	Wheat	2.7	2.0	3.7	3.5
	Lupin	Canola	Wheat	2.0	2.1	3.9	3.4
			Significance	N.A.	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>

Soil mineral N at sowing

Year 1 2011	Year 2 2012	Year 3 2013	Crop Management	Year 1	Year 2	Year 3
Pea	Wheat	Wheat	Grain	94.7	83.0	50.4
		Wheat	BM	94.7	125.1	73.9
			Significance	N.A.	<i>P</i> <0.05	<i>n.s.</i>
Vetch	Wheat	Wheat	Hay cut	94.7	67.2	60.9
		Wheat	BM	94.7	114.8	106.9
			Significance	N.A.	<i>n.s.</i>	<i>P</i> <0.05
Pasture	Wheat	Wheat	Hay cut	94.7	67.7	60.8
		Wheat	BM	94.7	83.5	63.2
			Significance	N.A.	<i>n.s.</i>	<i>n.s.</i>
Lupin	Wheat	Wheat	Grain	94.7	81.0	79.2
	Canola	Wheat	Grain	94.7	72.1	77.6
			Significance	N.A.	<i>n.s.</i>	<i>n.s.</i>
Wheat+N	Wheat+N	Wheat+N	Grain	94.7	73.6	89.5
	Wheat-N	Wheat-N	Grain			43.4
			Significance			<i>P</i> <0.01

Gross margin analysis

Crop Management	Treatment	Income	Variable cost	Gross margin
B.Manured	Pea	\$585	\$296	\$289
	Vetch	\$553	\$295	\$259
	Pasture	\$562	\$287	\$275
Hay	Vetch	\$825	\$400	\$425
	Pasture	\$811	\$402	\$409
Grain	Pea	\$714	\$354	\$360
	Lupin	\$716	\$339	\$376
	Canola	\$859	\$359	\$500
Grain	+N	\$878	\$412	\$467
	-N	\$663	\$333	\$330

(averaged across 3 years with single break crop)



Take home messages

- Brown manured treatments increased wheat yield significantly due to additional N input
- The N benefit from pulses and pastures was greater than, or equivalent to 75 kg N/ha
- The N benefit from break crops diminished in the 2nd and 3rd wheat crops



Take home messages

- Averaged across 4 years, the rotation with canola had the highest gross margin (\$500/year)
- Treatments that were brown manured had the lowest gross margin (\$259 - \$289/year) due to total loss of income in year 1
- However, brown manured treatments offer great opportunities to manage herbicide resistant weeds and reduce the risk of diseases, as well as provide significant N benefits