

Practice for Profit Trial

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Australian Government



Key Messages

- Higher rainfall in 2015 allowed the crop to capitalise on extra nutrient availability with the top three treatments (canola, wheat and field pea) under a high input rotation.
- Low input on continuous wheat rotation is returning the highest gross margin in this scenario.

Aim

To examine the difference in profitability between low and high input cropping practices over an extended period of time and to determine the effect these practices are having on soil carbon.

Background

The Practice for Profit trial is for the fifth season in a row, located on the Mills' property east of Dalwallinu. Since 2011 we have compared the following two scenarios:

- **Low input** treatments based on a farmer producing grain at the lowest possible cost, regardless of seasonal conditions.
- **High input** treatments to simulate a paddock with high yield potential matched with increased inputs to maximise yields and profitability.

2011 was the setup phase of the trial, the seeding and fertiliser rates were not blanket dependant on the rotation with the wheat treatment receiving high and low inputs, (Appendix B).

In 2013 the set rotation was not able to be planted due to a timing mismatch between rain and trial contractors resulting in the soil being too dry for the small trial seeding machinery to negotiate. The whole site was thus fallowed in 2013.

It is important to note that high and low inputs of this trial are considered on a seasonal basis, and on the back of a chemical fallow in 2013 all nutrient levels were high. On the trial to date the low input treatments have received maintenance levels of phosphorus (P) and nitrogen (N). The levels of P, potassium (K) and sulphur (S) will be monitored for the 2016 season and maintenance levels will be adjusted accordingly.

Trial Details

Property	Wenballa Farm, east Dalwallinu		
Plot size & replication	8.8m x 12m x 3 replications		
Soil type	Loamy clay		
Soil pH (CaCl₂)	0-10cm: 5.7	10-20cm: 7.1	20-40cm: 7.5
EC (dS/m)	0-10cm: 0.107		
Sowing date	08/05/2015		
Seeding rate	See Table 2		
Paddock rotation	See Table 1		
Fertiliser	See Table 2		
Herbicides, Fungicides & Insecticides	08/05/2015: 1.5 L/ha Glyphosate, 500 mL/ha Chlorpyrifos, 2 L/ha Trifluralin 29/07/2015: 150 mL/ha Prosaro, 400 mL/ha Alpha-cypermethrin, 300 mL/ha Lontrel, 1% Hasten 04/09/2015: 1 L/ha Velocity, 1% Hasten		
Growing rainfall	season	2015: 236mm, 2014: 187mm, 2013: fallow, 2012: 321mm, 2011: 232.8mm	

Trial Layout

Table 1: Practice for Profit trial, rotation history and 2016 plan.

Treatment	2011	2012	2013	2014	2015	2016	Input Level
1	Wheat	Wheat	Fallow	Wheat	Wheat	Wheat	Low
2	Wheat	Wheat	Fallow	Wheat	Wheat	Wheat	High
3	Canola	Wheat	Fallow	Wheat	Wheat	Canola	Low
4	Canola	Wheat	Fallow	Wheat	Wheat	Canola	High
5	Volunteer Pasture (Spraytopped)	Wheat	Fallow	Wheat	Wheat	Volunteer Pasture	Low
6	Volunteer Pasture (Spraytopped)	Wheat	Fallow	Wheat	Wheat	Volunteer Pasture	High
7	Field Peas	Wheat	Fallow	Wheat	Wheat	Field Peas	Low
8	Field Peas	Wheat	Fallow	Wheat	Wheat	Field Peas	High

Note: Stated input levels are for all treatment years, except rotation crops in 2011 and 2016 (Appendix B).

Table 2: 2015 Practice for Profit input rates.

Treatment	Variety	Input	Sowing rate (kg/ha)	K – Till Banded (kg/ha)	Urea *TD IBS (kg/ha)	UAN 4 WA-S (L/ha)	2011 Rotation
1	Mace	Low	30	40	40	0	Wheat low
2	Mace	High	80	80	40	44	Wheat high
3	Mace	Low	30	40	40	0	Canola
4	Mace	High	80	80	40	44	Canola
5	Mace	Low	30	40	40	0	Vol Pasture
6	Mace	High	80	80	40	44	Vol Pasture
7	Mace	Low	30	40	40	0	Field Peas
8	Mace	High	80	80	40	44	Field Peas

*TD = Top Dressed, IBS = Incorporated By Seeding.

Results

Table 3 shows soil properties taken from the trial site from 2012-2015. In 2012, the site had an average topsoil (0-10cm) and subsoil (10-20cm) pH of 6.6 and 7.3 respectively. When this is broken down into the low and high inputs, the high input pH in the topsoil is 6.5 and the low is 6.7. The first two successive years of implementing the trial saw little acidification caused by the applied fertiliser treatments. However, the treatments impact on the pH levels can be observed in 2014 when they declined by an average of 0.9 units.

Table 3: Average organic carbon (OC) and pH (CaCl₂) across high and low input treatments taken from 2012-2015.

Year	Depth (cm)	Average pH (CaCl ₂)	High Input pH (CaCl ₂)	Low Input pH (CaCl ₂)	Average OC (%)	High Input OC (%)	Low Input OC (%)
March 2012	0-10	6.6	6.5	6.7	0.66	0.68	0.64
	10-20	7.3	7.2	7.3	0.60	0.65	0.55
	20-30	8.0	8.0	8.1	0.42	0.43	0.41
July 2013	0-10	5.3	5.3	5.4	0.89	0.90	0.87
	10-20	7.1	7.1	7.1	0.48	0.48	0.46
	20-30	7.9	7.9	7.9	0.33	0.35	0.32
March 2014	0-10	5.7	5.5	5.9	0.89	0.90	0.89
	10-20	7.1	7.2	6.9	0.56	0.60	0.52
	20-30	7.5	7.5	7.4	0.51	0.53	0.53
November 2015	0-10	5.7	5.7	5.7	0.80	0.79	0.81
	10-20	6.9	6.8	6.9	0.52	0.52	0.51
	20-30	7.4	7.4	7.4	0.42	0.42	0.43

Note: 2013 was a chemical fallow across all plots.

Table 4: Average total carbon (t/ha) across high and low input wheat and field pea rotations (Treatments 1, 2, 7 & 8).

Treatment	Depth (cm)	2014 Total Carbon (t/ha)	2015 Total Carbon (t/ha)
Low Input	0-10	17.3	15.6
	10-20	21.5	19.9
	20-30	26.9	25.3
High Input	0-10	17.5	16.6
	10-20	25.5	20.4
	20-30	40.4	25.6

Organic carbon percentage increased in the topsoil (0-10cm) from 2012 to 2013 (Table 3), in both high and low treatments. By 2014 however, the high input organic carbon levels remained unchanged while the low input treatment increased soil organic carbon levels by 0.02%. This is likely to be related to the chemical fallow in 2013. By November 2015 the total carbon (t/ha) levels had declined over both treatments, with the high treatment declining at greater rate than the low input treatment, Table 4.

Table 5: Average yield, quality and grade of Mace wheat sown in 2015 at east Dalwallinu over the differing treatments.

Treatment	Yield (t/ha)	Moisture (%)	Hectolitre (g/hL)	Protein (%)	Grade
Canola High	3.30 ^a	11.0	74.3	11.6 ^a	H2
Field Peas High	3.30 ^a	10.9	75.1	11.5 ^a	H2
Wheat High	3.28 ^a	11.0	76.0	11.0 ^{abc}	APW1
Vol Pasture High	2.84 ^b	10.6	74.7	11.4 ^{ab}	APW1
Canola Low	2.77 ^b	10.9	78.5	10.5 ^{bcd}	APW1
Wheat Low	2.76 ^b	11.1	76.4	9.90 ^d	ASW1
Field Peas Low	2.54 ^{bc}	10.8	78.2	10.3 ^{cd}	APW2
Vol Pasture Low	2.16 ^c	11.0	77.1	9.80 ^d	ASW1
LSD (P=0.05)	0.419	NS (0.31)	NS (4.27)	0.88	
CV (%)	8.35	1.6	3.2	4.67	
P value	0.0003	1.933	0.3412	0.0018	

Note: Average screenings are not shown due to harvest error.

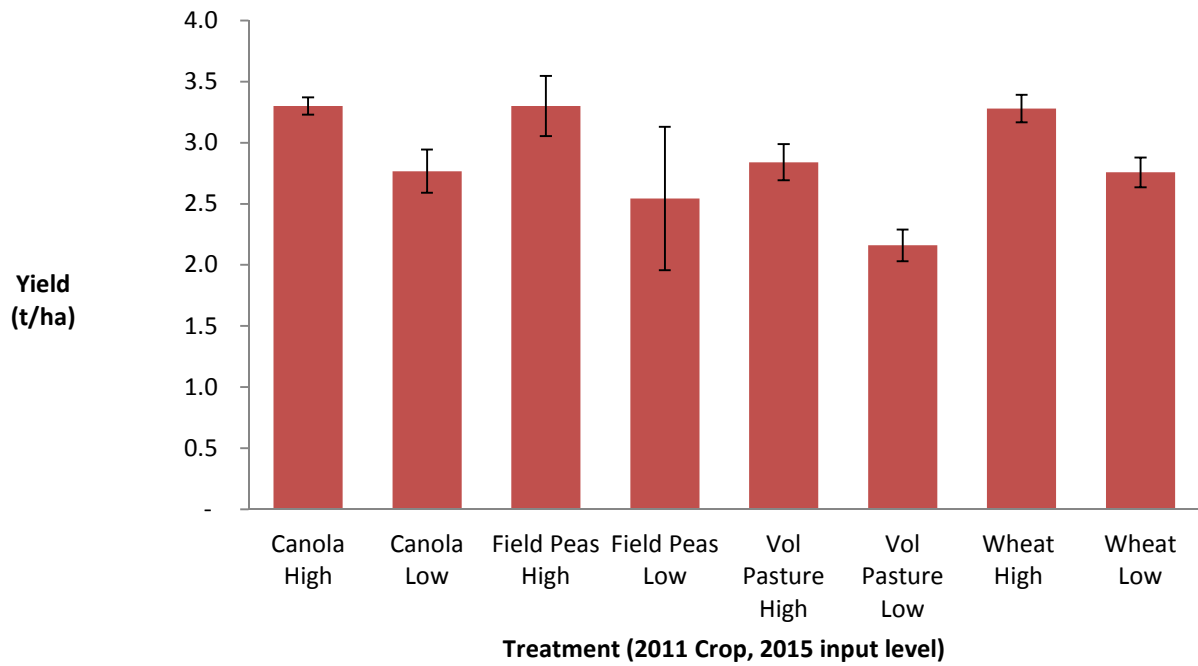


Figure 1: Average yield of Mace wheat grown at east Dalwallinu 2015. Error bars indicate standard deviation.

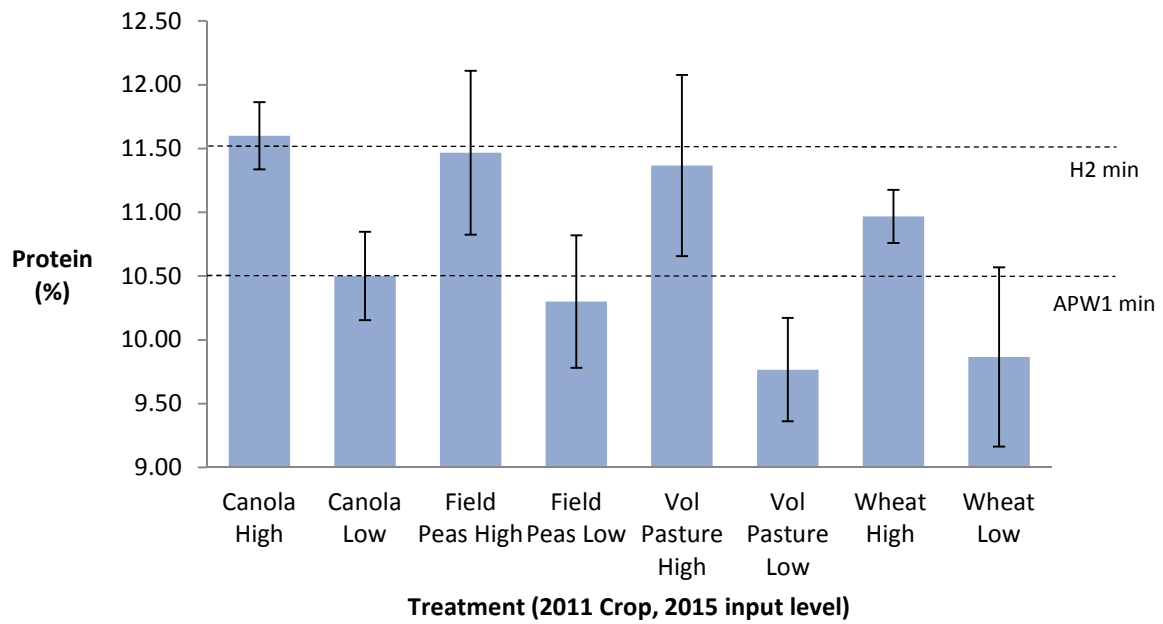


Figure 2: Average protein of Mace wheat grown at east Dalwallinu 2015. Dotted lines represent minimum CBH receive standards for protein.

Economic Analysis

Table 6: Economic analysis of each treatment over the 2011, 2012, 2014 and 2015 seasons.

Treatment	Gross Margin (\$/ha)				Cumulative Total
	2015	2014	2012	2011	
Canola high	582	399	138	392	1511
Field Peas high	576	365	144	222	1307
Wheat high	566	305	66	440	1377
Canola low	509	329	303	303	1444
Wheat low	495	409	204	448	1556
Volunteer Pasture high	470	221	-159	61	593
Field Peas low	453	325	315	188	1281
Volunteer Pasture low	356	314	102	61	833

Note: More detail of income and cost figures can be seen in Appendix A. 2013 was a chemical fallow with all plots treated the same.

The 2011 treatments only varied input levels for the wheat rotation. The canola, field peas and volunteer pasture plots were treated as one input level with targeted nutrient inputs based on the rotation.

Costs taken into account include fertiliser and herbicide costs, CBH receipt and handling fees (\$38/t). The cost of wheat seed was also considered with the difference in input levels at 30 kg/ha and 80 kg/ha. The volunteer pasture plots, while not creating profit via yield in 2011 provide a value in sheep grazing; this was valued at \$74/winter grazed hectare, assumed from district practice.

Income was based on grade of sample tested at CBH site and price based on AWB cash prices on November 19th 2015 (H2 @ \$283/t, APW1 @ \$278/t, APW2 @ \$275/t and ASW1 @ \$270/t) averaged from this year. Cost of application has not been included.

Comments

Analysis shows over the 2011, 2012, 2014 and 2015 seasons, wheat grown under a low input regime has consecutively returned the highest gross margin. The volunteer pasture high treatment has consecutively returned the lowest gross margin (Table 6 and Appendix A) except in 2015 where the volunteer pasture low treatment had the lowest return.

Cumulative gross margins for the volunteer pasture treatments are still significantly impacted by 2011 and 2012 results in which yields were below average. These treatments received no nitrogen in 2011 (Appendix B) and income was measured as grazing. In 2012 the reason for this significant variation was not determined, with no significant difference observed in soil sample results or weed burden. In 2015 the emergence on these treatments, was also particularly low and maybe as a result of the 2011 pasture rotation.

Now that the trial is into its fifth season changes in soil health are becoming apparent over the treatments. The pH and the total carbon levels are declining over both high and low inputs. The phosphorus bank is slowly being lowered and nitrate levels are currently at an average of 2 units. This trial will continue to follow the rotation plan shown in Table 1 to determine the compounding effect of high and low input regimes.

The decrease in soil pH from 2012 to 2013 could be attributed to the chemical fallow, when nitrogen was being mineralised but there was no plant uptake, causing acidification.

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Appendix

Appendix A: Economic analysis over four cropping seasons: 2011, 2012, 2014 and 2015 at east Dalwallinu.

Treatment	Income (\$/ha)				Variable Costs (\$/ha)				Gross Margin (\$/ha)				Cumulative Income
	2015	2014	2012	2011	2015	2014	2012	2011	2015	2014	2012	2011	
Wheat low	752	584	328	699	257	175	124	251	495	409	204	448	1,556
Canola high	928	667	371	539	346	269	233	147	582	399	138	392	1,511
Canola low	766	493	427	443	257	164	124	140	509	329	303	303	1,444
Field Peas low	912	487	440	350	346	257	124	161	566	305	315	188	1,377
Wheat high	922	562	299	750	346	264	233	310	576	365	66	440	1,307
Field Peas high	702	629	377	388	249	162	233	166	453	325	144	222	1281
Vol Pasture low	591	474	226	74	234	160	124	13	356	314	102	61	833
Vol Pasture high	799	469	73	74	329	248	232	13	470	221	-159	61	593

Note: 2013 was a chemical fallow.

Appendix B: 2011 trial inputs.

Treatment	2011	Input	Seed (kg/ha)	Gusto Gold (kg/ha)	Urea (kg/ha)
1	Wheat	Low	30	65	10
2	Wheat	High	80	65	65
3	Canola	Low	5	65	100
4	Canola	High	5	65	100
5	Volunteer Pasture	Low	0	0	0
6	Volunteer Pasture	High	0	0	0
7	Field Peas	Low	90	65	0
8	Field Peas	High	90	65	0