Gen Y Paddock Challenge -Tactical Employment of Fallow and Utilising Fertiliser Strategies to Optimise Rotation Performance on Heavy soils

Blair Stone, PR&CJ Stone, and Judith Storer, Research and Development Coordinator, Liebe Group

Take Home Messages

- An increased fertiliser rate can help to optimise profits post fallow, taking full advantage of stored soil moisture from the fallow period.
- The fallow wheat rotation significantly improved EBT in comparison to the wheat, wheat rotation.

Aim

To investigate fertiliser rates on wheat post fallow to optimise the combined two-year EBT.

Background

Farmers are very good at trialling best practice soil management in the isolation of their environment, however, do not always effectively capture and analyse trial information beyond visual or yield assessments. Furthermore, they don't always have the opportunity to share the information they are gathering publicly, limiting their opportunities to gain valuable feedback from peers. By building the capacity of farmers to actively trial, capture and share their on-farm trials, with input from their peers and in a trusted environment, we aim to increase engagement and foster the adoption of best practice soil management methods.

Blair Stone has been investigating optimisation of returns on a usual heavy clay soil on his property. The soil has a high water-holding capacity and a high wilting point due to the higher clay content. This has resulted in the paddock performing especially poorly in low rainfall years but quite well in average and above-average rainfall years. Due to this, Blair has been investigating the use of fallows in years with poor outlooks. He has had very promising results and over the last four years, has implemented a wheat, fallow, wheat, fallow rotation with wheat strips seeded each year in the fallow rotation. In 2018 the single wheat harvest yield after a fallow was higher in tons per hectare than the combined yields off the two crops with a wheat, wheat rotation.

Blair is now looking to fine-tune the system by investigating fertiliser application strategies in the wheat rotation to optimise return on investment.

Additional natural resources management (NRM) benefits to this strategy include improved water use efficiency, and higher biomass resulting in a reduced risk of wind erosion.

Trial Details

Trial location	Stone Property, Marchagee
Plot size & replication	36m x 400m x 2 replications
Soil type	Red deep loam
Paddock rotation	2019 Fallow, 2018 Wheat, 2017 Fallow
Sowing date	15/05/2020
Sowing rate	55 kg/ha Scepter Wheat
Fertiliser	As per treatment list
Herbicides, Insecticides & Fungicides	15/05/2020 118 g/ha Sakura, 2 L/ha Treflan 15/07/2020 650 L/ha Trident, 10 g/ha Logran

Treatments

#	Treatment	
1	Low Rate Fertiliser	55kg Agstar Extra
2	Medium Rate Fertiliser	55kg Agstar Extra, 30kg Urea at seeding & 40L top up Flexi N
3	High Rate Fertiliser	55kg Agstar Extra, 30kg Urea at seeding & 80L top up Flexi N

Soil Composition

Depth (cm)	PH ($CaCl_2$)	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	N (NO_3) (mg/kg)	N (NH_4) (mg/kg)	EC (dS/m)	OC (%)
0-10	7.4	41	701	15.4	46	2	0.2	1.1
10-20	8.0	9	245	3.1	8	1	0.1	0.6
20-40	8.4	3	162	16.1	5	1	0.2	0.3
40-60	8.5	3	207	38.3	5	<1	0.5	0.3
60-80	8.6	<2	258	73.9	3	<1	0.8	0.2
80-100	8.6	<2	318	91.7	2	<1	0.8	0.2

Results

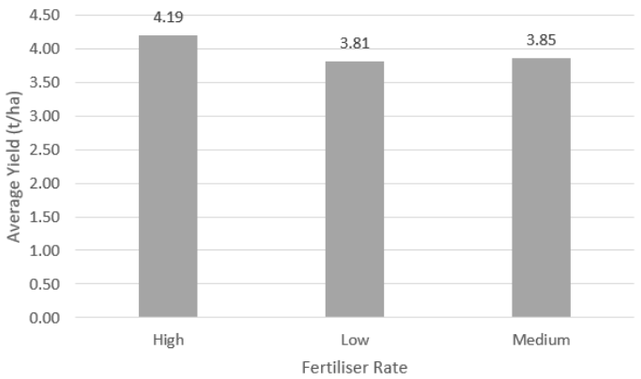

Figure 1: Average wheat yield (t/ha) by fertiliser rate as harvested on the 27/11/2020.

The crop was even and came off well at harvest. During harvest, there was a clear visual difference between the treatments that have been mirrored by the yield results.

Comments

There was a clear trend between the treatments and the yield, showing a positive yield effect to both the increased fertiliser rate (Figure 1). When analysing the economics (Table 1), this also correlated to an increased enterprise profit from the high fertiliser rate (highest EBT). However, there was also an increase in EBT from the lower fertiliser rate in comparison to the medium (standard practice fertiliser rate. This shows that there was another limiting factor in place, and the decreased cost associated with the low fertiliser rate also had the potential to increase enterprise performance. This clearly shows the diverse effect fertiliser rate can have on enterprise performance, and that optimising fertiliser application can be a valuable tool to optimise a fallow wheat rotation.

Table 1: Economic analysis of three fertiliser rates applied to wheat following fallow.

Fertiliser Rate		**High**	**Medium**	**Low**
Yield	t/ha	4.19	3.85	3.81
Grade		ASW1	ASW1	ASW1
Average Grain Price	$/t	$300	$300	$300
Income	**$/ha**	**$1,257**	**$1,155**	**$1,143**
Variable Operating Costs	**$/ha**	**$**	**$**	**$**
Seed, Treatment & EPR's		$12	$12	$12
Grain Freight		$21	$19	$19
Grain Handling Charges		$37	$34	$34
Crop Contract		$35	$35	$35
Other Crop Costs & Crop Ins		$22	$22	$22
Wages Gross		$28	$28	$28
R&M Mach./Plant/Vehicle		$42	$42	$42
Fuel & Oil		$27	$27	$27
Fertiliser		$76	$62	$33
Variable Operating Costs	**$/ha**	**$300**	**$281**	**$252**
Operating Gross Margin	**$/ha**	**$957**	**$874**	**$891**
Fixed Operating Costs	**$/ha**	**$73**	**$73**	**$73**
Total Operating Costs	**$/ha**	**$373**	**$354**	**$325**
Operating Profit (BIT)	**$/ha**	**$884**	**$801**	**$818**
Finance Costs	**$/ha**	**$24**	**$24**	**$24**
Earnings Before Tax (EBT)	**$/ha**	**$860**	**$777**	**$794**

Table 2: Economic analysis of two rotation options applied over 2017 & 2018 seasons.

		Fallow-Wheat Rotation		Wheat-Wheat Rotation	
		Wheat 2018	Fallow 2017	Wheat 2018	Wheat 2017
Yield	t/ha	4.8	0	3.2	1.2
Grade		ASW1		ASW1	ASW1
Average Grain Price	$/t	$300	$0	$300	$300
Income	$/ha	$1,440	$0	$960	$360
Variable Operating Costs	$/ha	$	$	$	$
Seed, Treatment & EPR's		$12	$11	$12	$12
Grain Freight		$24	$0	$16	$6
Grain Handling Charges		$42	$0	$28	$11
Crop Contract		$35	$0	$35	$35
Other Crop Costs & Crop Ins		$22	$0	$22	$22
Wages Gross		$28	$14	$28	$28
R&M Mach./Plant/Vehicle		$42	$21	$42	$42
Fuel & Oil		$27	$12	$27	$27
Fertiliser		$106	$0	$106	$106
Variable Operating Costs	$/ha	$338	$58	$316	$289
Operating Gross Margin	$/ha	$1,102	-$58	$644	$71
Fixed Operating Costs	$/ha	$73	$72	$73	$73
Total Operating Costs	$/ha	$411	$130	$389	$362
Operating Profit (BIT)	$/ha	$1,029	-$130	$571	-$2
Finance Costs	$/ha	$24	$23	$24	$24
Earnings Before Tax (EBT)	$/ha	$1,005	-$153	$547	-$26
Combined 2 Year EBT	$/ha	$852		$521	

The comparison of the two rotation options (Table 2) clearly shows the benefits of the tactical fallow Blair is looking to employ on these soils in his business. There was insufficient water available to grow a profitable crop in 2016, and the lack of that soil water in 2017 significantly limited the wheat yield.

Conversely, the additional soil water from the 2019 fallow boosted the yield achieved in the 2020 wheat, significantly increasing its profitability. Looking to the combined 2-year EBT the fallow wheat rotation is the clear standout, showing an above-average profit compared to the wheat, wheat rotation.

Please note that this is an un-replicated farmer demonstration and results should be interpreted with caution.

Acknowledgements
This Project is supported by the Department of Agriculture, Water and the Environment, through funding from Australian Government's National Landcare Program Smart Farms Small Grants.

The Liebe Group would like to thank Blair Stone for the extensive time and effort he invested into implementing and managing the trial, and for his continued participation in the Gen Y Paddock Challenge.

Peer review
Chris O'Callaghan, Liebe Group

Contact
Blair Stone, PR & CJ Stone
blair.stone@hotmail.com
0459 920 479

Judith Storer, Liebe Group
research@liebegroup.org.au
08 9661 1907

Scan the QR code to view a video interview with Blair.