Demonstrating the benefits of soil amelioration – Ripper Gauge

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AIM

To evaluate the grain yield and economic benefit of soil amelioration and controlled traffic practices on a broader range of soil types across the grain growing region of WA.

TRIAL DETAILS

Property:	Craig Jespersen – Stretton Farm
Plot size & replication:	12.4m x 700m
Soil type:	Sandy Loam/Gravel
Crop Variety:	Spartacus Barley
Sowing Date:	19th May 2020
Seeding Rate:	70 kg/ha
Fertiliser:	Vigour 85kgs, MAXamFlo 80ltrs, Urea 70kg
Paddock rotation:	Wheat 2019, Wheat 2018, Lupins 2017, Barley 2016, Wheat 2015
Herbicides:	19/5/2019 – 2.8L/ha trifluralin (IBS) Paraquat 1.6ltrs 26/5/20 Jaguar .7L, LVE MCPA .35l, Intervix 375mls, Hasten 1%
Insecticides:	19/5/2019 – 0.1L/ha Alpha Cypermethrin 100EC + 0.1L/ha Chlorpyrifos 500EC

METHODOLOGY

The trial was incorporated into the Facey Group in-house RipOff site, which assessed four adjacent plots which included an untreated control, a 30cm rip, a 60cm deep rip and a standard district practice, as shown in *Table 1*. Assessments and sampling are taken within 3 x quadrants of the length of the trial.

Table 1: *Ripper Gauge Treatments*

Treatment	***Description***	***RipOff Plot #***
Untreated control	*Control*	*7*
30cm Rip	*Terraland 350mm*	*8*
60cm Rip	*Terraland 550mm*	*4*
Standard district practice	*AgroPlow 350mm*	*5*

The treatments were applied on the 13th March 2018, with 3t/ha of lime applied prior to treatment installation. The trial is PA scale with the plot sizes at 12.4m wide x 100m long, applied to a 'virgin' soil which had never been deep ripped. The site was sown on the 19th May 2020 to Spartacus barley.

Annual assessments for this project included a composite soil test in 10cm increments to 50cm, plant establishment counts, three in-season handheld Greenseeker NDVI measurements at Zadok growth stages Z14, Z30 and Z59 and soil strength testing with data logging penetrometer.

The trial site was harvested on the 20th November 2020 (table 5). Plots were harvested using grower machinery with yield mapping capabilities, as well as using a weigh trailer with samples taken for grain quality assessment. Grain samples were taken from each plot and sent to CBH for grain quality analysis.

RESULTS & DISCUSSION

Rainfall data from Stretton Farm was recorded throughout the year (table 2). The 2020 rainfall total was 203.4mm.

Table 2: *Stretton Farm rainfall data - 2020*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainfall	0	51	12.6	12.6	32	59.4	30.5	40.5	28.4	0	18.7	0

Soil test results

Soil samples in 10cm increments to a depth of 50cm were taken on the 15th April 2020. The pH (CaCl2) of the trial site from 2019 to 2020 was recorded and is compared in Table 3.

Table 3: Soil pH (CaCl2) of each treatment in 2019 and 2020.

Depth	Year	Control	Terraland 350mm	Terraland 550mm	AgroPlow 350mm
0-10cm	2019	5.8	5.9	6	6
	2020	5.7	5.4	5.8	6
10-20cm	2019	5.7	4.5	4.7	5.1
	2020	5.0	4.9	5.4	5.4
20-30cm	2019	5.8	4.5	5.3	6.2
	2020	5.5	5.1	5.6	5.7
30-40cm	2019	5.8	5.1	6	6.6
	2020	5.8	5.6	5.6	5.8
40-50cm	2019	6.1	5.7	6.1	6.6
	2020	6.5	6.0	6.0	6.3

Increases in soil pH were observed from 10cm downwards in the Terraland 350mm treatment. Increased alkalinity was also noted at 10-30cm in the Terraland 550mm, and 10-20 in the AgroPlow 350mm treatments. No scientific relationship between treatment and pH change was reported despite the above observations.

Plant establishment counts and NDVI

Plant establishment counts were completed at Zadoks growth stage Z14 on 6th June 2020, with three counts per quadrant. Crop NDVI readings were taken at growth stages Z14. Z30 and Z59 (table 4).

Table 4: *Average NDVI at growth stage Z24,Z30 and Z59 in the 2020 season.*

Treatment	Average plants per/sqm	NDVI GS 24	NDVI GS 30	NDVI GS 59
Boom track – control	137	0.34	0.63	0.44
Terraland 350mm	149	0.33	0.68	0.51
Terraland 550mm	153	0.40	0.65	0.51
AgroPlow 350mm	139	0.38	0.66	0.54
Significance (P<0.05)	NS	NS	NS	NS

A one-way ANOVA (α=0.05) was used to assess if the four different soil amelioration methods differed significantly between the number of plants per square metre. The results indicate that there was no significant difference between all groups ($p < 0.05$). With the treatment averages being: Control 137 (±4.6 se, n=9), Terraland 350mm 149 (5.2x se, n=9), Terraland 550mm 153 (±4.8 se, n=9) and AgroPlow 350mm 139 (±5 se, n=9) respectively.

A one-way ANOVA (α=0.05) was used to assess any relationship between treatment and NDVI at growth stages 24, 30 and 59. No significant relationship was found amongst any of the treatments. In 2019, a significant relationship was found between the control and Terraland 550mm at growth stage Z14 in wheat crop ($p<0.007$). No significance was found between any of the other treatments in the 2019 trial.

Soil strength testing was not able to be completed due to limited soil moisture throughout the season in 2020.

Crop Yield and Grain Quality

Table 5: Grain yield and grain quality data for each of the treatments.

Treatment	Yield (t/ha)	Protein	Hecto (g)	Hecto kg/hl	% screen	Retention (g)	Retention (%)
Control	4.392	10.2	321.9	64.38	23.37	246.7	76.63
Terraland 350mm	4.54	10.2	329.5	65.9	36.58	209	63.42
Terraland 550mm	4.12	10.5	320.0	64.0	25.1	239.7	74.9
AgroPlow 350mm	4.48	9.9	321.8	64.36	24.55	242.8	75.45

A one-way ANOVA (α=0.05) determined that there was no significant difference in grain quality and yields between treatments. All treatments met the protein requirements of malt1 barley (9.5-12.8%), and all treatments except Terraland 350mm met the screening requirements of malt2.

CONCLUSION

The treatments applied in this demonstration are to alleviate multiple soil constraints, including non-wetting, subsoil water infiltration, subsoil acidity and compaction. Prior to the commencement of this trial in 2018, the soil had never been deep ripped. The results of the trial currently indicate that the four different soil amelioration methods do not impact on the grain yield or quality of the cereal crops grown.

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