

## The Impact of Stubble Height on Cropping Systems in the Western Region

Aeneva Poulish, Project Officer, and Chris O'Callaghan, Executive Officer, Liebe Group

### Key Messages

- Strip and disc system yielded the least out of all treatments in 2023.
- Stripper stubble may have provided protection to the growing crop which led to a longer flowering period in a hot finish.
- Less weeds were present in the disc seeding system in comparison to the tyne seeder.

### Aim

Grain growers will have the knowledge and understanding of how differing stubble architectures contribute value to their farming system, understand the differing costs involved, acknowledge the risk/reward profile and use this knowledge to apply the step changes required for profitability.

### Background

Since 2021, the Liebe Group have collaborated with Stirlings to Coast Farmers, Facey Group, Corrigin Farm Improvement Group as well as Farmanco, DPIRD and Charles Stuart University to research the "Impact of Stubble Height on Cropping Systems in the Western Region". This GRDC investment came about due to an increased interest in the 'strip and disc' system and to understand the benefits in water use efficiencies, reduced wind erosion and increased yields.

Four farmer-scale demonstration sites have been designed and implemented in the Wheatbelt and Great Southern regions of WA, with various treatments including: stripper front + disc seeder, draper front + tyne seeder, and other combinations. This report focuses on the Liebe Group site at Bunjil, which was the first year of the trial at this location.

### Trial Details

<b>Trial Location</b>	BA JM Hirsch, Bunjil
<b>Plot size &amp; replication</b>	36.6m x 1000m (1 strip) x 4 replications
<b>Soil type</b>	Sandy loam
<b>Paddock rotation</b>	2021 lupins, 2022 wheat, 2023 wheat
<b>Sowing date</b>	15/05/2023
<b>Sowing rate</b>	62 kg/ha Rockstar wheat
<b>Fertiliser</b>	15/05 – 40 L/ha UAN, 02/06 – 100 kg/ha Urea Sustain
<b>Herbicides</b>	20/06 – 1 L/ha Mateno Complete
<b>Harvest date</b>	29/11/2023

### Treatments

<b>T1</b>	Draper Front + Tyne Seeder
<b>T2</b>	Stripper Front + Disc Seeder
<b>T3</b>	Draper Front + Disc Seeder

### Soil Composition- Pre Seeding (Average)

Depth (cm)	pH (CaCl <sub>2</sub> )	Col P (mg/kg)	Col K (mg/kg)	S (mg/kg)	N (NO <sub>3</sub> ) (mg/kg)	N (NH <sub>4</sub> ) (mg/kg)	EC (ds/m)	OC (%)
0-10	6.2-6.6	29.2-38.7	56.0-70.7	11.5-31.5	4.7-5.0	2.5-3.7	0.07-0.09	0.60-0.65
10-30	4.7-4.9	27.2-28.2	33.7-47.0	10.6-13.3	1	1	0.02-0.03	0.21-0.25
30-50	5.2-5.4	3.75	31.0-36.7	12.4-14.5	<1	<1-1	0.01-0.02	0.10-0.14
50-70	5.4-5.9	2.5-3.0	25.7-32.5	13.1-15.4	<1	<1	0.02	0.09-0.13

**Bunjil Monthly Rainfall (mm)**

Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
2023	0.4	0.0	9.4	1.0	6.8	27.5	23.1	22.4	4.1	0.0	18.4	2.6	115.7

**Results**

**Harvest Losses**

Harvest Losses were not taken in 2023, as the stripper front was not used during harvest as crops were too short.

**Moisture Conservation**

Soil moisture at seeding was measured using a volumetric probe in the top 10cm. Results show that the strip and disc system (treatment 2) had the greatest % of volumetric moisture on the day of sowing (figure 1). Stripper stubble has the ability to conserve soil moisture due to its retention of standing crop residue, whereas draper stubble may result in greater soil exposure and potentially lower moisture conservation (Schillinger & Wuest, 2021).

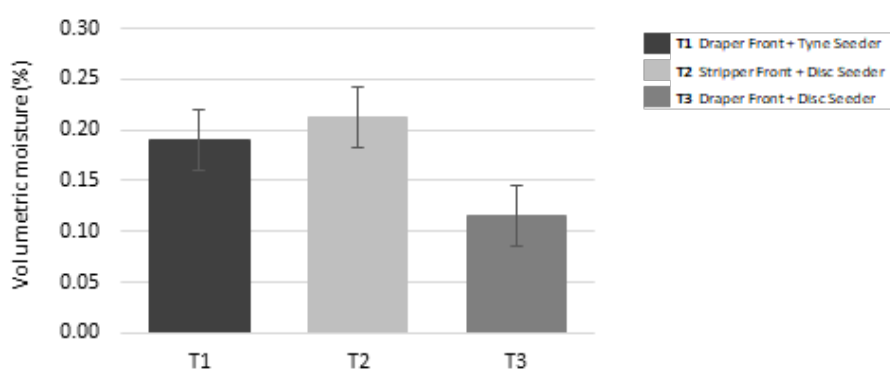


Figure 1: Pre-seeding volumetric soil moisture readings measured on 15/05/2023.

**Crop Establishment**

Wheat plant counts were collected four weeks after sowing (4WAS) (22/06/2023), with treatment 3 (draper front + disc seeder) having the highest average plant count of 33 plants/m<sup>2</sup>. By growth stage 30 (GS30) (after stem elongation) (04/08/2023), plant counts decreased by 30% to an average of 23 plants/m<sup>2</sup> across all treatments. At GS30, treatment 3 also had the highest plant count of 24 plants/m<sup>2</sup>.

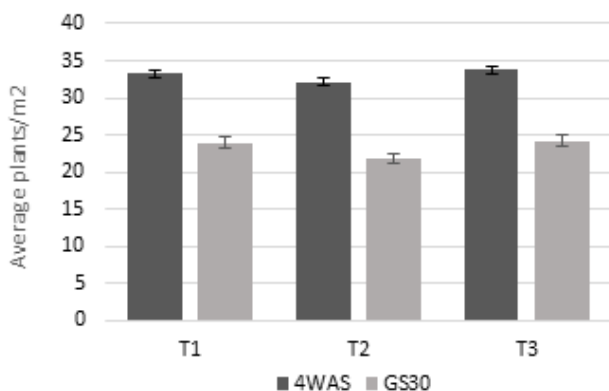


Figure 2: Average plants/m<sup>2</sup> 4 weeks after sowing (4WAS) and growth stage 30 (GS30).

Crop height was measured three weeks prior to harvest, when crop had reached full maturity. Results demonstrate that treatment 2 (striper front + disc seeder) had the greatest crop height with an average of 46cm. Due to the increased wind protection, greater soil moisture and reduced weed competition, the stripper stubble provided a more favourable growing environment in the dry conditions.

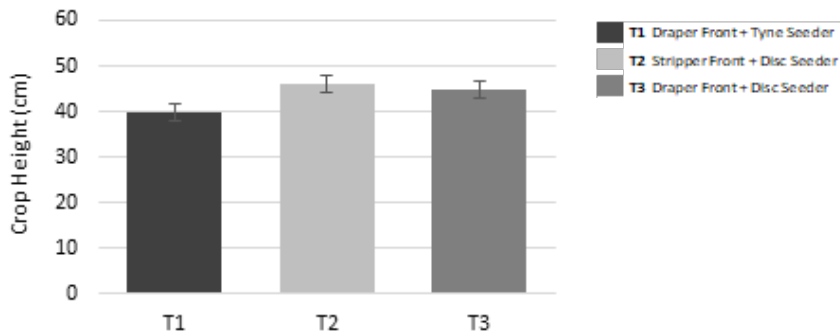


Figure 3: Average crop height (cm) across all treatments at full maturity (30/10/2023).

### Weed Density

Weed counts were taken four weeks after sowing (4WAS), and no weeds were present across all treatments (data not shown). The next weed assessment was taken in late October when the crop reached full maturity. Treatment 1 had the highest weed count with an average of 3 across all plots. Treatment 2 and treatment 3 had an average of less than 1 weed across all plots (Figure 4).

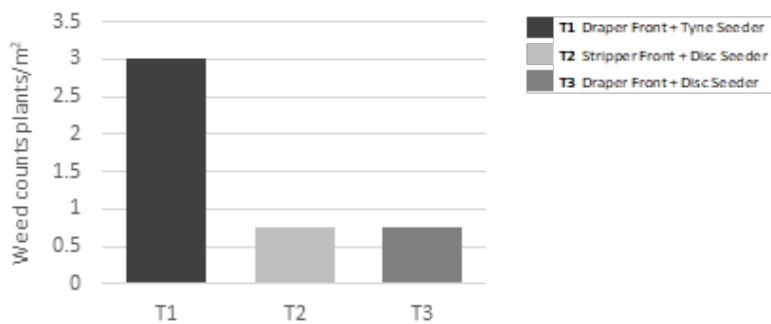


Figure 4: Average weed counts (plants/m<sup>2</sup>) across all treatments recorded at full maturity (30/10/2023).

### Yield

Yield data from 2023 showed that treatment 3 (draper front + disc seeder) had the highest yield, with an average of 0.40 t/ha, followed by treatment 1 (draper front + tyne seeder), with an average of 0.37 t/ha. Treatment 2 (stripper front + disc seeder) had the lowest yield, average of 0.30 t/ha.

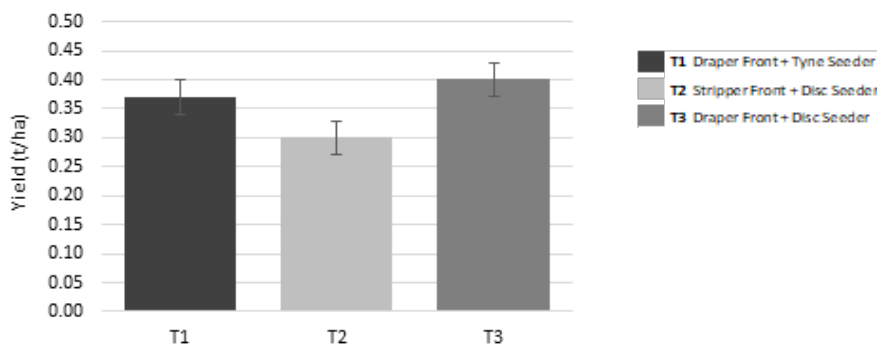


Figure 5: Average yield (t/ha) across all treatments.

### Grain Quality

In terms of grain quality, the average protein was 13.1 and hectolitre weight averaged 78.5% across all treatments. There is no significant difference between treatments in the protein and hectolitre weight.

Table 1: Grain quality per treatment.

	Protein (%)	Hectolitre (%)	Screenings (%)
T1	12.80	79.12	3.06
T2	13.78	77.82	3.32
T3	12.90	78.54	3.04

## Comments

Stubble heights from the 2022 harvest were measured at the start of the season. Heights for the draper treatments averaged 33.93cm in treatment 1 and 28.35cm in treatment 3, whereas the stripper stubble height averaged 47.43cm (Data not presented). The site was extremely dry at sowing across all treatments.

Conditions at this site were unfavourable due to the below-average rainfall for the 2023 season, which was evident in the low yields across all treatments. The site was sown on 15 May, and did not receive a follow up rainfall event until 1 June.

Observations were made during spring, that the crop sown into the stripper front stubble was greener and flowered for longer, however this did not translate into a yield benefit. The trial was harvested on 27 of November and due to the dry conditions, all plots were harvested with a draper front. The yield penalty associated with the stripper stubble was counter-intuitive to what was expected. Potentially this can be explained by the stripper stubble providing greater heat protection over the other treatments, which has potentially slowed the growth rates of the plants, causing a delay in flowering into the hotter climate and resulting in heat stress.

Full results from this project are still being analysed and will be released later in the year.

## Acknowledgments

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## References

Schillinger, W. F., & Wuest, S. B. (2021). Wheat stubble height effects on soil water capture and retention during long fallow. *Agricultural Water Management*, 256

## Peer Review

Rebecca Wallis, Liebe Group

## Contact

Aeneva Poulsh  
projects@liebegroup.org.au  
0400 377 319

