COGGO Research Fund - Corrigin Farm Improvement Group

Final Technical Report

Maximising fallow rotations with a ‘Strip and Disc’ strategy to increase water use efficiency and subsequent crop yields across the wheatbelt region of Western Australia.

CORRIGIN
Farm Improvement Group

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1. Introduction

This report evaluates the Draper/Tyne vs. Disc/Stripper systems in the 2020-2022 COGGO S+D trials conducted across the central eastern wheatbelt of Western Australia. The key objectives were:

- Assess the impact of stubble management and seeding systems on grain yield, quality, and efficiency.
- Determine the soil moisture retention benefits of a stripper-disc system vs. a draper-tyne system.
- Compare weed populations under both treatments.
- Evaluate machinery efficiency to assess cost-effectiveness for growers.

2. Background

Effective management of stubble during a fallow period can lead to improvements in crop emergence, nutrition, soil structure, soil moisture retention and crop yields. For growers in Western Australia, moisture conservation and water use efficiency are key factors for producing higher yielding crops; especially in the central and eastern wheatbelt regions.

By leaving a greater stubble biomass leading into a chemical fallow rotation, growers can encourage positive effects on soil quality for crop production in the subsequent year. This includes increases in soil moisture retention, and reductions in soil loss by wind and water erosion.

By utilising a 'strip and disc' strategy growers are able to leave the maximum amount of standing stubble for the following fallow rotation. Stripper fronts allow growers to cut stubble higher than the commonly used draper fronts. Indications from research carried out in the northern and southern regions of Australia show that wheat and barley can be harvested successfully using a stripper front.

Disc seeders can handle taller, larger stubble loads and have better cutting capacity using a sharp disc opener operating in dry stubble and firm ground, which is required for implementing this rotation strategy. The threshold where machinery can start to have trouble handling stubble varies considerably but occurs most commonly from 3 to 4t/ha (GRDC Factsheet, 2011). Whilst disc seeders can sow into heavy stubbles as of 9t/ha or more (CSU Factsheet, 2011).

This project compared stubble management strategies leading into a fallow then cereal rotation for the eastern wheatbelt region. Treatments included.

- Cereal crop harvested with a stripper front, chemical fallow, followed by a cereal crop sown with a disc seeder.
- Cereal crop harvested with a draper front, chemical fallow, followed by a cereal crop sown with a tyned seeder (standard practice for the region – Control).
- Latrobe barley was sown.

The trial would run for two seasons, allowing the group to measure harvest yield late 2019, followed with fallow in 2020, then a cereal crop (wheat or barley) in 2021 and analyse crop emergence, seed bed soil moisture at emergence, vigour, in-season NDVI, grain yields and

quality across the 8 treatments. Statistical and economic analysis will be conducted, and yield mapping will capture any spatial variability.

This project aims to provide grain growers in the central and eastern wheatbelt region with stubble management strategies utilising a 'strip and disc' system with fallow rotations to increase soil moisture retention for maximum yield potential in subsequent cereal crops (wheat or barley).

3. Potential Application to the WA Grains Industry and broader Community

To our knowledge very little of the research don't in this area was carried out in WA, and mostly the data is representative of the northern and southern regions of Australia. This project aims to put these theories to the test in the central to eastern wheatbelt region of WA where soil moisture retention and water use efficiency is crucial for growing profitable cereal crops. Given that seasonal conditions vary substantially, and the last two seasons have been a late break, maximising soil moisture following a fallow rotation is essential. Growers in the eastern wheatbelt region have a keen interest in the strip and disc theory.

To our knowledge there has been little investment in ground-truthing the "strip and disc" with a fallow rotation for Western Australia, especially in the eastern wheatbelt region. Given the series of late breaks in recent year's growers are searching for effective strategies to increase their soil moisture content and water use efficiencies to maximise cereal production.

The following outcomes have been achieved with the successful implementation of this project.

1) Provide trial evidence to growers of in the eastern wheatbelt region of "strip and disc" strategy with a fallow rotation to maximum yield potential in cereals (wheat or barley).

2) The potential to increase the productivity of cereal grain yields and grain quality when implementing a ''strip and disc' strategy following a fallow rotation.

3) Increase grower's long term profitability through greater awareness of stubble management strategies for retaining soil moisture for greater water use efficiencies and yield potential in the subsequent year's cereal crop.

3.1 Additional Benefits:

- Reduced severity of hair-pinning with disc openers
- Positive trellising effects improving growth and harvestability of crop such as lupins and field peas
- Increased moisture captures in furrow and reduced moisture evaporation due to wind
- More even soil moisture conditions and less crop establishment variability
- More efficient harvest (fuel/ha, work rate, etc)
- Seedling protection in early growth stages
- Better IBS herbicide potential in stubble
- Improved water use efficiency

The effective management of stubble during a fallow period (the period when no crop is growing in the paddock) can minimise a number of potential cropping issues such as weed populations, seeder blockages and erosion. Effective fallow management can also lead to improvements in crop emergence, crop nutrition, soil structure, soil moisture retention and crop yields.

To harness the benefits of a retained stubble system, monitoring and management of fallow paddocks is critical. While thinking ahead to the next crop to be grown in the paddock, growers need to consider the current stubble load and how this will influence sowing, crop emergence, herbicide efficacy and disease and pest levels.

Research also suggests that tall standing stubble, such as that produced by a stripper header, can improve soil water retention by capturing more snow, reducing soil-water evaporation, and reducing wind speeds at the soil surface (Black and Siddoway 1977; Nielsen 1995; McMaster et al. 2000; Nielsen et al. 2005).

4. Methods & Data Collection

`4.1 Trial Design

	Treatments	1	Stubble	Strip, fallow, disc		**header**	12m	40 ft	2020	LaTrobe Barley	
		2	Stubble	Draper, fallow, tyne		**seeder bar**	18m	60ft	2021	Chem Fallow	
						sprayer	36m	120ft	2022	LaTrobe Barley	
						Jacobs See	12m	40 ft			
											N
					Road						
											108E
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
	5		5	5		5	5		5		
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
	4		4	4		4	4		4		
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
	3		3	3		3	3		3		
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
	2		2	2		2	2		2		
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
	1		1	1		1	1		1		
	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne	Strip & Disc		Draper & Tyne		
229W	Plot 1		Plot 2	Plot 3		Plot 4	Plot 5		Plot 6		**209W**
	Rep 1			Rep 2			Rep 3				-32.2939162
											118.1529649
	sprayer width 36m runs x 6 = 220m										

COGGO - Maximising fallow rotations with a 'Strip and Disc' strategy to increase water use efficiency and subsequent crop yields in the central eastern wheatbelt region of WA										
Trial Design										
	Treatments	1	Stubble	Strip, fallow, disc		**header**	12m	40 ft	2020	LaTrobe Barley
		2	Stubble	Draper, fallow, tyne		**seeder bar**	18m	60ft	2021	Chem Fallow
						sprayer	36m	120ft	2022	LaTrobe Barley
						Jacobs Seeder	12m	40 ft		

The 2022 trial was an extension of the 2020 research. The primary treatments were:

Treatment 1: Draper/Tyne System

- Draper front harvester + tyne seeder.
- Traditional soil disturbance method.

Treatment 2: Disc/Stripper System

- Stripper front harvester + disc seeder.
- Minimized soil disturbance for moisture conservation.

4.2 Data Collected Results and Discussion

4.2.1 Yield Performance (2020 vs. 2022)

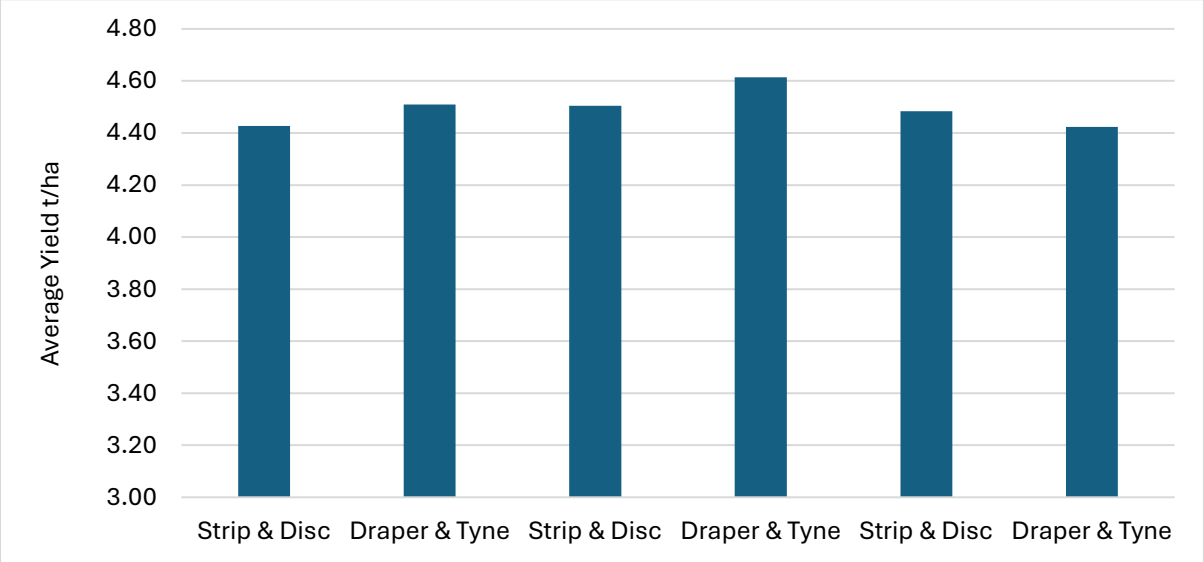
Draper/Tyne consistently yielded slightly higher (4.52 t/ha in 2022 vs. 4.47 t/ha for Disc/Stripper).

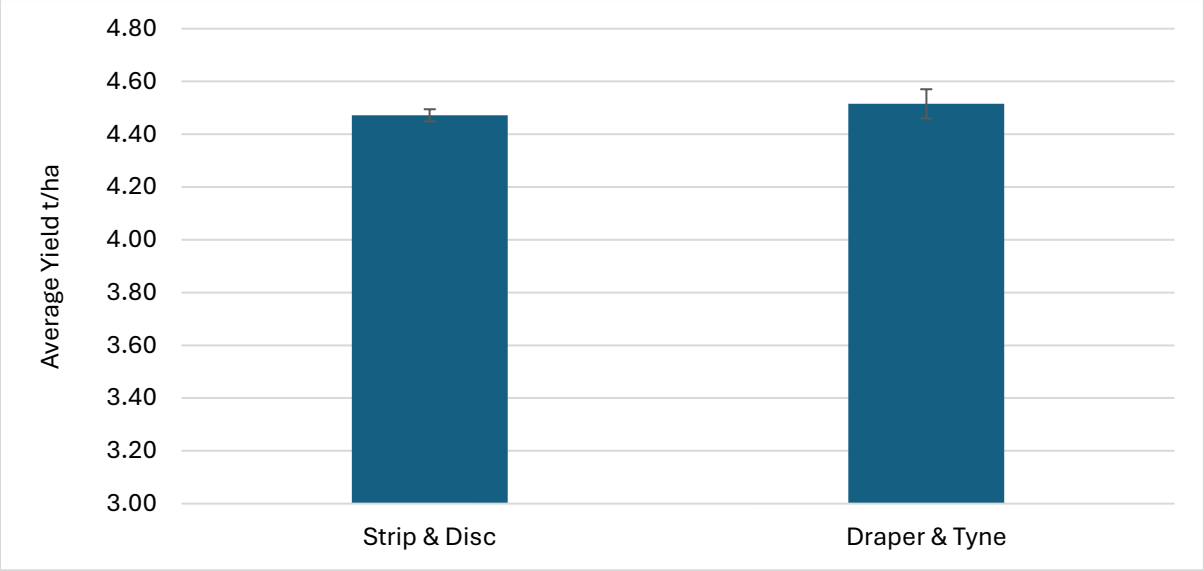
Difference was small (less than 5%), likely due to high rainfall in 2022.

Conclusion:

Draper/Tyne provides slightly higher yield but at the expense of grain quality and efficiency.

4.2.2. Yield Performance (t/ha)





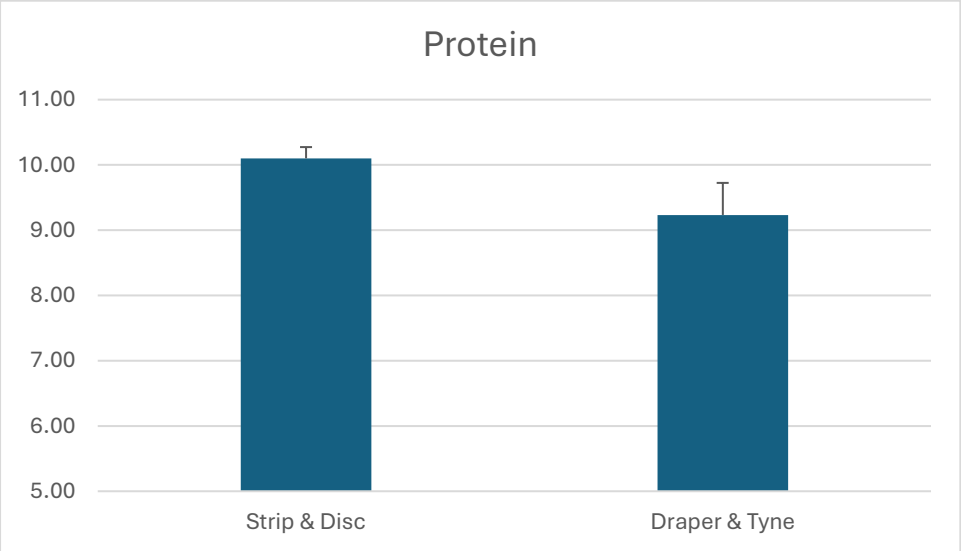
4.3 Grain Quality & Hectolitre Weight

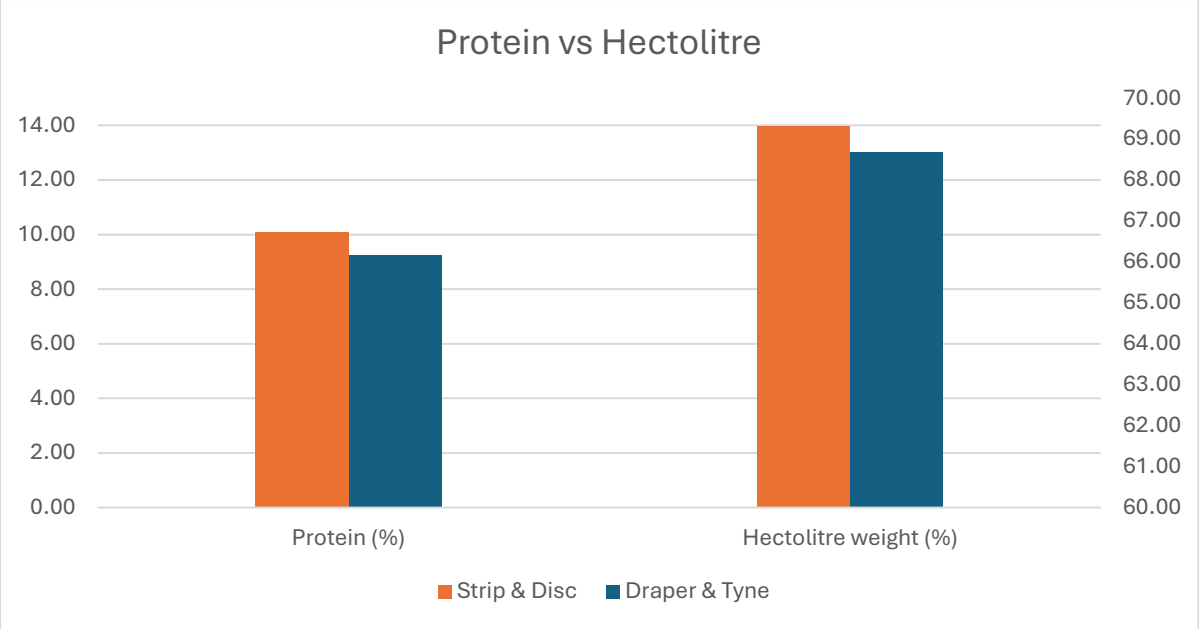
Disc/Stripper consistently had better grain quality.

Higher hectolitre weight → denser, more marketable grain.

Lower screenings → reduced grain downgrades.

Higher protein levels (10.1% vs. 9.23%) → improved quality for malt barley.





Conclusion:

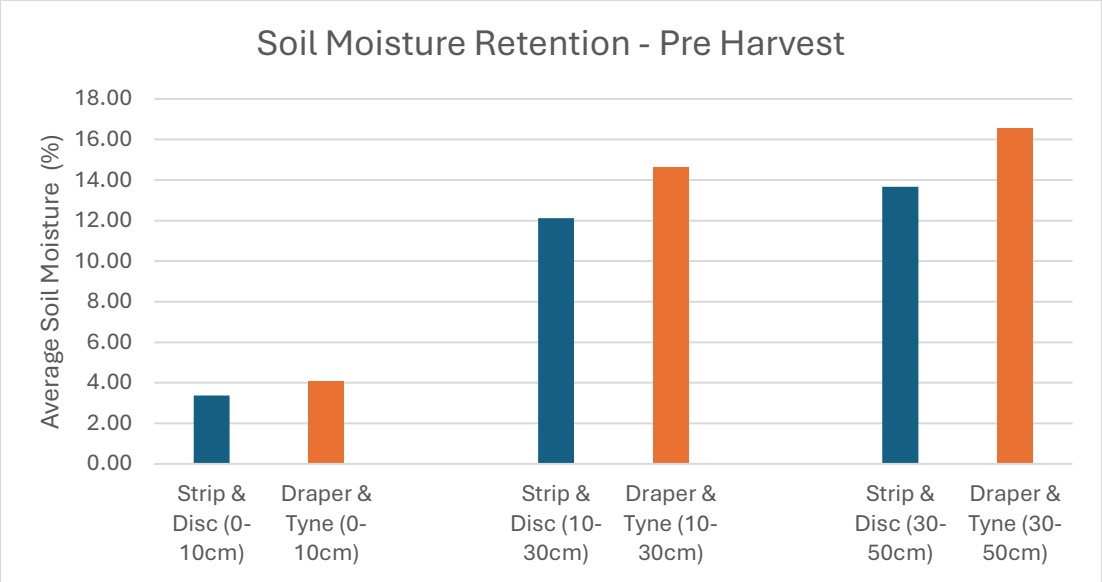
For premium grain markets, Disc/Stripper is superior.

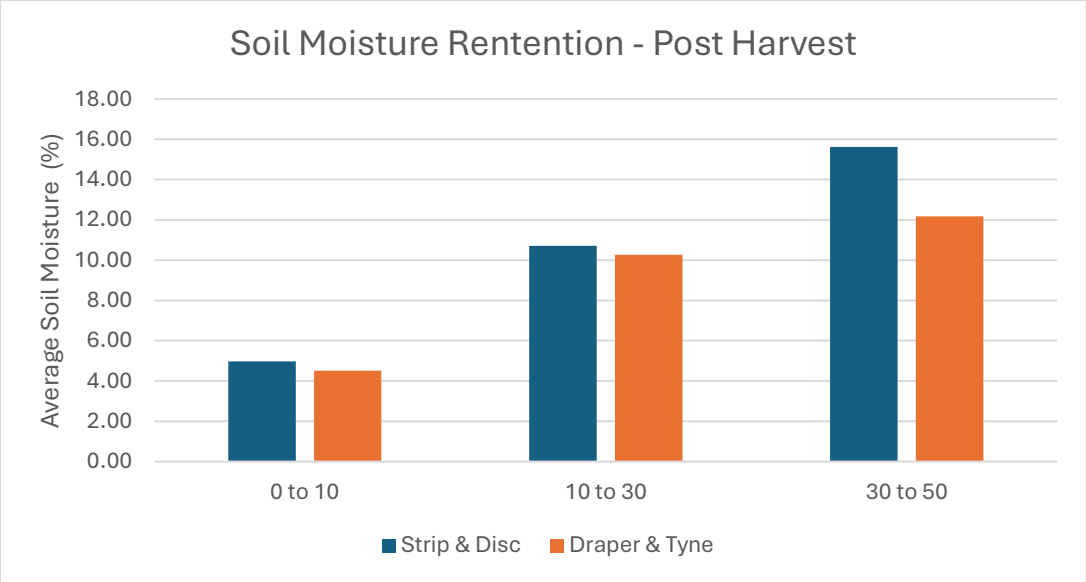
4.3.1. Grain Quality (hectolitre weight, screenings, protein)

Treatment Name	Protein	Hectolitre weight (%)	Screen 2.2mm (%)
Strip & Disc	9.8	69.04	1.29
Draper & Tyne	8.9	68.50	1.02
Strip & Disc	10.1	69.39	1.24
Draper & Tyne	8.6	69.06	0.97
Strip & Disc	10.4	69.51	1.23
Draper & Tyne	10.2	68.47	3.06

4.4 Soil Moisture Retention

4.4.1. Soil Moisture Retention (pre- and post-harvest)





Disc/Stripper retained ~16% more moisture post-fallow.

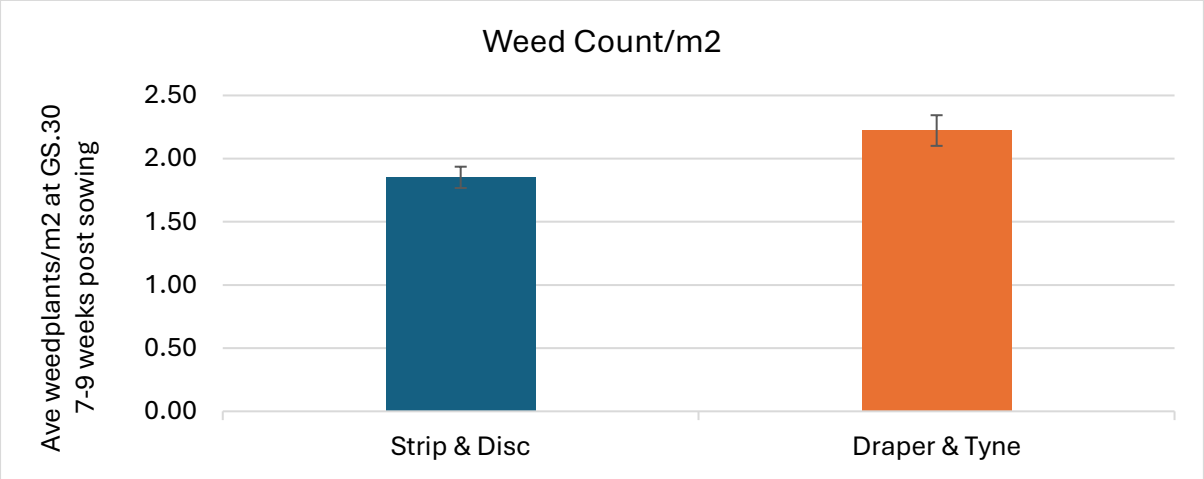
Post-harvest moisture remained higher, indicating improved water conservation.

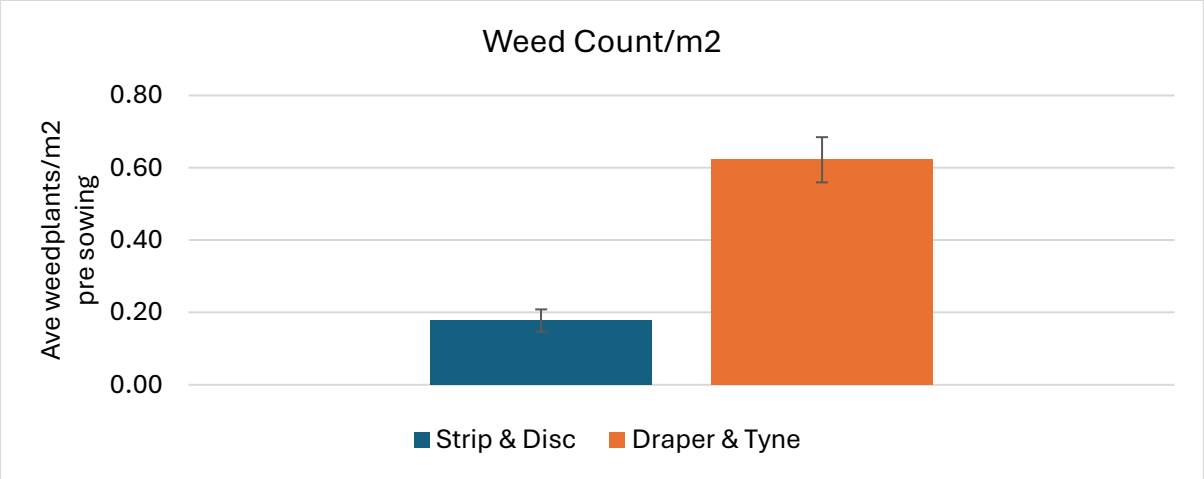
Conclusion:

In low-rainfall years, Disc/Stripper would outperform Draper/Tyne in moisture retention.

4.5 Weed Population

4.5.1. Weed Populations (density per square meter)





15% fewer weeds in Disc/Stripper plots.

Reduced weed competition → lower yield loss.

Potential herbicide savings.

Conclusion:

Disc/Stripper provides better weed control, lowering chemical input costs.

4.6 Machinery Efficiency

4.6.1. Machinery Efficiency (harvest speed, fuel use, cost)

	Strip & Disc	Draper & Tyne
harvest speed (km/h)	10.33	5.5
fuel use (l/h)	6.93	?
Cost ($)	?	?

? = no results available

Disc/Stripper was nearly twice as fast in harvesting speed.

Fuel consumption was lower → reducing costs.

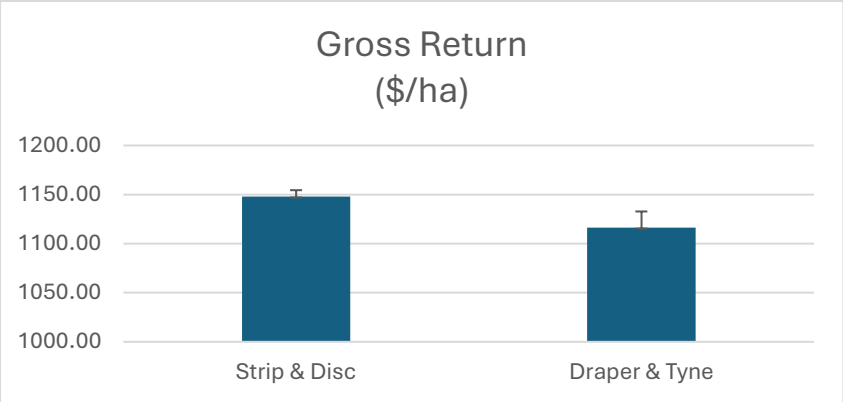
Harvest rate was 86% higher (12.3 t/hr vs. 6.6 t/hr).

Conclusion:

Disc/Stripper is more cost-effective and time-efficient, reducing machinery wear and fuel costs.

4.7 Gross Return

The strip n disc system provided a higher return due to higher grain quality vs lower yield.



5. Conclusion

Key Takeaways

1. Yield → Draper/Tyne slightly higher

2. Grain Quality → Disc/Stripper better (higher hectolitre weight, higher hectolitre weight lower screenings).

3. Soil Moisture → Disc/Stripper superior

4. Weed Control → Disc/Stripper lower weed density .

5. Machinery Efficiency → Disc/Stripper twice as fast, more fuel-efficient.

6. Gross Return → The strip n disc system provided a higher return due to higher grain quality vs lower yield.

Final Verdict:

For high-rainfall years → Both systems perform similarly.

For dry years → Disc/Stripper is expected to outperform.

For economic efficiency → Disc/Stripper saves fuel, time, and chemical costs.

5.1 Recommendations

Conduct longer-term trials (multi-year evaluation).

Further economic analysis of cost-benefit ratios.

Evaluate soil health impacts over time.

Overall, the Disc/Stripper system provides more advantages for long-term sustainability, especially in lower rainfall conditions.

5.2 Other Considerations

If stubbles are too thick to sow through, consider strategic late burn, especially before the second wheat crop or if sowing canola into large stubbles.

Harvest weed seed control is an additional component that growers like Daniel Fox at Marrar, NSW are adding to the 'strip and disc' system

The threshold where machinery can start to have trouble handling stubble varies considerably but occurs most commonly from 3 to 4t/ha (GRDC Factsheet, 2011). For some older tined machinery in wet conditions it can be as low as 2.2 t/ha while more modern set-ups and disc seeders can sow into heavy stubbles as of 9t/ha or more (CSU Factsheet, 2011).

One example is to consider the return on investment (ROI) of using a stripper front to maximise cereal stubble retention (plucks heads only) and potentially save on costs from faster harvest speed and reduced risk of weather losses, compared with a draper front which cuts stubble lower and needs to process more residue through the header before spreading. Initial indications show that wheat and barley can be harvested successfully using a stripper front

Disc seeders can handle taller, larger stubble load (less residue on ground) with uniformly spread residue and have better cutting capacity using a sharp disc opener operating in dry stubble and firm ground.

Stubble management during fallow is important for pre-sowing weed and pest management and stubble characteristics to maintain groundcover and enable crop sowing and establishment.

Disc seeders are generally designed to handle residue better than tyne seeders and can be an effective way of establishing crops into field pea and vetch stubble.

"With a stripper there is basically bare ground between the stubble rows, but that exposed soil is protected from wind by the standing stubble. "There are also moisture conservation benefits because rainfall infiltration is better in paddocks with standing stubble than where the surface is covered.

Systems that reduce or limit fallow frequency and tillage intensity generally result in greater amounts of surface crop residues remaining during fallow periods. Those residue increases generally produce positive effects on soil quality for crop production, including increases in soil OM, nutrients, physical structure, water content, and microorganisms, as well as reductions in soil loss by wind and water erosion.

6. Appendices

6.1 Soil Samples Data

23/02/2022 – Refer to attached spreadsheet

Lab Number		MUS22157	MUS22158	MUS22159	MUS22160	MUS22161	MUS22162	MUS22164	MUS22165	MUS22166	MUS22167	MUS22168	MUS22169	MUS22170	MUS22171	MUS22172	MUS22173	MUS22174	MUS22175
Name		M	K	N	H	P	B	Q	D	G	J	R	C	O	L	F	E	I	A
Code		Site 5	Site 4	Site 5	Site 3	Site 6	Site 1	Site 6	Site 2	Site 3	Site 4	Site 6	Site 1	Site 5	Site 4	Site 2	Site 2	Site 3	Site 1
Sampled Date		17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
Depth		0-10	10-30	10-30	10-30	0-10	10-20	10-30	0-10	0-10	0-10	30-50	30-50	30-50	30-50	30-50	10-30	30-50	0-10
Colour		BR	DKBR	DKBR	BR	BRGR	BR	BR	BRGR	BRGR	BRGR	BRRD	BR	BRRD	BRRD	BR	LTBR	LTBR	BRGR
Gravel	%	5	0	0	0	5-10	5-10	5	5-10	5-10	5-10	0	0	0	5	5-10	5-10	5	5-10
Texture		2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.0	2.5	2.5	2.5
Ammonium Nitrogen	mg/kg	9.00	< 1	1.00	< 1	3.00	< 1	< 1	6.00	7.00	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6
Nitrate Nitrogen	mg/kg	33.00	5.00	6.00	7.00	37.00	8.00	9.00	46.00	48.00	59.00	9.00	7.00	5.00	5.00	5.00	6.00	6.00	34.00
Phosphorus Colwell	mg/kg	59.00	13.00	8.00	5.00	46.00	2.00	6.00	60.00	51.00	38.00	< 2	< 2	5.00	45302.00	45303.00	45297.00	4.00	39.00
Potassium Colwell	mg/kg	522.00	163.00	68.00	296.00	607.00	92.00	208.00	570.00	628.00	333.00	305.00	144.00	68.00	209.00	140.00	111.00	402.00	404.00
Sulfur	mg/kg	8.20	4.80	3.30	43.90	6.30	12.50	15.10	10.50	14.60	28.50	84.30	48.10	3.60	6.20	10.20	6.90	91.30	11.20
Organic Carbon	%	1.22	0.78	0.41	0.30	1.26	0.49	0.48	1.20	1.34	1.38	0.28	0.22	0.22	0.23	0.18	0.50	0.17	1.10
Total Organic Carbon	%	1.41	0.87	0.51	0.36	1.40	0.52	0.62	1.55	1.55	1.57	0.31	0.29	0.26	0.28	0.25	0.53	0.19	1.25
Conductivity	dS/m	0.22	0.20	0.17	0.57	0.21	0.34	0.49	0.24	0.39	0.36	0.95	0.64	0.23	0.31	0.29	0.20	0.87	0.30
pH Level (CaCl2)		6.80	7.70	7.80	8.20	7.70	7.70	8.20	7.20	7.70	7.00	8.40	8.00	7.90	7.80	7.80	8.20	8.30	7.50
pH Level (H2O)		7.70	8.30	8.70	9.20	8.60	8.60	9.60	7.60	8.00	7.20	9.70	9.30	8.90	9.10	9.10	9.00	9.40	7.90
DTPA Copper	mg/kg	1.22	0.72	1.24	0.71	1.12	0.58	1.55	1.06	0.87	1.02	1.30	0.71	0.96	0.74	0.77	1.09	0.50	1.07
DTPA Iron	mg/kg	9.00	6.20	7.40	6.80	4.10	6.50	6.50	11.10	8.80	17.20	5.60	9.20	17.40	8.20	13.80	14.10	7.90	9.70
DTPA Manganese	mg/kg	36.02	2.05	2.83	0.88	7.96	0.83	1.43	23.71	17.86	34.85	1.00	1.69	5.36	2.38	2.64	4.26	1.13	17.75
DTPA Zinc	mg/kg	0.57	0.14	0.22	0.15	0.45	0.19	0.22	0.59	0.62	0.60	0.13	0.19	0.13	0.27	0.68	0.21	0.35	0.49
Exc. Aluminium	meq/100g	0.01	0.03	0.02	0.06	0.02	0.06	0.04	0.02	0.02	0.03	0.06	0.04	0.05	0.03	0.03	0.05	0.08	0.03
Exc. Calcium	meq/100g	14.48	15.86	15.02	8.97	20.67	10.95	12.04	13.02	15.11	10.54	7.36	7.70	11.94	9.61	10.23	11.38	7.02	14.84
Exc. Magnesium	meq/100g	3.65	5.47	5.00	8.10	5.49	4.56	10.75	4.01	4.84	3.13	11.99	7.47	6.19	5.07	6.72	6.01	8.72	3.93
Exc. Potassium	meq/100g	1.36	0.50	0.22	0.89	1.64	0.27	0.72	1.56	1.58	0.81	1.01	0.43	0.21	0.59	0.41	0.36	1.08	1.12
Exc. Sodium	meq/100g	0.52	1.52	1.21	5.32	1.09	2.27	6.58	0.45	1.26	0.69	11.32	6.13	2.55	2.80	2.77	1.54	7.39	0.76
Boron Hot CaCl2	mg/kg	2.54	6.54	3.31	37.83	4.90	8.03	25.51	3.38	5.03	2.04	49.24	23.66	5.02	13.84	7.92	5.21	39.06	3.15
PBI		96.40	146.40	122.80	167.50	174.50	159.30	217.00	90.40	123.00	73.90	199.40	178.60	116.30	135.60	128.90	111.00	155.20	103.90

8/3/2023

Name		G	B	C	F	A	D	E	J	H	L	M	K	I
Code		Plot 4	Plot 6	Plot 5	Plot 4	Plot 6	Plot 5	Plot 5	Plot 3	Plot 2	Plot 1	Plot 1	Plot 3	Plot 2
Depth		10-30	10-30	0-10	0-10	0-10	10-30	30-50	0-10	0-10	0-10	10-30	10-30	10-30
Colour		BRRD	BRRD	BR	BR	BR	BR	BR	BR	BR	GRBR	BR	BR	DKBR
Gravel	%	5	5	0	5	5	5	0	10-15	5-10	15-20	15-20	5-10	5-10
Texture		3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0	3.0	2.5	3.0	3.0	3.0
Ammonium Nitrogen	mg/kg	< 1	< 1	3	2	2	< 1	< 1	3	4	2	< 1	< 1	< 1
Nitrate Nitrogen	mg/kg	1	1	3	5	4	< 1	1	2	14	3	1	1	3
Phosphorus	mg/kg	7	4	45	29	33	5	3	25	38	23	5	5	11
Colwell Potassium	mg/kg	252	108	566	597	365	222	228	580	956	659	257	233	448
Colwell Sulfur	mg/kg	1.6	0.9	2.7	4.3	2.9	1.6	6.5	2.2	7.4	2.7	3.9	4.8	2.5
Organic Carbon	%	0.59	0.38	1.19	1.23	1.04	0.57	0.33	1.19	1.66	1.42	0.64	0.98	0.95
Conductivity	dS/m	0.174	0.185	0.223	0.260	0.241	0.236	0.396	0.225	0.296	0.203	0.306	0.259	0.177
pH Level (CaCl2)		7.9	7.8	7.6	7.2	7.5	8.0	8.4	7.7	7.5	7.8	8.1	8.0	7.8
pH Level (H2O)		9.0	9.0	8.3	8.1	8.1	9.3	9.7	8.5	8.2	8.7	9.5	9.3	8.8
DTPA Copper	mg/kg	1.15	1.40	1.80	1.64	1.64	1.42	1.20	1.59	1.71	1.83	2.30	1.80	1.79
DTPA Iron	mg/kg	13.10	9.60	18.20	30.50	18.90	15.80	12.00	8.90	11.40	7.40	7.70	8.20	9.40
DTPA Manganese	mg/kg	3.41	5.29	18.11	18.19	27.18	3.40	1.34	15.54	13.99	10.96	2.35	3.19	3.72
DTPA Zinc	mg/kg	0.16	0.17	0.64	0.57	0.52	0.09	0.05	0.38	0.61	0.50	0.08	0.08	0.18
Exc. Aluminium	meq/100g	0.021	0.021	0.011	0.020	0.017	0.027	0.018	0.012	0.012	0.011	0.020	0.020	0.021
Exc. Calcium	meq/100g	17.40	14.87	17.36	17.28	13.85	14.91	9.91	18.74	19.53	19.21	14.34	15.80	21.84
Exc. Magnesium	meq/100g	6.86	7.01	5.29	3.92	4.28	10.13	11.96	5.06	4.61	5.04	9.30	8.63	7.42
Exc. Potassium	meq/100g	0.74	0.37	1.62	1.53	1.02	0.80	0.79	1.44	2.56	1.58	0.86	0.59	1.38
Exc. Sodium	meq/100g	1.57	2.13	0.61	0.53	0.77	2.94	5.22	0.81	0.80	0.85	3.40	2.60	1.22
Boron Hot CaCl2	mg/kg	6.70	5.21	4.35	3.39	2.78	11.26	29.26	4.73	3.78	5.63	15.46	12.09	8.78
PBI		190.6	152.4	146.5	120.8	104.1	196.9	208.3	161.8	153.5	179.7	208.2	201.8	208.9
Moisture %	%	8.01	7.69	2.85	3.18	2.81	11.18	8.03	5.07	3.96	5.06	10.51	9.88	10.38

6.2 Harvest Data

n.d.

Treatment Number	1	2	3	4	5	6
Treatment Name	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Variety	Latrobe Barley	Latrobe Barley	Latrobe Barley	Latrobe Barley	Latrobe Barley	Latrobe Barley
Area (Ha)						
Yield (kg) Weigh Trailer						
Yield (t/ha)	4.43	4.51	4.50	4.61	4.48	4.42
Grade	MALT 1	BFED 1	MALT 1	BFED 1	MALT 1	BFED 1
Protein	9.8	8.9	10.1	8.6	10.4	10.2
Moisture	9.6	10.1	10	10.5	10	10.4
Temp	17	16	17	17	17	18
Hectolitre weight (g)	345.21	342.48	346.96	345.30	347.54	342.34
Hectolitre weight (%)	69.04	68.50	69.39	69.06	69.51	68.47
Retention (g)	328.79	319.09	333.99	327.99	347.54	304.27
Retention (%)	95.24	93.17	96.26	94.99	100.00	88.88
Screen 2.2mm (g)	4.44	3.48	4.29	3.34	4.26	10.49
Screen 2.2mm (%)	1.29	1.02	1.24	0.97	1.23	3.06
SFS (gms)						0.37
SFS (%)	0.00	0.00	0.00	0.00	0.00	0.11
Germ End	8	41	3	32	8	24

6.3 Soil Moisture Retention Data

Pre-seeding 17/02/2022

Soil Moisture Measurements (0-10cm)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	137.87	125.65	138.15	134.58	128.8	120.15
Dry Weight	133.64	122.24	133.4	129.88	124.57	114.42
Weight of T	1.9	1.92	1.9	1.92	1.93	1.93
Soil Moistu	3.17	2.79	3.56	3.62	3.40	5.01

Soil Moisture Measurements (10-30)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	120.4	149.38	124.17	120.68	123.15	113.56
Dry Weight	110.01	137.14	108.89	107.22	109.11	92.8
Weight of T	1.89	1.92	1.91	1.92	1.91	1.89
Soil Moistu	9.44	8.93	14.03	12.55	12.87	22.37

Table 17.3: Soil Moisture Measurements (30-50)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	130.06	166.43	141.56	120.9	155.22	113.27
Dry Weight	115.04	144.36	123.11	108.66	137.4	92.03
Weight of T	1.88	1.89	1.91	1.9	1.89	1.83
Soil Moistu	13.06	15.29	14.99	11.26	12.97	23.08
	8.56	9.00	10.86	9.15	9.74	16.82

Post-harvest 02/03/2023

Soil Moisture Measurements (0-10cm)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	83.03	61.69	62.98	82.36	51.33	165.19
Dry Weight	78.77	59	60.21	78.94	48.93	157.83
Weight of T	1.91	1.91	1.91	1.91	1.91	1.91
Soil Moistu	5.41	4.56	4.60	4.33	4.90	4.66

Soil Moisture Measurements (10-30)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	152.19	111.33	83.92	107.63	137.67	167.31
Dry Weight	136.57	100.86	76.56	98.02	123.94	151.26
Weight of T	1.91	1.91	1.91	1.91	1.91	1.91
Soil Moistu	11.44	10.38	9.61	9.80	11.08	10.61

Table 17.3: Soil Moisture Measurements (30-50)						
Plot	1	2	3	4	5	6
Treatment	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Wet Weight	37.59	66.33	32.57	36.84	41.33	55.07
Dry Weight	33.51	59.06	27.41	32.17	35.67	50.2
Weight of T	1.91	1.91	1.91	1.91	1.91	1.91
Soil Moistu	12.18	12.31	18.83	14.52	15.87	9.70
	9.67	9.08	11.01	9.55	10.62	8.33

6.4 Weed Counts Data

Pre-seeding 17/02/2022

Treatment Name	plot number	Average	Plants/m2	STDEV.P	S.E.
Strip & Disc	1	0.07	**0.27**	**0.25**	**0.06**
Draper & Tyne	2	0.00	**0.00**	**0.00**	**0.00**
Strip & Disc	3	0.00	**0.00**	**0.00**	**0.00**
Draper & Tyne	4	0.27	**1.07**	**0.44**	**0.11**
Strip & Disc	5	0.07	**0.27**	**0.25**	**0.06**
Draper & Tyne	6	0.20	**0.80**	**0.54**	**0.14**

Post-seeding 110/7/2022

6.5 Machinery settings and Inputs Data

Inputs

Activity	Product	Rate /Ha	Unit	$/unit	$/ha	Comments
Spreading			**ha**			
Spray application			**ha**			
Knockdown	**Ester**	**400**	**mL**		**$3.15**	
	Glyphosate	**1L**			**$6**	
Spray application			**ha**			
Pre-Emergent						
	Paraquat	1L			$4	
	Treflan	2L			$12	
Seeding			**ha**			
Seed	latrobe Barle	50	kg/ha		$20	
Fertiliser	Agflow + MOF	65	kg/ha		$90	
Fertiliser						
Spray application			**ha**			
PSPE						
Spray application			**ha**			
Fertiliser	Amnistar Extı	400	ml		$15	
Spreading			**ha**			
Fertiliser	Urea	40	kg/ha		$35	
Spray application			**ha**			
Post Emergent	Prosulfacarb	2	L		$18	
	Brodal	50	mL		$16	
Spray application			**ha**			
Harvest			**ha**			

Crop year	2020	2021	2022
Crop Type	Barley	Fallow	Barley
Variety	Latrobe		Latrobe
Seeding Date			
Summer Spray			400ml Ester
Pre-emergent		Glyphosate 1L Ester 400ml	1L Glyphosate 1L Paraquat 2L Treflan
Seeding			50kg/ha Latrobe Barley 65kg Agflow Extra
Post-emergent			2L Prosulfacarb 50ml Brodal
Post-emergent			40kg Urea (not in trial plots)
Post-em Fertiliser			400ml AmniStar Extra
Yield	1.5		

Seeding 2022:		
Seeder info	DISC	TYNE
Bar:	12m Rootboot Razor Discs	DBS 18m
Row Spacing:	20 cm	30cm
Box:	Morris 8425XL	Simplicity 1500 (3 bin)
Machine:	Case Magnum 340	JD 9530T Tracks
Fan Speed:	4000	3800
Press Wheels:	V shape	90mm Flat
Breakout:	300kg	
Seeding Depth:	3cm	2.5cm
Fert Depth:	3cm	10cm
Soil Wetter:	0	0

Headers 2020:		
Header Info	Stripper Front	Draper Front
Make:		640D JD 12m Front
Model:		9870 JD Header
Front:		
Rotor Speed:		
Concave Setting:		
Other:	410 stripper rotor	
Time of day		
Temperature		
Front width		
Spread Width		
Spread Pattern		
Ground Speed		55
Crop Yield		
Moisture		
Concave clearance	10mm	12mm
Rotor Speed	550rpm	910 rpm
Top Sieve	20mm	22mm
Pre Sieve		
Bottom Sieve	12mm	12mm
Fan Speed	950rpm	950rpm
Combine Capacity (t/hr)		
Reel Speed		
Front loss		
Back loss		
Grain Loss		
flow		
fuel		

6.5.1 Machinery settings

Mobile Phone	Strip & Disc	Draper & Tyne
Nearest town	Corrigin	Corrigin
Crop type	Barley	Barley
Crop variety	LaTrobe	LaTrobe
Date		
Average yield (t/ha)		
Yield monitor calibrated?	Yes	No
Yield range - From (t/ha)	2.5	2.5
Yield range - To (t/ha)	5	5
Grain moisture (%)		
Grower using trays?	Yes	No
Temperature (˚C)	30	30
Relative Humidity (%)	10.7	10.7
Threshing conditions	Good	Good
Any crop lodging?	Yes	Yes
Harvester Make	Case IH	John Deere
Harvester Model		9870
Approx hours		4800
Rotor	As delivered	As delivered
Specify rotor modifications	*Comment: Standard*	*Comment: Standard*
Concaves	As delivered	As delivered
Specify concave modifications	*Comment: Standard*	*Comment: Standard*
Front style	stripper	Draper
Front Make	Case IH	John Deere
Front Model		640D
Cut (m)		12
Cutting Height (mm)		200
Front modifications		centre paddles
Front modifications 2		Top Cross Auger
Front modifications 3		
Front Divider	Round bar	Round bar
Straw spread width (m)		12
Straw management	Chop & spread	Chop & spread
Chaff spread width (m)		12
Chaff management	Windrow	Mill
If Mill - nominate make		HSD
Notes (inc knife condition)		*knife guard - double cut, standard good condition. Belts - good codition, standard reel fingers*
Data gathered by	VC	VC
Test Ground Speed km/h	10.33	5.5
Engine load (%)	76.67	
Fuel use (l/h)	6.93	
Capacity/Flow (t/hr)	54.33	
w/rate (ha/hr)	12.30	
Rotor speed (rpm)	550	910
Concave clearance (mm)	10	12
Top sieve (mm)	20	22
Bottom sieve (mm)	12	12
Pre-sieve setting (if applicable)	15	n/a
Fan Speed (rpm)	950	950
Reel finger angle (o'clock from RHS)	n/a	5
Additional notes	410stripper rotor	

6.6 Gross margin and Gross return Data

Gross margin

INCOME								
			t/ha		$/t	$	-	/ha
					Total income	$	-	/ha
EXPENSES								
Seed								
	Iatrobe Barley	50	kg/ha		$/t		$20	/ha
						$	20.00	/ha
Herbicides / Fungicides / Insecticides / Adjuvants								
	Paraquat	1L	L		$/L		$4	/ha
Pre-Emergent spray	Treflan	2L	g		$/L	$	12.00	/ha
	Ester	400	mL		$/L		$3.15	/ha
	Glyphosate	1L	0			$	6.00	
	Prosulfacarb	2	L		$/L		$18	/ha
Post Emergent spray	Brodal	50	mL		$/L	$	16.00	/ha
						$	59.15	/ha
Fertiliser								
	Amnistar Extra	400	ml		$/kg		$15	/ha
	0	0	0		$/kg	$	-	/ha
	0	0	0			$	-	
	Agflow + MOP	65	kg/ha		$/t		$90	
						$	105.00	/ha
Freight & Storage								
Contract cartage		1	/t	$ 11.50	$/t	$	11.50	/t
CBH Charges		1	/t	$ 42.00	$/t	$	42.00	/t
						$	53.50	/t
Contract Work								
	Seeding		ha	$ 65.00	$/ha			/ha
	Spray application		ha	$ 8.00	$/ha	$	-	/ha
	Spray application		ha	$ 8.00	$/ha	$	-	/ha
	Spray application		ha	$ 8.00	$/ha	$	-	/ha
	Harvest		ha	$ 75.00	$/ha	$	-	/ha
						$	-	/ha
					Total expenses	$	237.65	/ha
					PROFIT	-$	237.65	/ha
					Income	$	-	
					Seed	$	20.00	
					Fertiliser	$	105.00	
					Chemicals	$	59.15	
					Contracting	$	-	
					Freight & Storage	$	53.50	
					Expenses	$	237.65	
					Profit	-$	237.65	

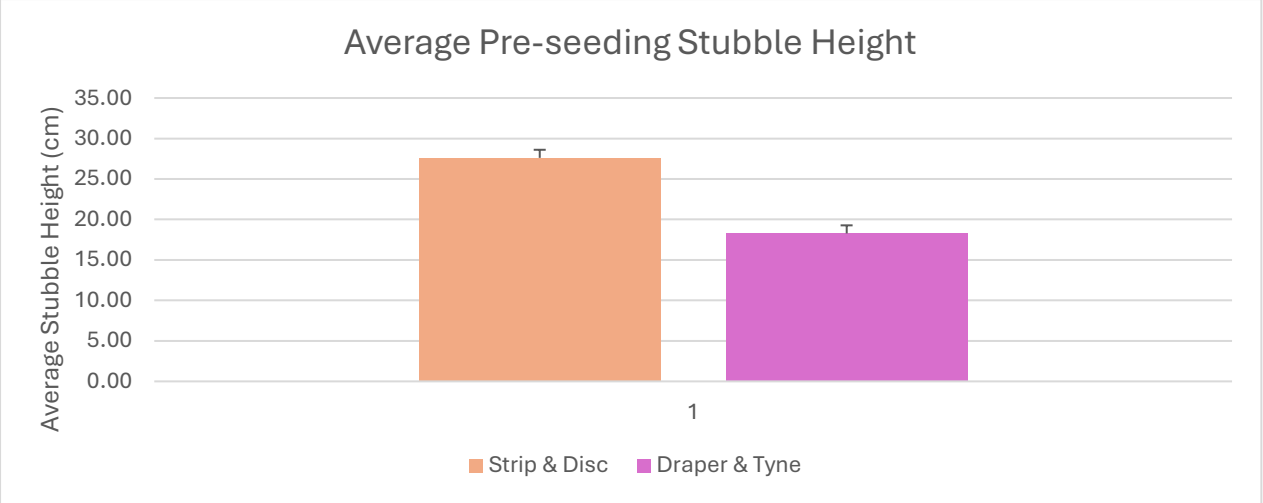
6.7 Gross return

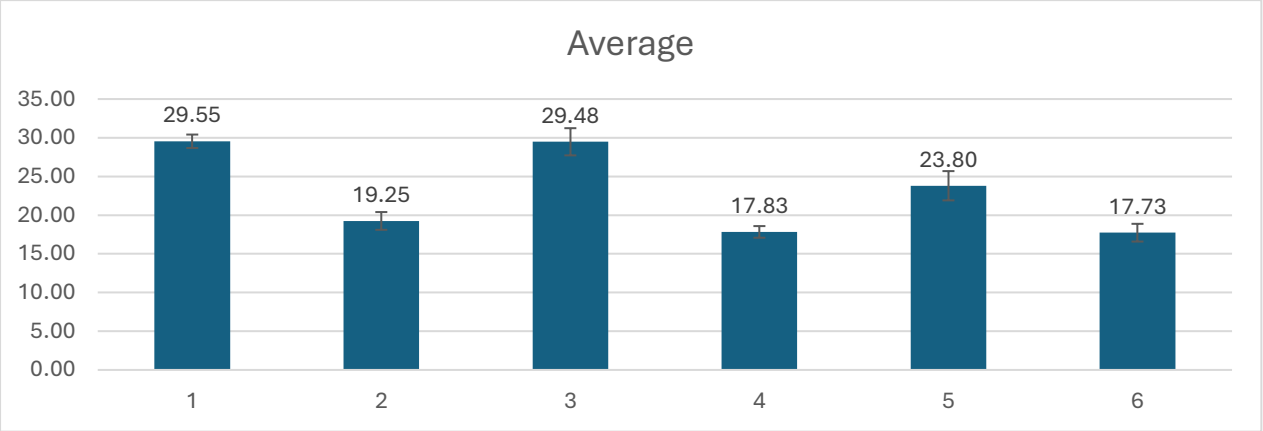
Treatment Number	1	2	3	4	5	6
Treatment Name	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne	Strip & Disc	Draper & Tyne
Variety	La Trobe Barley	La Trobe Barley	La Trobe Barley	La Trobe Barley	La Trobe Barley	La Trobe Barley
Yield (t/ha)	4.43	4.51	4.50	4.61	4.48	4.42
Grade	MALT 1	BFED 1	MALT 1	BFED 1	MALT 1	BFED 1
Price ($/t)	310.00	300.00	310	300	310	300
Income ($/ha)	1373.30	1353.00	1395	1383	1388.8	1326
Seed Costs ($/ha)	20.00	20.00	20	20	20	20
Contracting Charges ($/ha)	11.50	11.50	11.5	11.5	11.5	11.5
Chem Costs ($/ha)	59.15	59.15	59.15	59.15	59.15	59.15
Fert Costs ($/ha)	105.00	105.00	105	105	105	105
Freight & Handling Charges ($/t)	42.00	42.00	42	42	42	42
Total Input costs ($/ha)	237.65	237.65	237.65	237.65	237.65	237.65
Gross Return ($/ha)	**1135.65**	**1115.35**	1157.35	1145.35	1151.15	1088.35

6.8 Stubble height Data

17/02/2022

Treatment Name	plot number	Average	STDEV.S	S.E.
Strip & Disc	1	29.55	**3.47**	**0.90**
Draper & Tyne	2	19.25	**4.60**	**1.19**
Strip & Disc	3	29.48	**7.04**	**1.82**
Draper & Tyne	4	17.83	**3.02**	**0.78**
Strip & Disc	5	23.80	**7.58**	**1.96**
Draper & Tyne	6	17.73	**4.60**	**1.19**

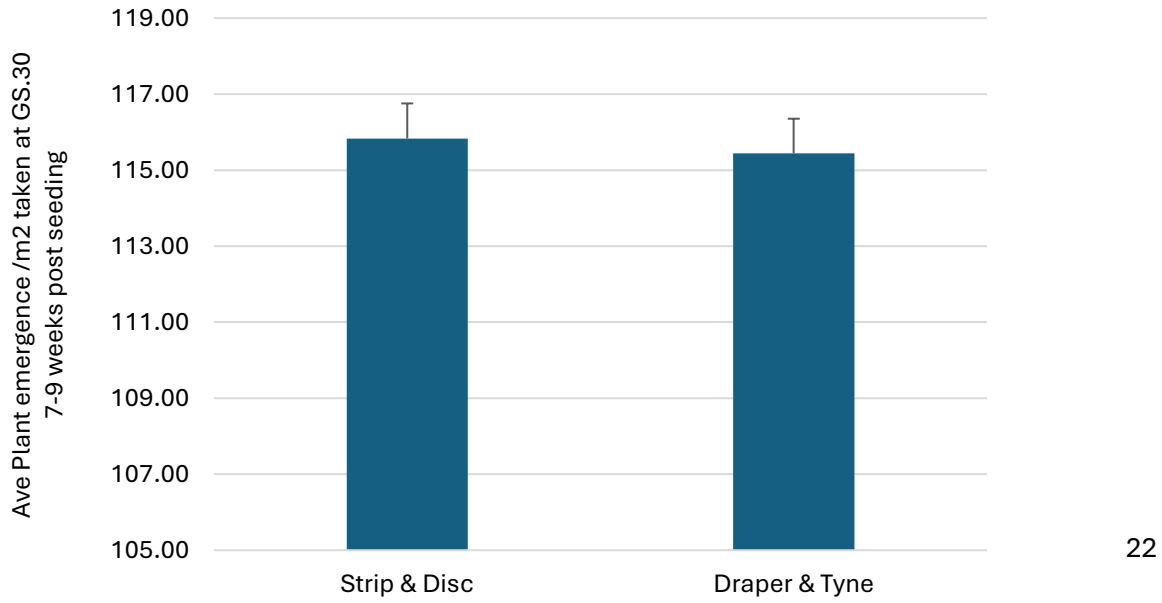




6.10 Plant establishment Data

11/07/2022

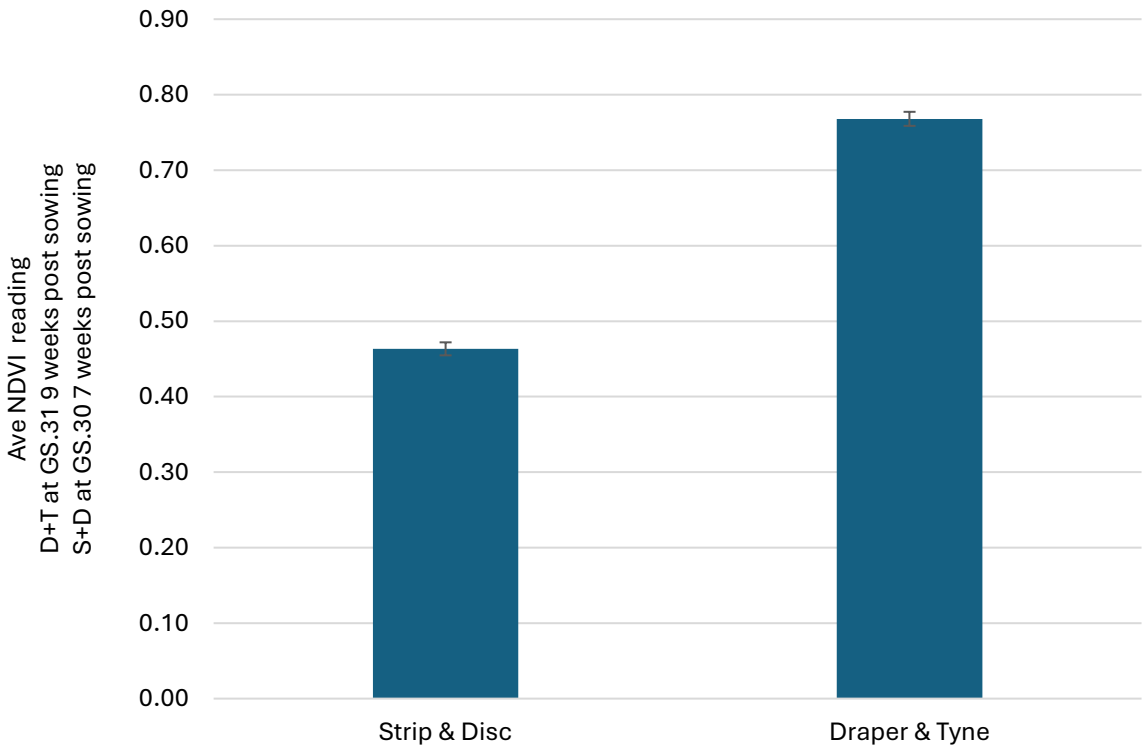
Treatment Name	plot number	Average	Plants/m2	STDEV.S	S.E.
Strip & Disc	1	23.00	**115.00**	**5.58**	**1.76**
Draper & Tyne	2	32.80	**109.33**	**4.85**	**1.53**
Strip & Disc	3	24.60	**123.00**	**6.06**	**1.92**
Draper & Tyne	4	35.70	**119.00**	**5.79**	**1.83**
Strip & Disc	5	21.90	**109.50**	**3.21**	**1.02**
Draper & Tyne	6	35.40	**118.00**	**4.14**	**1.31**



6.11 NDVI GS.30 Data

11/07/022

Treatment Name	plot number	GS.14	STDEV.S	S.E.
Strip & Disc	1	0.46	**0.05**	**0.02**
Draper & Tyne	2	0.79	**0.03**	**0.01**
Strip & Disc	3	0.47	**0.05**	**0.01**
Draper & Tyne	4	0.75	**0.07**	**0.02**
Strip & Disc	5	0.47	**0.05**	**0.01**
Draper & Tyne	6	0.77	**0.04**	**0.01**



6.12 Rainfall Data

Year 2022

Rainfall Record 2022:												
Date	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
2022 Monthly Total (mm)	0	1.6	85.2	55.4	40.2	87.8	53.6	76.6				
Total Rainfall	0	1.6	86.8	142.2	182.4	270.2	323.8	400.4				
Growing Season Rainfall April - Oct				55.4	95.6	183.4	237	313.6	313.6			

6.13 References

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